ESI-CIL Nuclear Governance Project
A multidisciplinary research project by the Energy Studies Institute & Centre for International Law

Selected Documents Relevant to Transboundary Consultation on Nuclear Power Development

MAY 2019

SELECTED DOCUMENTS RELEVANT TO TRANSBOUNDARY CONSULTATION ON NUCLEAR POWER DEVELOPMENT

CONTENTS

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A: INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA) DOCUMENTS

CONVENTION ON NUCLEAR SAFETY ("CNS")

Adopted in Vienna, Austria, on 17 June 1994
Entered into force on 24 October 1996

PREAMBLE

THE CONTRACTING PARTIES

(i) Aware of the importance to the international community of ensuring that the use of nuclear energy is safe, well regulated and environmentally sound;

(ii) Reaffirming the necessity of continuing to promote a high level of nuclear safety worldwide;

(iii) Reaffirming that responsibility for nuclear safety rests with the State having jurisdiction over a nuclear installation;

(iv) Desiring to promote an effective nuclear safety culture;

(v) Aware that accidents at nuclear installations have the potential for transboundary impacts;

(vi) Keeping in mind the Convention on the Physical Protection of Nuclear Material (1979), the Convention on Early Notification of a Nuclear Accident (1986), and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (1986);

(vii) Affirming the importance of international co-operation for the enhancement of nuclear safety through existing bilateral and multilateral mechanisms and the establishment of this incentive Convention;

(viii) Recognizing that this Convention entails a commitment to the application of fundamental safety principles for nuclear installations rather than of detailed safety standards and that there are internationally formulated safety guidelines which are updated from time to time and so can provide guidance on contemporary means of achieving a high level of safety;

(ix) Affirming the need to begin promptly the development of an international convention on the safety of radioactive waste management as soon as the ongoing process to develop waste management safety fundamentals has resulted in broad international agreement;

(x) Recognizing the usefulness of further technical work in connection with the safety of other parts of the nuclear fuel cycle, and that this work may, in time, facilitate the development of current or future international instruments;

HAVE AGREED as follows:

CHAPTER 1. OBJECTIVES, DEFINITIONS AND SCOPE OF APPLICATION

Article 1. Objectives

The objectives of this Convention are:

(i) to achieve and maintain a high level of nuclear safety worldwide through the enhancement of national measures and international co-operation including, where appropriate, safety-related technical co-operation;

(ii) to establish and maintain effective defences in nuclear installations against potential radiological hazards

in order to protect individuals, society and the environment from harmful effects of ionizing radiation from such installations;

(iii) to prevent accidents with radiological consequences and to mitigate such consequences should they occur.

Article 2. Definitions

For the purpose of this Convention:

(i) "nuclear installation" means for each Contracting Party any land-based civil nuclear power plant under its jurisdiction including such storage, handling and treatment facilities for radioactive materials as are on the same site and are directly related to the operation of the nuclear power plant. Such a plant ceases to be a nuclear installation when all nuclear fuel elements have been removed permanently from the reactor core and have been stored safely in accordance with approved procedures, and a decommissioning programme has been agreed to by the regulatory body.

(ii) "regulatory body" means for each Contracting Party any body or bodies given the legal authority by that Contracting Party to grant licenses and to regulate the siting, design, construction, commissioning, operation or decommissioning of nuclear installations.

(iii) "license" means any authorization granted by the regulatory body to the applicant to have the responsibility for the siting, design, construction, commissioning, operation or decommissioning of a nuclear installation.

Article 3. Scope of application

This Convention shall apply to the safety of nuclear installations.

CHAPTER 2. OBLIGATIONS

(a) General Provisions

Article 4. Implementing measures

Each Contracting Party shall take, within the framework of its national law, the legislative, regulatory and administrative measures and other steps necessary for implementing its obligations under this Convention.

Article 5. Reporting

Each Contracting Party shall submit for review, prior to each meeting referred to in Article 20, a report on the measures it has taken to implement each of the obligations of this Convention.

Article 6. Existing nuclear installations

Each Contracting Party shall take the appropriate steps to ensure that the safety of nuclear installations existing at the time the Convention enters into force for that Contracting Party is reviewed as soon as possible. When necessary in the context of this Convention, the Contracting Party shall ensure that all reasonably practicable improvements are made as a matter of urgency to upgrade the safety of the nuclear installation. If such upgrading cannot be achieved, plans should be implemented to shut down the nuclear installation as soon as practically possible. The timing of the shut-down may take into account the whole energy context and possible alternatives as well as the social, environmental and economic impact.

(b) Legislation and regulation

Article 7. Legislative and regulatory framework

1. Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of nuclear installations.

2. The legislative and regulatory framework shall provide for:

(i) the establishment of applicable national safety requirements and regulations;

(ii) a system of licensing with regard to nuclear installations and the prohibition of the operation of a nuclear installation without a license;

(iii) a system of regulatory inspection and assessment of nuclear installations to ascertain compliance with applicable regulations and the terms of licenses;

(iv) the enforcement of applicable regulations and of the terms of licenses, including suspension, modification or revocation.

Article 8. Regulatory body

1. Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 7, and provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities.

2. Each Contracting Party shall take the appropriate steps to ensure an effective separation between the functions of the regulatory body and those of any other body or organization concerned with the promotion or utilization of nuclear energy.

Article 9. Responsibility of the licence holder

Each Contracting Party shall ensure that prime responsibility for the safety of a nuclear installation rests with the holder of the relevant license and shall take the appropriate steps to ensure that each such license holder meets its responsibility.

(c) General safety considerations

Article 10. Priority to safety

Each Contracting Party shall take the appropriate steps to ensure that all organizations engaged in activities directly related to nuclear installations shall establish policies that give due priority to nuclear safety.

Article 11. Financial and human resources

1. Each Contracting Party shall take the appropriate steps to ensure that adequate financial resources are available to support the safety of each nuclear installation throughout its life.

2. Each Contracting Party shall take the appropriate steps to ensure that sufficient numbers of qualified staff with appropriate education, training and retraining are available for all safety-related activities in or for each nuclear installation, throughout its life.

Article 12. Human factors

Each Contracting Party shall take the appropriate steps to ensure that the capabilities and limitations of human performance are taken into account throughout the life of a nuclear installation.

Article 13. Quality assurance

Each Contracting Party shall take the appropriate steps to ensure that quality assurance programmes are established and implemented with a view to providing confidence that specified requirements for all activities important to nuclear safety are satisfied throughout the life of a nuclear installation.

Article 14. Assessment and verification of safety

Each Contracting Party shall take the appropriate steps to ensure that:

(i) comprehensive and systematic safety assessments are carried out before the

construction and commissioning of a nuclear installation and throughout its life. Such assessments shall be well documented, subsequently updated in the light of operating experience and significant new safety information, and reviewed under the authority of the regulatory body;

(ii) verification by analysis, surveillance, testing and inspection is carried out to ensure that the physical state and the operation of a nuclear installation continue to be in accordance with its design, applicable national safety requirements, and operational limits and conditions.

Article 15. Radiation protection

Each Contracting Party shall take the appropriate steps to ensure that in all operational states the radiation exposure to the workers and the public caused by a nuclear installation shall be kept as low as reasonably achievable and that no individual shall be exposed to radiation doses which exceed prescribed national dose limits.

Article 16. Emergency preparedness

1. Each Contracting Party shall take the appropriate steps to ensure that there are on-site and off-site emergency plans that are routinely tested for nuclear installations and cover the activities to be carried out in the event of an emergency.

For any new nuclear installation, such plans shall be prepared and tested before it commences operation above a low power level agreed by the regulatory body.

2. Each Contracting Party shall take the appropriate steps to ensure that, insofar as they are likely to be affected by a radiological emergency, its own population and the competent authorities of the States in the vicinity of the nuclear installation arc provided with appropriate information for emergency planning and response.

3. Contracting Parties which do not have a nuclear installation on their territory, insofar as they are likely to be affected in the event of a radiological emergency at a nuclear installation in the vicinity, shall take the appropriate steps for the preparation and testing of emergency plans for their territory that cover the activities to be carried out in the event of such an emergency.

(d) Safety of Installations

Article 17. Siting

Each Contracting Party shall take the appropriate steps to ensure that appropriate procedures are established and implemented:

(i) for evaluating all relevant site-related factors likely to affect the safety of a nuclear installation for its projected lifetime;

(ii) for evaluating the likely safety impact of a proposed nuclear installation on individuals, society and the environment;

(iii) for re-evaluating as necessary all relevant factors referred to in sub-paragraphs (i) and (ii) so as to ensure the continued safety acceptability of the nuclear installation;

(iv) for consulting Contracting Parties in the vicinity of a proposed nuclear installation, insofar as they are likely to be affected by that installation and, upon request providing the necessary information to such Contracting Parties, in order to enable them to evaluate and make their own assessment of the likely safety impact on their own territory of the nuclear installation.

Article 18. Design and construction

Each Contracting Party shall take the appropriate steps to ensure that:

(i) the design and construction of a nuclear installation provides for several reliable levels and methods of protection (defense in depth) against the release of radioactive materials, with a view to preventing the occurrence of accidents and to mitigating their radiological consequences should they occur;

(ii) the technologies incorporated in the design and construction of a nuclear installation are proven by experience or qualified by testing or analysis;

(iii) the design of a nuclear installation allows for reliable, stable and easily manageable operation, with specific consideration of human factors and the man-machine interface.

Article 19. Operation

Each Contracting Party shall take the appropriate steps to ensure that:

(i) the initial authorization to operate a nuclear installation is based upon an appropriate safety analysis and a commissioning programme demonstrating that the installation, as constructed, is consistent with design and safety requirements;

(ii) operational limits and conditions derived from the safety analysis, tests and operational experience are defined and revised as necessary for identifying safe boundaries for operation;

(iii) operation, maintenance, inspection and testing of a nuclear installation are conducted in accordance with approved procedures;

(iv) procedures are established for responding to anticipated operational occurrences and to accidents;

(v) necessary engineering and technical support in all safety-related fields is available throughout the lifetime of a nuclear installation;

(vi) incidents significant to safety are reported in a timely manner by the holder of the relevant licence to the regulatory body;

(vii) programmes to collect and analyse operating experience are established, the results obtained and the conclusions drawn are acted upon and that existing mechanisms are used to share important experience with international bodies and with other operating organizations and regulatory bodies;

(viii) the generation of radioactive waste resulting from the operation of a nuclear installation is kept to the minimum practicable for the process concerned, both in activity and in volume, and any necessary treatment and storage of spent fuel and waste directly related to the operation and on the same site as that of the nuclear installation take into consideration conditioning and disposal.

CHAPTER 3. MEETINGS OF THE CONTRACTING PARTIES

Article 20. Review meetings

1. The Contracting Parties shall hold meetings (hereinafter referred to as "review meetings") for the purpose of reviewing the reports submitted pursuant to Article 5 in accordance with the procedures adopted under Article 22.

2. Subject to the provisions of Article 24 sub-groups comprised of representatives of Contracting Parties

may be established and may function during the review meetings as deemed necessary for the purpose of reviewing specific subjects contained in the reports.

3. Each Contracting Party shall have a reasonable opportunity to discuss the reports submitted by other Contracting Parties and to seek clarification of such reports.

Article 21. Timetable

1. A preparatory meeting of the Contracting Parties shall be held not later than six months after the date of entry into force of this Convention.

2. At this preparatory meeting, the Contracting Parties shall determine the date for the first review meeting. This review meeting shall be held as soon as possible, but not later than thirty months after the date of entry into force of this Convention.

3. At each review meeting, the Contracting Parties shall determine the date for the next such meeting. The interval between review meetings shall not exceed three years.

Article 22. Procedural arrangements

1. At the preparatory meeting held pursuant to Article 21 the Contracting Parties shall prepare and adopt by consensus Rules of Procedure and Financial Rules. The Contracting Parties shall establish in particular and in accordance with the Rules of Procedure:

   (i) guidelines regarding the form and structure of the reports to be submitted pursuant to Article 5;

   (ii) a date for the submission of such reports;

   (iii) the process for reviewing such reports.

2. At review meetings the Contracting Parties may, if necessary, review the arrangements established pursuant to sub-paragraphs (i)-(iii) above, and adopt revisions by consensus unless otherwise provided for in the Rules of Procedure. They may also amend the Rules of Procedure and the Financial Rules, by consensus.

Article 23. Extraordinary meetings

An extraordinary meeting of the Contracting Parties shall be held:

(i) if so agreed by a majority of the Contracting Parties present and voting at a meeting, abstentions being considered as voting; or

(ii) at the written request of a Contracting Party, within six months of this request having been communicated to the Contracting Parties and notification having been received by the secretariat referred to in Article 28, that the request has been supported by a majority of the Contracting Parties.

Article 24. Attendance

1. Each Contracting Party shall attend meetings of the Contracting Parties and be represented at such meetings by one delegate, and by such alternates, experts and advisers as it deems necessary.

2. The Contracting Parties may invite, by consensus, any intergovernmental organization which is competent in respect of matters governed by this Convention to attend, as an observer, any meeting, or specific sessions thereof. Observers shall be required to accept in writing, and in advance, the provisions of Article 27.

Article 25. Summary reports

The Contracting Parties shall adopt, by consensus, and make available to the public a document addressing issues discussed and conclusions reached during a meeting.

Article 26. Languages

1. The languages of meetings of the Contracting Parties shall be Arabic, Chinese, English, French, Russian and Spanish unless otherwise provided in the Rules of Procedure.

2. Reports submitted pursuant to Article 5 shall be prepared in the national language of the submitting Contracting Party or in a single designated language to be agreed in the Rules of Procedure. Should the report be submitted in a national language other than the designated language, a translation of the report into the designated language shall be provided by the Contracting Party.

3. Notwithstanding the provisions of paragraph 2, if compensated, the secretariat will assume the translation into the designated language of reports submitted in any other language of the meeting.

Article 27. Confidentiality

1. The provisions of this Convention shall not affect the rights and obligations of the Contracting Parties under their law to protect information from disclosure. For the purposes of this Article, "information" includes, inter alia, (i) personal data; (ii) information protected by intellectual property rights or by industrial or commercial confidentiality; and (iii) information relating to national security or to the physical protection of nuclear materials or nuclear installations.

2. When, in the context of this Convention, a Contracting Party provides information identified by it as protected as described in paragraph 1, such information shall be used only for the purposes for which it has been provided and its confidentiality shall be respected.

3. The content of the debates during the reviewing of the reports by the Correcting Parties at each meeting shall be confidential.

Article 28. Secretariat

1. The International Atomic Energy Agency, (hereinafter referred to as the "Agency") shall provide the secretariat for the meetings of the Contracting Parties.

2. The secretariat shall:

   (i) convene, prepare and service the meetings of the Contracting Parties;

   (ii) transmit to the Contracting Parties information received or prepared in accordance with the provisions of this Convention.

   The costs incurred by the Agency in carrying out the functions referred to in subparagraphs (i) and (ii) above shall be borne by the Agency as part of its regular budget.

3. The Contracting Parties may, by consensus, request the Agency to provide other services in support of meetings of the Contracting Parties. The Agency may provide such services if they can be undertaken within its programme and regular budget. Should this not be possible, the Agency may provide such services if voluntary funding is provided from another source.

CHAPTER 4. FINAL CLAUSES AND OTHER PROVISIONS

Article 29. Resolution of disagreements

In the event of a disagreement between two or more Contracting Parties concerning the interpretation or application of this Convention, the Contracting Parties shall consult within the framework of a meeting of the Contracting Parties with a view to resolving the disagreement.

Article 30. Signature, ratification, acceptance, approval, accession

1. This Convention shall be open for signature by all States at the Headquarters of the Agency in Vienna from 20 September 1994 until its entry into force.

2. This Convention is subject to ratification, acceptance or approval by the signatory States.

3. After its entry into force, this Convention shall be open for accession by all States.

4. (i) This Convention shall be open for signature or accession by regional organizations of an integration or other nature, provided that any such organization is constituted by sovereign States and has competence in respect of the negotiation, conclusion and application of international agreements in matters covered by this Convention.

   (ii) In matters within their competence, such organizations shall, on their own behalf, exercise the rights and fulfil the responsibilities which this Convention attributes to States Parties.

   (iii) When becoming party to this Convention, such an organization shall communicate to the Depositary referred to in Article 34, a declaration indicating which States are members thereof, which articles of this Convention apply to it, and the extent of its competence in the field covered by those articles.

   (iv) Such an organization shall not hold any vote additional to those of its Member States.

5. Instruments of ratification, acceptance, approval or accession shall be deposited with the Depositary.

Article 31. Entry into force

1. This Convention shall enter into force on the ninetieth day after the date of deposit with the Depositary of the twenty-second instrument of ratification, acceptance or approval, including the instruments of seventeen States, each having at least one nuclear installation which has achieved criticality in a reactor core.

2. For each State or regional organization of an integration or other nature which ratifies, accepts, approves or accedes to this Convention after the date of deposit of the last instrument required to satisfy the conditions set forth in paragraph 1, this Convention shall enter into force on the ninetieth day after the date of deposit with the Depositary of the appropriate instrument by such a State or organization.

Article 32. Amendments to the Convention

1. Any Contracting Party may propose an amendment to this Convention. Proposed amendments shall be considered at a review meeting or an extraordinary meeting.

2. The text of any proposed amendment and the reasons for it shall be provided to the Depositary who shall

communicate the proposal to the Contracting Parties promptly and at least ninety days before the meeting for which it is submitted for consideration. Any comments received on such a proposal shall be circulated by the Depositary to the Contracting Parties.

3. The Contracting Parties shall decide after consideration of the proposed amendment whether to adopt it by consensus, or, in the absence of consensus, to submit it to a Diplomatic Conference. A decision to submit a proposed amendment to a Diplomatic Conference shall require a two-thirds majority vote of the Contracting Parties present and voting at the meeting, provided that at least one half of the Contracting Parties are present at the time of voting. Abstentions shall be considered as voting.

4. The Diplomatic Conference to consider and adopt amendments to this Convention shall be convened by the Depositary and held no later than one year after the appropriate decision taken in accordance with paragraph 3 of this Article. The Diplomatic Conference shall make every effort to ensure amendments are adopted by consensus. Should this not be possible, amendments shall be adopted with a two-thirds majority of all Contracting Parties.

5. Amendments to this Convention adopted pursuant to paragraphs 3 and 4 above shall be subject to ratification, acceptance, approval, or confirmation by the Contracting Parties and shall enter into force for those Contracting Parties which have ratified, accepted, approved or confirmed them on the ninetieth day after the receipt by the Depositary of the relevant instruments by at least three fourths of the Contracting Parties. For a Contracting Party which subsequently ratifies, accepts, approves or confirms the said amendments, the amendments will enter into force on the ninetieth day after that Contracting Party has deposited its relevant instrument.

Article 33. Denunciation

1. Any Contracting Party may denounce this Convention by written notification to the Depositary.

2. Denunciation shall take effect one year following the date of the receipt of the notification by the Depositary, or on such later date as may be specified in the notification.

Article 34. Depositary

1. The Director General of the Agency shall be the Depositary of this Convention.

2. The Depositary shall inform the Contracting Parties of:

   (i) the signature of this Convention and of the deposit of instruments of ratification, acceptance, approval or accession, in accordance with Article 30;

   (ii) the date on which the Convention enters into force, in accordance with Article 31;

   (iii) the notifications of denunciation of the Convention and the date thereof, made in accordance with Article 33;

   (iv) the proposed amendments to this Convention submitted by Contracting Parties, the amendments adopted by the relevant Diplomatic Conference or by the meeting of the Contracting Parties, and the date of entry into force of

the said amendments, in accordance with Article 32.

Article 35. Authentic texts

The original of this Convention of which the Arabic, Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited with the Depositary, who shall send certified copies thereof to the Contracting Parties.

JOINT CONVENTION ON THE SAFETY OF SPENT FUEL MANAGEMENT AND ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT ("JOINT CONVENTION")

Adopted in Vienna, Austria on 5 September 1997
Entered into force on 18 June 2001

PREAMBLE

The Contracting Parties

(i) Recognizing that the operation of nuclear reactors generates spent fuel and radioactive waste and that other applications of nuclear technologies also generate radioactive waste;

(ii) Recognizing that the same safety objectives apply both to spent fuel and radioactive waste management;

(iii) Reaffirming the importance to the international community of ensuring that sound practices are planned and implemented for the safety of spent fuel and radioactive waste management;

(iv) Recognizing the importance of informing the public on issues regarding the safety of spent fuel and radioactive waste management;

(v) Desiring to promote an effective nuclear safety culture worldwide;

(vi) Reaffirming that the ultimate responsibility for ensuring the safety of spent fuel and radioactive waste management rests with the State;

(vii) Recognizing that the definition of a fuel cycle policy rests with the State, some States considering spent fuel as a valuable resource that may be reprocessed, others electing to dispose of it;

(viii) Recognizing that spent fuel and radioactive waste excluded from the present Convention because they are within military or defense programmes should be managed in accordance with the objectives stated in this Convention;

(ix) Affirming the importance of international co-operation in enhancing the safety of spent fuel and radioactive waste management through bilateral and multilateral mechanisms, and through this incentive Convention;

(x) Mindful of the needs of developing countries, and in particular the least developed countries, and of States with economies in transition and of the need to facilitate existing mechanisms to assist in the fulfillment of their rights and obligations set out in this incentive Convention;

(xi) Convinced that radioactive waste should, as far as is compatible with the safety of the management of such material, be disposed of in the State in which it was generated, whilst recognizing that, in certain circumstances, safe and efficient management of spent fuel and radioactive waste might be fostered through agreements among Contracting Parties to use facilities in one of them for the benefit of the other Parties, particularly where waste originates from joint projects;

(xii) Recognizing that any State has the right to ban import into its territory of foreign spent fuel and radioactive waste;

(xiii) Keeping in mind the Convention on Nuclear Safety (1994), the Convention on Early Notification of a Nuclear Accident (1986), the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (1986), the Convention on the Physical Protection of Nuclear Material (1980), the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter as amended (1994) and other relevant international instruments;

(xiv) Keeping in mind the principles contained in the interagency "International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources" (1996), in the IAEA Safety Fundamentals entitled "The Principles of Radioactive Waste Management" (1995), and in the existing international standards relating to the safety of the transport of radioactive materials;

(xv) Recalling Chapter 22 of Agenda 21 by the United Nations Conference on Environment and Development in Rio de Janeiro adopted in 1992, which reaffirms the paramount importance of the safe and environmentally sound management of radioactive waste;

(xvi) Recognizing the desirability of strengthening the international control system applying specifically to radioactive materials as referred to in Article 1(3) of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989);

Have agreed as follows:

CHAPTER 1. OBJECTIVES, DEFINITIONS AND SCOPE OF APPLICATION

Article 1. Objectives

The objectives of this Convention are:

(i) to achieve and maintain a high level of safety worldwide in spent fuel and radioactive waste management, through the enhancement of national measures and international co-operation, including where appropriate, safety-related technical co-operation;

(ii) to ensure that during all stages of spent fuel and radioactive waste management there are effective defenses against potential hazards so that individuals, society and the environment are protected from harmful effects of ionizing radiation, now and in the future, in such a way that the needs and aspirations of the present generation are met without compromising the ability of future generations to meet their needs and aspirations;

(iii) to prevent accidents with radiological consequences and to mitigate their consequences should they occur during any stage of spent fuel or radioactive waste management.

Article 2. Definitions

For the purposes of this Convention:

(a) "*closure*" means the completion of all operations at some time after the emplacement of spent fuel or radioactive waste in a disposal facility. This includes the final engineering or other work required to bring the facility to a condition that will be safe in the long term;

(b) "*decommissioning*" means all steps leading to the release of a nuclear facility, other than a disposal facility, from regulatory control. These steps include the processes of decontamination and dismantling;

(c) "*discharges*" means planned and controlled releases into the environment, as a legitimate practice,

within limits authorized by the regulatory body, of liquid or gaseous radioactive materials that originate from regulated nuclear facilities during normal operation;

(d) "*disposal*" means the emplacement of spent fuel or radioactive waste in an appropriate facility without the intention of retrieval;

(e) "*licence*" means any authorization, permission or certification granted by a regulatory body to carry out any activity related to management of spent fuel or of radioactive waste;

(f) "*nuclear facility*" means a civilian facility and its associated land, buildings and equipment in which radioactive materials are produced, processed, used, handled, stored or disposed of on such a scale that consideration of safety is required;

(g) "*operating lifetime*" means the period during which a spent fuel or a radioactive waste management facility is used for its intended purpose. In the case of a disposal facility, the period begins when spent fuel or radioactive waste is first emplaced in the facility and ends upon closure of the facility;

(h) *"radioactive waste*" means radioactive material in gaseous, liquid or solid form for which no further use is foreseen by the Contracting Party or by a natural or legal person whose decision is accepted by the Contracting Party, and which is controlled as radioactive waste by a regulatory body under the legislative and regulatory framework of the Contracting Party;

(i) "*radioactive waste management*" means all activities, including decommissioning activities, that relate to the handling, pretreatment, treatment, conditioning, storage, or disposal of radioactive waste, excluding off-site transportation. It may also involve discharges;

(j) "*radioactive waste management facility*" means any facility or installation the primary purpose of which is radioactive waste management, including a nuclear facility in the process of being decommissioned only if it is designated by the Contracting Party as a radioactive waste management facility;

(k) "*regulatory body*" means any body or bodies given the legal authority by the Contracting Party to regulate any aspect of the safety of spent fuel or radioactive waste management including the granting of licenses;

(l) "*reprocessing*" means a process or operation, the purpose of which is to extract radioactive isotopes from spent fuel for further use;

(m) "*sealed source*" means radioactive material that is permanently sealed in a capsule or closely bonded and in a solid form, excluding reactor fuel elements;

(n) "*spent fuel*" means nuclear fuel that has been irradiated in and permanently removed from a reactor core;

(o) "*spent fuel management*" means all activities that relate to the handling or storage of spent fuel, excluding off-site transportation. It may also involve discharges;

(p) "*spent fuel management facility*" means any facility or installation the primary purpose of which is spent fuel management;

(q) "*State of destination*" means a State to which a transboundary movement is planned or takes place;

(r) "*State of origin*" means a State from which a transboundary movement is planned to be initiated or is initiated;

(s) "*State of transit*" means any State, other than a State of origin or a State of destination, through whose territory a transboundary movement is planned or takes place;

(t) "*storage*" means the holding of spent fuel or of radioactive waste in a facility that provides for its containment, with the intention of retrieval;

(u) "*transboundary movement*" means any shipment of spent fuel or of radioactive waste from a State of origin to a State of destination.

Article 3. Scope of application

1. This Convention shall apply to the safety of spent fuel management when the spent fuel results from the operation of civilian nuclear reactors. Spent fuel held at reprocessing facilities as part of a reprocessing activity is not covered in the scope of this Convention unless the Contracting Party declares reprocessing to be part of spent fuel management.

2. This Convention shall also apply to the safety of radioactive waste management when the radioactive waste results from civilian applications. However, this Convention shall not apply to waste that contains only naturally occurring radioactive materials and that does not originate from the nuclear fuel cycle, unless it constitutes a disused sealed source or it is declared as radioactive waste for the purposes of this Convention by the Contracting Party.

3. This Convention shall not apply to the safety of management of spent fuel or radioactive waste within military or defense programmes, unless declared as spent fuel or radioactive waste for the purposes of this Convention by the Contracting Party. However, this Convention shall apply to the safety of management of spent fuel and radioactive waste from military or defence programmes if and when such materials are transferred permanently to and managed within exclusively civilian programmes.

4. This Convention shall also apply to discharges as provided for in Articles 4, 7, 11, 14, 24 and 26.

CHAPTER 2. SAFETY OF SPENT FUEL MANAGEMENT

Article 4. General safety requirements

Each Contracting Party shall take the appropriate steps to ensure that at all stages of spent fuel management, individuals, society and the environment are adequately protected against radiological hazards.

In so doing, each Contracting Party shall take the appropriate steps to:

(i) ensure that criticality and removal of residual heat generated during spent fuel management are adequately addressed;

(ii) ensure that the generation of radioactive waste associated with spent fuel management is kept to the minimum practicable, consistent with the type of fuel cycle policy adopted;

(iii) take into account interdependencies among the different steps in spent fuel management;

(iv) provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due

regard to internationally endorsed criteria and standards;

(v) take into account the biological, chemical and other hazards that may be associated with spent fuel management;

(vi) strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;

(vii) aim to avoid imposing undue burdens on future generations.

Article 5. Existing facilities

Each Contracting Party shall take the appropriate steps to review the safety of any spent fuel management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility.

Article 6. Siting of proposed facilities

1. Each Contracting Party shall take the appropriate steps to ensure that procedures are established and implemented for a proposed spent fuel management facility:

   (i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime;

   (ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment;

   (iii) to make information on the safety of such a facility available to members of the public;

   (iv) to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.

2. In so doing, each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 4.

Article 7. Design and construction of facilities

Each Contracting Party shall take the appropriate steps to ensure that:

(i) the design and construction of a spent fuel management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;

(ii) at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a spent fuel management facility are taken into account;

(iii) the technologies incorporated in the design and construction of a spent fuel management facility are supported by experience, testing or analysis.

Article 8. Assessment of safety of facilities

Each Contracting Party shall take the appropriate steps to ensure that:

(i) before construction of a spent fuel management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out;

(ii) before the operation of a spent fuel management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).

Article 9. Operation of facilities

Each Contracting Party shall take the appropriate steps to ensure that:

(i) the licence to operate a spent fuel management facility is based upon appropriate assessments as specified in Article 8 and is conditional on the completion of a commissioning programme demonstrating that the facility, as constructed, is consistent with design and safety requirements;

(ii) operational limits and conditions derived from tests, operational experience and the assessments, as specified in Article 8, are defined and revised as necessary;

(iii) operation, maintenance, monitoring, inspection and testing of a spent fuel management facility are conducted in accordance with established procedures;

(iv) engineering and technical support in all safety-related fields are available throughout the operating lifetime of a spent fuel management facility;

(v) incidents significant to safety are reported in a timely manner by the holder of the licence to the regulatory body;

(vi) programmes to collect and analyse relevant operating experience are established and that the results are acted upon, where appropriate;

(vii) decommissioning plans for a spent fuel management facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body.

Article 10. Disposal of spent fuel

If, pursuant to its own legislative and regulatory framework, a Contracting Party has designated spent fuel for disposal, the disposal of such spent fuel shall be in accordance with the obligations of Chapter 3 relating to the disposal of radioactive waste.

CHAPTER 3. SAFETY OF RADIOACTIVE WASTE MANAGEMENT

Article 11. General safety requirements

Each Contracting Party shall take the appropriate steps to ensure that at all stages of radioactive waste management individuals, society and the environment are adequately protected against radiological and other hazards.

In so doing, each Contracting Party shall take the appropriate steps to:

(i) ensure that criticality and removal of residual heat generated during radioactive waste management are adequately addressed;

(ii) ensure that the generation of radioactive waste is kept to the minimum practicable;

(iii) take into account interdependencies among the different steps in radioactive waste management;

(iv) provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due regard to internationally endorsed criteria and standards;

(v) take into account the biological, chemical and other hazards that may be associated with radioactive waste management;

(vi) strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;

(vii) aim to avoid imposing undue burdens on future generations.

Article 12. Existing facilities and past practices

Each Contracting Party shall in due course take the appropriate steps to review:

(i) the safety of any radioactive waste management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility;

(ii) the results of past practices in order to determine whether any intervention is needed for reasons of radiation protection bearing in mind that the reduction in detriment resulting from the reduction in dose should be sufficient to justify the harm and the costs, including the social costs, of the intervention.

Article 13. Siting of proposed facilities

1. Each Contracting Party shall take the appropriate steps to ensure that procedures are established and implemented for a proposed radioactive waste management facility:

    (i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime as well as that of a disposal facility after closure;

    (ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment, taking into account possible evolution of the site conditions of disposal facilities after closure;

    (iii) to make information on the safety of such a facility available to members of the public;

    (iv) to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.

2. In so doing, each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 11.

Article 14. Design and construction of facilities

Each Contracting Party shall take the appropriate steps to ensure that:

(i) the design and construction of a radioactive waste management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;

(ii) at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a radioactive waste management facility other than a disposal facility are taken into account;

(iii) at the design stage, technical provisions for the closure of a disposal facility are prepared;

(iv) the technologies incorporated in the design and construction of a radioactive waste management facility are supported by experience, testing or analysis.

Article 15. Assessment of safety of facilities

Each Contracting Party shall take the appropriate steps to ensure that:

(i) before construction of a radioactive waste management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out;

(ii) in addition, before construction of a disposal facility, a systematic safety assessment and an environmental assessment for the period following closure shall be carried out and the results evaluated against the criteria established by the regulatory body;

(iii) before the operation of a radioactive waste management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).

Article 16. Operation of facilities

Each Contracting Party shall take the appropriate steps to ensure that:

(i) the licence to operate a radioactive waste management facility is based upon appropriate assessments as specified in Article 15 and is conditional on the completion of a commissioning programme demonstrating that the facility, as constructed, is consistent with design and safety requirements;

(ii) operational limits and conditions, derived from tests, operational experience and the assessments as specified in Article 15 are defined and revised as necessary;

(iii) operation, maintenance, monitoring, inspection and testing of a radioactive waste management facility are conducted in accordance with established procedures. For a disposal facility the results thus obtained shall be used to verify and to review the validity of assumptions made and to update the assessments as specified in Article 15 for the period after closure;

(iv) engineering and technical support in all safety-related fields are available throughout the operating lifetime of a radioactive waste management facility;

(v) procedures for characterization and segregation of radioactive waste are applied;

(vi) incidents significant to safety are reported in a timely manner by the holder of the licence to the regulatory body;

(vii) programmes to collect and analyse relevant operating experience are established and that the results are acted upon, where appropriate;

(viii) decommissioning plans for a radioactive waste management facility other than a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body;

(ix) plans for the closure of a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that

facility and are reviewed by the regulatory body.

Article 17. Institutional measures after closure

Each Contracting Party shall take the appropriate steps to ensure that after closure of a disposal facility:

(i) records of the location, design and inventory of that facility required by the regulatory body are preserved;

(ii) active or passive institutional controls such as monitoring or access restrictions are carried out, if required; and

(iii) if, during any period of active institutional control, an unplanned release of radioactive materials into the environment is detected, intervention measures are implemented, if necessary.

CHAPTER 4. GENERAL SAFETY PROVISIONS

Article 18. Implementing measures

Each Contracting Party shall take, within the framework of its national law, the legislative, regulatory and administrative measures and other steps necessary for implementing its obligations under this Convention.

Article 19. Legislative and regulatory framework

1. Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of spent fuel and radioactive waste management.

2. This legislative and regulatory framework shall provide for:

   (i) the establishment of applicable national safety requirements and regulations for radiation safety;

   (ii) a system of licensing of spent fuel and radioactive waste management activities;

   (iii) a system of prohibition of the operation of a spent fuel or radioactive waste management facility without a license;

   (iv) a system of appropriate institutional control, regulatory inspection and documentation and reporting;

   (v) the enforcement of applicable regulations and of the terms of the licenses;

   (vi) a clear allocation of responsibilities of the bodies involved in the different steps of spent fuel and of radioactive waste management.

3. When considering whether to regulate radioactive materials as radioactive waste, Contracting Parties shall take due account of the objectives of this Convention.

Article 20. Regulatory body

1. Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 19, and provided with adequate authority, competence and financial and human resources to fulfill its assigned responsibilities.

2. Each Contracting Party, in accordance with its legislative and regulatory framework, shall take the appropriate steps to ensure the effective independence of the regulatory functions from other functions where organizations are involved in both

spent fuel or radioactive waste management and in their regulation.

Article 21. Responsibility of the licence holder

1. Each Contracting Party shall ensure that prime responsibility for the safety of spent fuel or radioactive waste management rests with the holder of the relevant licence and shall take the appropriate steps to ensure that each such licence holder meets its responsibility.

2. If there is no such licence holder or other responsible party, the responsibility rests with the Contracting Party which has jurisdiction over the spent fuel or over the radioactive waste.

Article 22. Human and financial resources

Each Contracting Party shall take the appropriate steps to ensure that:

(i) qualified staff are available as needed for safety-related activities during the operating lifetime of a spent fuel and a radioactive waste management facility;

(ii) adequate financial resources are available to support the safety of facilities for spent fuel and radioactive waste management during their operating lifetime and for decommissioning;

(iii) financial provision is made which will enable the appropriate institutional controls and monitoring arrangements to be continued for the period deemed necessary following the closure of a disposal facility.

Article 23. Quality assurance

Each Contracting Party shall take the necessary steps to ensure that appropriate quality assurance programmes concerning the safety of spent fuel and radioactive waste management are established and implemented.

Article 24. Operational radiation protection

1. Each Contracting Party shall take the appropriate steps to ensure that during the operating lifetime of a spent fuel or radioactive waste management facility:

   (i) the radiation exposure of the workers and the public caused by the facility shall be kept as low as reasonably achievable, economic and social factors being taken into account;

   (ii) no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection; and

   (iii) measures are taken to prevent unplanned and uncontrolled releases of radioactive materials into the environment.

2. Each Contracting Party shall take appropriate steps to ensure that discharges shall be limited:

   (i) to keep exposure to radiation as low as reasonably achievable, economic and social factors being taken into account; and

   (ii) so that no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection.

3. Each Contracting Party shall take appropriate steps to ensure that during the operating lifetime of a regulated nuclear facility, in the event that an unplanned or uncontrolled release of radioactive materials into the environment occurs, appropriate corrective measures are implemented to control the release and mitigate its effects.

Article 25. Emergency preparedness

1. Each Contracting Party shall ensure that before and during operation of a spent fuel or radioactive waste management facility there are appropriate on-site and, if necessary, off-site emergency plans. Such emergency plans should be tested at an appropriate frequency.

2. Each Contracting Party shall take the appropriate steps for the preparation and testing of emergency plans for its territory insofar as it is likely to be affected in the event of a radiological emergency at a spent fuel or radioactive waste management facility in the vicinity of its territory.

Article 26. Decommissioning

Each Contracting Party shall take the appropriate steps to ensure the safety of decommissioning of a nuclear facility. Such steps shall ensure that:

(i) qualified staff and adequate financial resources are available;

(ii) the provisions of Article 24 with respect to operational radiation protection, discharges and unplanned and uncontrolled releases are applied;

(iii) the provisions of Article 25 with respect to emergency preparedness are applied; and

(iv) records of information important to decommissioning are kept.

CHAPTER 5. MISCELLANEOUS PROVISIONS

Article 27. Transboundary movement

1. Each Contracting Party involved in transboundary movement shall take the appropriate steps to ensure that such movement is undertaken in a manner consistent with the provisions of this Convention and relevant binding international instruments.

   In so doing:

   (i) a Contracting Party which is a State of origin shall take the appropriate steps to ensure that transboundary movement is authorized and takes place only with the prior notification and consent of the State of destination;

   (ii) transboundary movement through States of transit shall be subject to those international obligations which are relevant to the particular modes of transport utilized;

   (iii) a Contracting Party which is a State of destination shall consent to a transboundary movement only if it has the administrative and technical capacity, as well as the regulatory structure, needed to manage the spent fuel or the radioactive waste in a manner consistent with this Convention;

   (iv) a Contracting Party which is a State of origin shall authorize a transboundary movement only if it can satisfy itself in accordance with the consent of the State of destination that the requirements of subparagraph (iii) are met

prior to transboundary movement;

(v) a Contracting Party which is a State of origin shall take the appropriate steps to permit re-entry into its territory, if a transboundary movement is not or cannot be completed in conformity with this Article, unless an alternative safe arrangement can be made.

2. A Contracting Party shall not licence the shipment of its spent fuel or radioactive waste to a destination south of latitude 60 degrees South for storage or disposal.

3. Nothing in this Convention prejudices or affects:

(i) the exercise, by ships and aircraft of all States, of maritime, river and air navigation rights and freedoms, as provided for in international law;

(ii) rights of a Contracting Party to which radioactive waste is exported for processing to return, or provide for the return of, the radioactive waste and other products after treatment to the State of origin;

(iii) the right of a Contracting Party to export its spent fuel for reprocessing;

(iv) rights of a Contracting Party to which spent fuel is exported for reprocessing to return, or provide for the return of, radioactive waste and other products resulting from reprocessing operations to the State of origin.

Article 28. Disused sealed sources

1. Each Contracting Party shall, in the framework of its national law, take the appropriate steps to ensure that the possession, remanufacturing or disposal of disused sealed sources takes place in a safe manner.

2. A Contracting Party shall allow for reentry into its territory of disused sealed sources if, in the framework of its national law, it has accepted that they be returned to a manufacturer qualified to receive and possess the disused sealed sources.

CHAPTER 6. MEETINGS OF THE CONTRACTING PARTIES

Article 29. Preparatory meeting

1. A preparatory meeting of the Contracting Parties shall be held not later than six months after the date of entry into force of this Convention.

2. At this meeting, the Contracting Parties shall:

(i) determine the date for the first review meeting as referred to in Article 30. This review meeting shall be held as soon as possible, but not later than thirty months after the date of entry into force of this Convention;

(ii) prepare and adopt by consensus Rules of Procedure and Financial Rules;

(iii) establish in particular and in accordance with the Rules of Procedure:

(a) guidelines regarding the form and structure of the national reports to be submitted pursuant to Article 32;

(b) a date for the submission of such reports;

(c) the process for reviewing such reports.

3. Any State or regional organization of an integration or other nature which ratifies, accepts, approves, accedes to or confirms this Convention and for which the Convention is not yet in force, may attend the preparatory meeting as if it were a Party to this Convention.

Article 30. Review meetings

1. The Contracting Parties shall hold meetings for the purpose of reviewing the reports submitted pursuant to Article 32.

2. At each review meeting the Contracting Parties:

   (i) shall determine the date for the next such meeting, the interval between review meetings not exceeding three years;

   (ii) may review the arrangements established pursuant to paragraph 2 of Article 29, and adopt revisions by consensus unless otherwise provided for in the Rules of Procedure. They may also amend the Rules of Procedure and Financial Rules by consensus.

3. At each review meeting each Contracting Party shall have a reasonable opportunity to discuss the reports submitted by other Contracting Parties and to seek clarification of such reports.

Article 31. Extraordinary meetings

An extraordinary meeting of the Contracting Parties shall be held:

(i) if so agreed by a majority of the Contracting Parties present and voting at a meeting; or

(ii) at the written request of a Contracting Party, within six months of this request having been communicated to the Contracting Parties and notification having been received by the secretariat referred to in Article 37 that the request has been supported by a majority of the Contracting Parties.

Article 32. Reporting

1. In accordance with the provisions of Article 30, each Contracting Party shall submit a national report to each review meeting of Contracting Parties. This report shall address the measures taken to implement each of the obligations of the Convention. For each Contracting Party the report shall also address its:

   (i) spent fuel management policy;

   (ii) spent fuel management practices;

   (iii) radioactive waste management policy;

   (iv) radioactive waste management practices;

   (v) criteria used to define and categorize radioactive waste.

2. This report shall also include:

   (i) a list of the spent fuel management facilities subject to this Convention, their location, main purpose and essential features;

   (ii) an inventory of spent fuel that is subject to this Convention and that is being held in storage and of that which has been disposed of. This inventory shall contain a description of the material and, if available, give

information on its mass and its total activity;

(iii) a list of the radioactive waste management facilities subject to this Convention, their location, main purpose and essential features;

(iv) an inventory of radioactive waste that is subject to this Convention that:

(a) is being held in storage at radioactive waste management and nuclear fuel cycle facilities;

(b) has been disposed of; or

(c) has resulted from past practices.

This inventory shall contain a description of the material and other appropriate information available, such as volume or mass, activity and specific radionuclides;

(v) a list of nuclear facilities in the process of being decommissioned and the status of decommissioning activities at those facilities.

Article 33. Attendance

1. Each Contracting Party shall attend meetings of the Contracting Parties and be represented at such meetings by one delegate, and by such alternates, experts and advisers as it deems necessary.

2. The Contracting Parties may invite, by consensus, any intergovernmental organization which is competent in respect of matters governed by this Convention to attend, as an observer, any meeting, or specific sessions thereof. Observers shall be required to accept in writing, and in advance, the provisions of Article 36.

Article 34. Summary reports

The Contracting Parties shall adopt, by consensus, and make available to the public a document addressing issues discussed and conclusions reached during meetings of the Contracting Parties.

Article 35. Languages

1. The languages of meetings of the Contracting Parties shall be Arabic, Chinese, English, French, Russian and Spanish unless otherwise provided in the Rules of Procedure.

2. Reports submitted pursuant to Article 32 shall be prepared in the national language of the submitting Contracting Party or in a single designated language to be agreed in the Rules of Procedure. Should the report be submitted in a national language other than the designated language, a translation of the report into the designated language shall be provided by the Contracting Party.

3. Notwithstanding the provisions of paragraph 2, the secretariat, if compensated, will assume the translation of reports submitted in any other language of the meeting into the designated language.

Article 36. Confidentiality

1. The provisions of this Convention shall not affect the rights and obligations of the Contracting Parties under their laws to protect information from disclosure. For the purposes of this article, "information" includes, inter alia, information relating to national security or to the physical protection of nuclear materials, information protected by intellectual property rights or by industrial or commercial confidentiality, and personal data.

2. When, in the context of this Convention, a Contracting Party provides information identified by it as protected as described in paragraph 1, such information shall be used only for the purposes for which it has been provided and its confidentiality shall be respected.

3. With respect to information relating to spent fuel or radioactive waste falling within the scope of this Convention by virtue of paragraph 3 of Article 3, the provisions of this Convention shall not affect the exclusive discretion of the Contracting Party concerned to decide:

   (i) whether such information is classified or otherwise controlled to preclude release;

   (ii) whether to provide information referred to in sub-paragraph (i) above in the context of the Convention; and

   (iii) what conditions of confidentiality are attached to such information if it is provided in the context of this Convention.

4. The content of the debates during the reviewing of the national reports at each review meeting held pursuant to Article 30 shall be confidential.

Article 37. Secretariat

1. The International Atomic Energy Agency, (hereinafter referred to as "the Agency") shall provide the secretariat for the meetings of the Contracting Parties.

2. The secretariat shall:

   (i) convene, prepare and service the meetings of the Contracting Parties referred to in Articles 29, 30 and 31;

   (ii) transmit to the Contracting Parties information received or prepared in accordance with the provisions of this Convention.

   The costs incurred by the Agency in carrying out the functions referred to in sub-paragraphs (i) and (ii) above shall be borne by the Agency as part of its regular budget.

3. The Contracting Parties may, by consensus, request the Agency to provide other services in support of meetings of the Contracting Parties. The Agency may provide such services if they can be undertaken within its programme and regular budget. Should this not be possible, the Agency may provide such services if voluntary funding is provided from another source.

CHAPTER 7. FINAL CLAUSES AND OTHER PROVISIONS

Article 38. Resolution of disagreements

In the event of a disagreement between two or more Contracting Parties concerning the interpretation or application of this Convention, the Contracting Parties shall consult within the framework of a meeting of the Contracting Parties with a view to resolving the disagreement. In the event that the consultations prove unproductive, recourse can be made to the mediation, conciliation and arbitration mechanisms provided for in international law, including the rules and practices prevailing within the IAEA.

Article 39. Signature, ratification, acceptance, approval, accession

1. This Convention shall be open for signature by all States at the Headquarters of the Agency in Vienna

from 29 September 1997 until its entry into force.

2. This Convention is subject to ratification, acceptance or approval by the signatory States.

3. After its entry into force, this Convention shall be open for accession by all States.

4. (i) This Convention shall be open for signature subject to confirmation, or accession by regional organizations of an integration or other nature, provided that any such organization is constituted by sovereign States and has competence in respect of the negotiation, conclusion and application of international agreements in matters covered by this Convention.

   (ii) In matters within their competence, such organizations shall, on their own behalf, exercise the rights and fulfil the responsibilities which this Convention attributes to States Parties.

   (iii) When becoming party to this Convention, such an organization shall communicate to the Depositary referred to in Article 43, a declaration indicating which States are members thereof, which Articles of this Convention apply to it, and the extent of its competence in the field covered by those articles.

   (iv) Such an organization shall not hold any vote additional to those of its Member States.

5. Instruments of ratification, acceptance, approval, accession or confirmation shall be deposited with the Depositary.

Article 40. Entry into force

1. This Convention shall enter into force on the ninetieth day after the date of deposit with the Depositary of the twenty-fifth instrument of ratification, acceptance or approval, including the instruments of fifteen States each having an operational nuclear power plant.

2. For each State or regional organization of an integration or other nature which ratifies, accepts, approves, accedes to or confirms this Convention after the date of deposit of the last instrument required to satisfy the conditions set forth in paragraph 1, this Convention shall enter into force on the ninetieth day after the date of deposit with the Depositary of the appropriate instrument by such a State or organization.

Article 41. Amendments to the Convention

1. Any Contracting Party may propose an amendment to this Convention. Proposed amendments shall be considered at a review meeting or at an extraordinary meeting.

2. The text of any proposed amendment and the reasons for it shall be provided to the Depositary who shall communicate the proposal to the Contracting Parties at least ninety days before the meeting for which it is submitted for consideration. Any comments received on such a proposal shall be circulated by the Depositary to the Contracting Parties.

3. The Contracting Parties shall decide after consideration of the proposed amendment whether to adopt it by consensus, or, in the absence of consensus, to submit it to a Diplomatic Conference. A decision to submit a proposed amendment to a Diplomatic Conference shall require a two-thirds majority vote of the Contracting

Parties present and voting at the meeting, provided that at least one half of the Contracting Parties are present at the time of voting.

4. The Diplomatic Conference to consider and adopt amendments to this Convention shall be convened by the Depositary and held no later than one year after the appropriate decision taken in accordance with paragraph 3 of this article. The Diplomatic Conference shall make every effort to ensure amendments are adopted by consensus. Should this not be possible, amendments shall be adopted with a two-thirds majority of all Contracting Parties.

5. Amendments to this Convention adopted pursuant to paragraphs 3 and 4 above shall be subject to ratification, acceptance, approval, or confirmation by the Contracting Parties and shall enter into force for those Contracting Parties which have ratified, accepted, approved or confirmed them on the ninetieth day after the receipt by the Depositary of the relevant instruments of at least two thirds of the Contracting Parties. For a Contracting Party which subsequently ratifies, accepts, approves or confirms the said amendments, the amendments will enter into force on the ninetieth day after that Contracting Party has deposited its relevant instrument.

Article 42. Denunciation

1. Any Contracting Party may denounce this Convention by written notification to the Depositary.

2. Denunciation shall take effect one year following the date of the receipt of the notification by the Depositary, or on such later date as may be specified in the notification.

Article 43. Depositary

1. The Director General of the Agency shall be the Depositary of this Convention.

2. The Depositary shall inform the Contracting Parties of:

   (i) the signature of this Convention and of the deposit of instruments of ratification, acceptance, approval, accession or confirmation in accordance with Article 39;

   (ii) the date on which the Convention enters into force, in accordance with Article 40;

   (iii) the notifications of denunciation of the Convention and the date thereof, made in accordance with Article 42;

   (iv) the proposed amendments to this Convention submitted by Contracting Parties, the amendments adopted by the relevant Diplomatic Conference or by the meeting of the Contracting Parties, and the date of entry into force of the said amendments, in accordance with Article 41.

Article 44. Authentic texts

The original of this Convention of which the Arabic, Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited with the Depositary, who shall send certified copies thereof to the Contracting Parties.

IN WITNESS WHEREOF THE UNDERSIGNED, BEING DULY AUTHORIZED TO THAT EFFECT, HAVE SIGNED THIS CONVENTION.

Done at Vienna on the fifth day of September, one thousand nine hundred and ninety-seven.

MANAGING ENVIRONMENTAL IMPACT ASSESSMENT FOR CONSTRUCTION AND OPERATION IN NEW NUCLEAR POWER PROGRAMMES ("IAEA EIA GUIDELINES")

IAEA Nuclear Energy Series No. NG-T-3.11

1. INTRODUCTION

1.1. Background

The introduction of a nuclear power programme is a major undertaking, with significant implications for many aspects of national infrastructure, ranging from 'hard' (or material) aspects of infrastructure to 'softer' (or human related) areas. For a State which does not already have nuclear power, it may take up to 10–15 years to develop the necessary infrastructure.

To facilitate the progress towards developing the required infrastructure for a State that is considering the introduction of nuclear power as part of its national energy strategy, the IAEA published IAEA Nuclear Energy Series No. NG-G-3.1, Milestones in the Development of a National Infrastructure for Nuclear Power [1], which describes a three phased approach, covering 19 different infrastructure issues that need to be addressed for each of the phases (see Fig. 1). Environmental protection is one of these 19 issues.

As States turn to nuclear power to fulfil development goals, deploying a nuclear power programme in an environmentally sound manner is gaining significant importance. Currently, the emphasis on environmental issues is highlighted in many national and international documents on licensing related procedures (e.g. guidance, regulations and permit applications). Moreover, environmental issues often correspond to the public perception and acceptance of a certain project. However, most States embarking on a nuclear power programme ('embarking States') have no, or little, experience of environmental issues specific to nuclear programmes.

This publication provides a holistic approach to environmental protection in new nuclear power programmes. It describes the environmental impact assessment (EIA) process, its utilization and the necessary infrastructure for such a process. The presumption is made that an embarking State already has an environmental regulatory framework, which may not be developed for nuclear power but instead for current industrial projects. Hence, the emphasis of this publication is on the environmental aspects that are unique to a nuclear power plant project.

1.2. Intended audience

This publication is addressed to senior managers, project managers or coordinators, and other technical specialists from: governmental authorities and agencies, including regulatory bodies; operating organizations and nuclear industries of embarking States; and organizations involved in environmental protection.

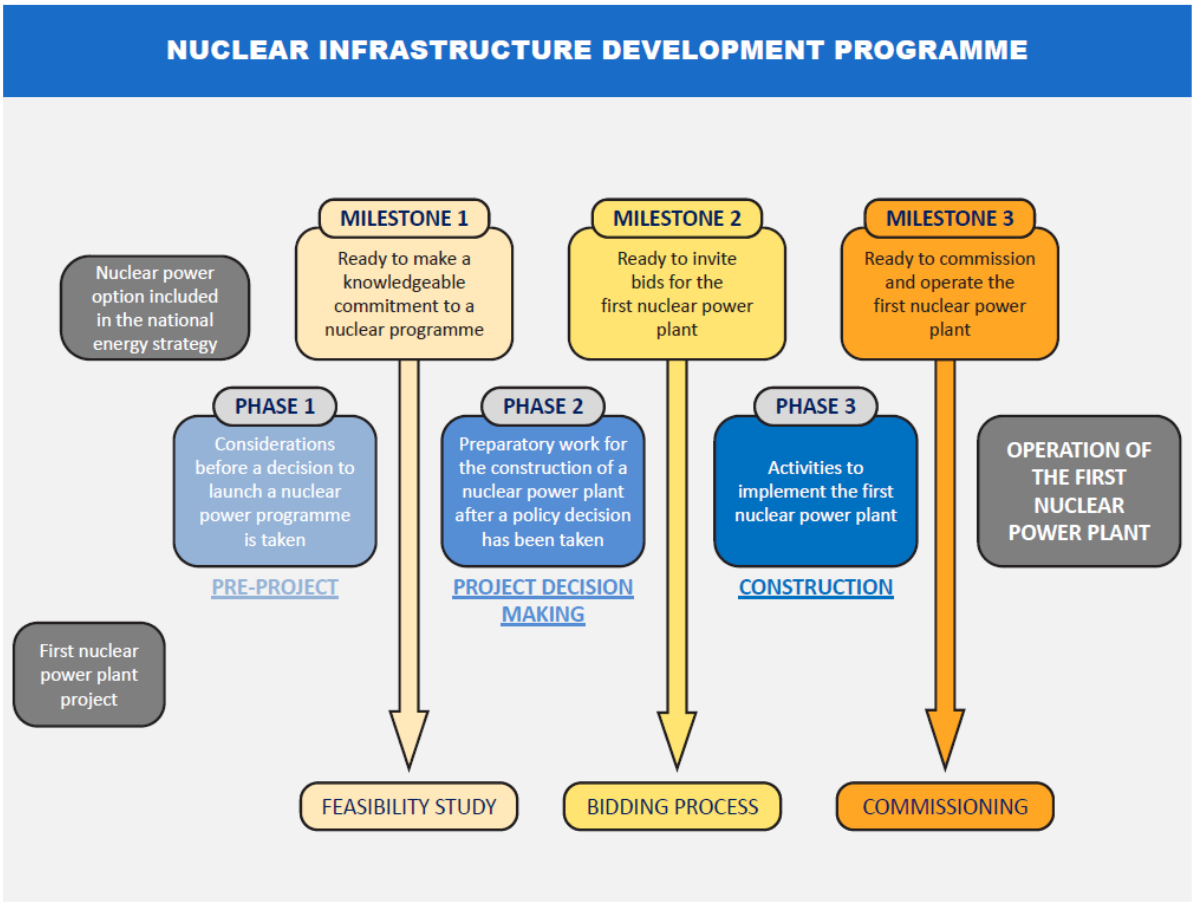

FIG. 1. Major phases and milestones in developing nuclear power.

1.3. Objective

The objective of this publication is to assist States in developing an effective EIA process and correctly using it in a consistent manner with existing IAEA publications. It is intended to cover all topics relevant to the process of addressing environmental issues in implementing nuclear power programmes.

This publication describes actions for each phase of the nuclear power programme dealing with environmental issues, following the approach suggested by IAEA Nuclear Energy Series No. NG-G-3.1 [1]. This publication also explains the process of developing a structured series of environmental reports, which provide information to all stakeholders and contribute to the open and transparent approach to nuclear power programme implementation. Where possible, this publication describes flexible approaches which allow States to adjust the recommendations to fit their existing legislative framework or policy.

1.4. Scope

This publication highlights typical environmental implications for nuclear power technology. Awareness of the specifics of nuclear technologies is required by all parties, including the regulators, to understand the unique aspects of implementing a nuclear power programme whilst protecting the environment. This awareness optimizes the planning and preparation phase.

IAEA publications are available for siting, safety, security, stakeholder involvement and emergency planning. Therefore, this publication only briefly reviews these topics, referencing the appropriate IAEA publications for further information.

1.5 Structure

Section 1 introduces the background, the objective, the scope and structure, and the targeted users of this publication. Section 2 presents general considerations for an environmental programme, including a roadmap for addressing environmental issues and an interface with other milestone issues. It examines the necessary expertise required to appropriately administer an environmental programme for nuclear power plant projects, and describes issues unique to nuclear EIAs.

Section 3 offers an overview of the necessary legislative, regulatory and organizational aspects that affect the environmental protection component of the new nuclear power programme. Section 4 is dedicated to the steps taken throughout the EIA process — from initial environmental information collection, through the environmental scoping report (ESR) to completion of the EIA report. Section 5 reviews the use of EIA reports in nuclear technology bid specification, the licence and permit processes, and the development of an environmental management plan (EMP) and an environmental monitoring programme.

Annex 1 provides a brief overview of some of the international legal instruments on environmental law. Annex 2 details the main technical sources of information required to prepare a nuclear power plant EIA.

Case studies on the role of public participation and communication, and environmental monitoring are given in Annexes 3 and 4, respectively.

2. GENERAL CONSIDERATIONS FOR THE ENVIRONMENTAL PROGRAMME

2.1. Roadmap for addressing environmental issues in new nuclear power programmes

In the first phase of a nuclear power programme, a State considers the environmental issues pertaining to an informed decision for a nuclear programme. Typical actions would be:

- Reviewing the suitability of the existing framework and organizational structure responsible for environmental protection, with an action plan on how to address the identified deficiencies;
- Initiating a siting survey, which would also include initial environmental information collection and analysis;

The second phase should encompass essential preparatory work for the deployment of nuclear power, leading to the formulation of a specification to accompany the bid invitation to vendors. Ideally, a State would:

- Implement the action plan on legal, regulatory and organizational improvements for environmental protection;
- Allocate responsibilities and establish decision making and licensing processes;
- Complete the EIA process, with development of the three reports: initial environmental information analysis, the ESR and the EIA report;
- Incorporate the EIA results to prepare the bid invitation specification or contract.

The third phase follows the bid invitation specification and concludes with the nuclear power plant ready for operation. During this phase:

- All the various licences and permits for environmental requirements should be obtained.
- Environmental monitoring programmes are developed and fully implemented, and, if required by the State, an EMP is developed, all of which aim to respond to the scientific uncertainty of the EIA.

Figure 2 depicts the phased implementation of the environmental protection programme. Each step of the process is described briefly below and examined in more detail in Section 4.

The strategic environmental assessment (SEA) is a high-level consideration of the issues likely to be significant to a particular project. The SEA

is based on information available early in the process and is used for early decision making regarding the environmental feasibility of a project. States may perform an SEA as the first step in terms of environmental protection.

During the site survey stage, when many sites are screened, initial environmental information is collected to support the choice of candidate sites. Typically, the information is from a desktop survey and collection of all available data of environmental relevance, such as the protection status of terrestrial ecosystems and aquatic environment, their characteristics and aquifer sensitivity. Subsurface data collection is not required at this stage. An analysis of information describing each site's environmental suitability for a nuclear power plant may be presented as part of a site survey report or as a separate document.

The ESR is a plan for how the EIA is to be carried out. It may also be called by some States the 'terms of reference for the EIA' or the 'EIA programme'. It builds on the information provided in the initial environmental information report and identifies the requirements for additional information and analysis in order to complete a comprehensive EIA report. The ESR also aims to identify all aspects for which there may be impacts to be assessed in the EIA. The ESR provides a stakeholder participation and communication plan and identifies key stakeholders.

The EIA is a process to identify and to assess all the environmental and socioeconomic impacts of the nuclear power plant. Its objective is to satisfy questions regarding impacts of the project on environmental and human health. It adds critical information to the licence and permit decision making process. In addition to the primary operating licence, it may be used by some stakeholders (e.g. financing institutions) in their own specific decision making processes. Therefore, it is important to understand the requirements associated with the specific uses of the EIA. The process also has the practical function of increasing the interaction among the project developer and stakeholders, as environmental issues are brought to light, discussed and resolved.

The EIA report presents the analysis and findings of the process in a holistic manner. It describes the baseline conditions of the environment and surrounding population, identifies the impacts of the project in all its phases on the environment and population, and analyses whether the impacts are significant. If the impacts are significant, the EIA report presents mitigation measures to address the impacts and a monitoring plan designed to keep track of the actual impacts during project development and operation.

The EIA also includes draft environmental monitoring for necessary mitigating measures when the monitored impacts exceed expected limits. The EIA report represents a holistic description of the project's environmental consequences to decision makers and increases the transparency of the nuclear development process. The report is a companion document to the safety analysis report (SAR)[1], which addresses the safety aspects of the site and the proposed project. In short, the EIA report is the leading document for the site permit request, while the SAR is the document submitted to the regulatory body for requesting the site licence.

[1] The SAR is used here to mean either the preliminary SAR or the final SAR, depending on the timing of the application process in the discussion. Generally, only the preliminary SAR is active during the entire EIA process until the EIA report is completed. The regulatory body uses the SAR to evaluate independently the safety of the plant. It typically includes some information also required in the EIA, so some coordination is generally needed to avoid duplication of effort.

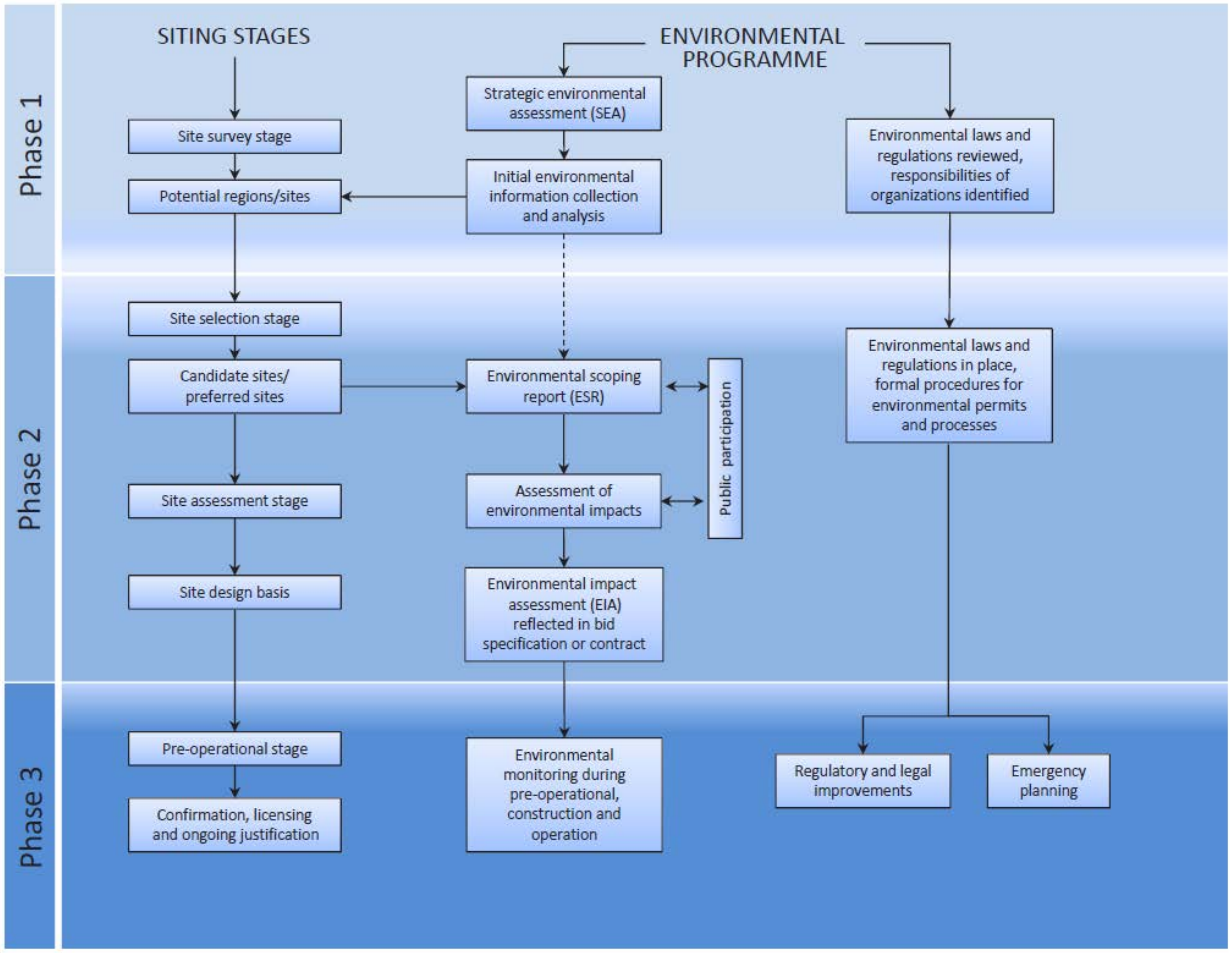

FIG. 2. Phased approach to address environmental issues in new nuclear power programmes.

A bid invitation specification will incorporate the environmental commitments, limitations and conditions resulting from EIA report approval to support the vendor evaluation. Environmental permits and licence applications, such as site, construction and operating licences, will also include relevant information and conclusions from the EIA process.

The environmental monitoring programme is compiled in the permit phase, utilizing recommendations made in the EIA report. The monitoring plan is approved by relevant authorities, either separately or as part of the relevant permits. The objective of monitoring is to provide ongoing information on significant impacts, so that mitigating steps can be taken if the monitored impacts exceed expected limits.

The EMP is a comprehensive document on all requirements for maintaining environmental protection, including monitoring, reporting, mitigation measures and processes for implementing corrective actions. Some States may not require such a combined document but instead may require individual plans for specific issues.

2.2. Significance and interaction with other milestone issues

Environmental issues span all aspects of a nuclear power programme. This section

describes their significance related to the following milestone issues[2]:

— Nuclear safety;
— Site and supporting facilities;
— Funding and financing;
— Electric power grid;
— Emergency planning;
— Nuclear fuel cycle and radioactive waste;
— National position;
— Stakeholder involvement.

2.2.1. Nuclear safety

There are areas of overlap between the EIA and the safety analysis, particularly with regards to nuclear power plant parameters and site characterization and analysis. IAEA safety standards are developed to protect people and the environment from harmful effects of ionizing radiation. Environmental safety, which is addressed in the IAEA safety standards (see Fig. 3), is analogous to environmental protection in the new nuclear power programmes reviewed in this publication.

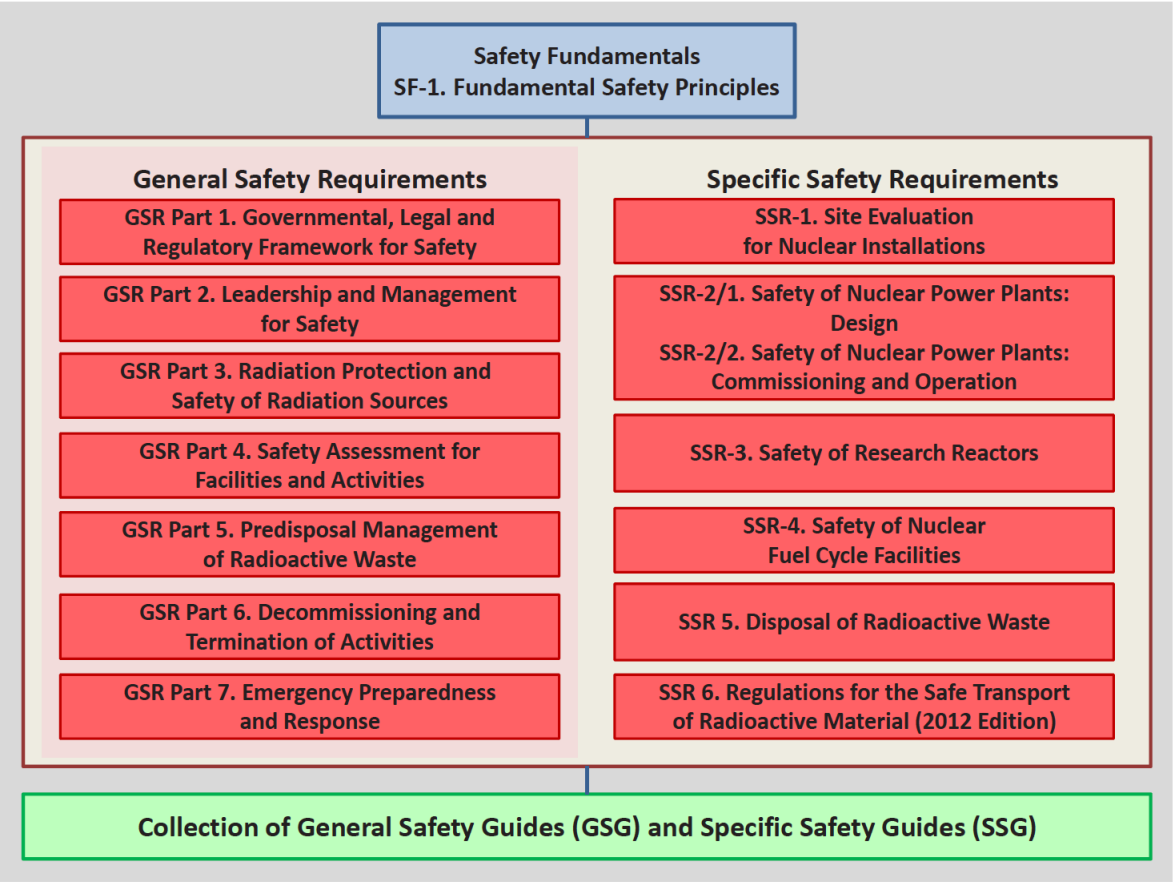

FIG. 3. The long term structure of the IAEA Safety Standards Series.

The relationship between the SAR and the EIA report should be noted. The SAR is a detailed demonstration of the safety of the nuclear power plant, reviewed and assessed by the regulatory body and in accordance with clearly defined procedures. The SAR contains accurate and sufficiently precise information on the plant and its operating conditions, including information on, for example, safety requirements, the design basis, site and plant

[2] The infrastructure issues indispensable to supporting environmental protection (e.g. the legislative and regulatory framework) are examined in depth in Section 3.

characteristics, operational limits and conditions, and safety analyses, in such a way that the regulatory body will be able to evaluate independently the safety of the plant [2].

Information in the SAR, which is required in the EIA, includes:

- Geography of the site, including restricted settlement areas;
- Demography such as nearby and regional populations, including sensitive subpopulations;
- External hazards that could impact the site;
- Meteorology, including discussion of the characteristics describing dispersion of airborne contamination.

Also included is a description of surface water and groundwater, including modelling showing pathways for water based contaminant transport. The SAR also contains information on local and regional geological and geotechnical parameters, and descriptions of seismic potential and faults. Most, if not all, of this provides the baseline physical information about the site and its vicinity, and supports the EIA analysis of the impacts of the nuclear power plant on the surrounding environment.

If the data required or intended for the SAR are available for stakeholder review by the time the EIA report is prepared and published, the EIA could refer to the data contained in the SAR. Otherwise, the EIA report contains enough of the SAR information relevant to site characterization to support its analyses and conclusions. Care should be taken throughout the entire EIA programme to ensure consistency between the EIA report and the SAR.

2.2.2. Siting

There is a clear connection between environmental protection and the site selection process. In fact, the siting process for nuclear power plants is strongly influenced by specific environmental considerations for the regions or sites of interest. These considerations for environmental protection and the environmental analysis typically include the protection of air, water, wildlife and cultural resources. They are among the factors influencing the site survey through the site selection criteria. The siting process narrows down the site options according to the available published environmental and safety related information, but the EIA process later enables considerable additional information to be collected and detailed analysis to be conducted. Consideration of environmental issues early in the site selection process should result in a selected site that is acceptable with regards to the environmental and socioeconomic impacts, with no other site significantly superior. Not just the environmental impacts, but also safety and other factors are considered in the site selection process. IAEA Nuclear Energy Series No. NG-T-3.7, Managing Siting Activities for Nuclear Power Plants [3], provides more guidance on the potential non-radiological environmental impacts on siting.

2.2.3. Funding and financing

A thorough analysis of environmental protection requirements, including required mitigation solutions, helps to reduce the uncertainty associated with the financial risks. By including the environmental protection requirements and mitigation solutions in the bid invitation specification, the possibility of unplanned and costly environmental protection measures impacting the design is minimized. Environmental protection requirements may also influence directly the choice of technology and design, with their associated costs. Many financial institutions require the completion of an EIA as a condition for a financing arrangement.

2.2.4. Electric power grid

Consideration of the impact due to upgrades of the electric power grid is more likely to be included in a separate EIA, which is often performed by someone other than the nuclear power plant developer. However, the environmental impact of the transmission corridor and substations associated with the

introduction of the nuclear power plant may need to be included in the nuclear power plant EIA, and the assessment can influence decisions about the development of the electric power grid.

2.2.5. Emergency planning

Although in some States emergency planning is covered in the SAR, it may use some of the data from the EIA to develop an effective emergency response programme. The data allow the identification of critical contamination paths in case of accidents so that emergency notification systems and procedures can be optimized. The connection between environmental monitoring and emergency situations is examined in more detail in IAEA Safety Standards Series No. RS-G-1.8, Environmental and Source Monitoring for Purposes of Radiation Protection [4].

2.2.6. Nuclear fuel cycle and radioactive waste

A nuclear power programme may require consideration of the environmental aspects of mining, enrichment, fuel fabrication, reprocessing and disposal as part of the overall environmental protection process. Some of these steps are located outside the State, therefore the regulatory agencies should provide guidance on the level of detail required to address this in the overall EIA process. There is flexibility when States may address the issue — starting from early in the programme up to later in the process (after the construction licence has been issued).

2.3. Stakeholder involvement in the environmental impact assessment process

The EIA addresses many issues of practical concern to stakeholders because it provides transparency and ensures that interested parties with insights and concerns have the opportunity for meaningful participation in a broad range of issues. Therefore, the EIA is regarded as one of the mechanisms for stakeholder involvement.

Sharing information on the development of a nuclear power programme starts with the involvement of the government and the nuclear energy programme implementing organization (NEPIO) when the overall expectations for the nuclear power programme and the purpose of the EIA are established. Information sharing should be continual, developing further the ability of the general public to understand the EIA process. Part of this information dissemination during the early stages is to reassure stakeholders that further information will be gathered as the process progresses, and that it will be analysed before firm decisions are made. When a specific site and an owner, or operator, are identified, then responsibility for stakeholder involvement in the EIA generally becomes the obligation of the owner or operator.

Stakeholder participation facilitates the overall EIA process and improves the comprehensive nature of the environmental assessment. Various stakeholders have different roles in the process. A useful distinction is between ‘statutory’ and ‘non-statutory’ stakeholders. Statutory stakeholders, primarily government agencies, are considered to be those organizations and bodies that, by law, are required to be involved in any planning, development or operational activity. Non-statutory stakeholders are additional stakeholders which may be affected, directly or indirectly, by the activity and therefore have an interest in the EIA (see Ref. [5]). Additionally, depending on the policy and law of the State, international stakeholders may be either statutory or non-statutory, with international hearings and consultations performed as part of the EIA process.

The main purpose in involving the stakeholders in the process is to identify and to consider all the environmental issues that are of significance to the various stakeholders. A two way communication approach should be taken, making the environmental reports public, and then having a process to receive comments from statutory and non-statutory stakeholders for further consideration. All the comments received should be evaluated and recorded, although some may be irrelevant

and therefore would not be addressed in the ESR and EIA report.

A competent authority may be designated as a focal point to coordinate the stakeholder involvement for the ESR and EIA report, making them available first to the statutory stakeholders for review and report revision, and then to the general public. The competent authority should also be the clearing house for receiving all the comments from the stakeholders and organizing them before forwarding to the proponent of the ESR or EIA report.

This competent authority should be identified under phase 1 activities, and is designated, or otherwise recognized, by the law during phase 2. It should have the quality of an 'independent party' (i.e. not responsible for the development of the project itself). The time frame for establishing the roles and responsibilities of other statutory stakeholders in the EIA process, including required competencies and their development, should coincide with the competent authority's time frame. The nature of the involvement of non-statutory stakeholders is defined in each State differently.

A time limit for the process should be established and publicized as part of the overall process explanation to the stakeholders. If the EIA process includes consultations with other States based on the policy and legislation of the State, the timelines for stakeholder involvement would have to take into account the differences between the legal and regulatory systems of neighbouring States. For example, the stakeholder process that is familiar to a neighbouring State may be subject to different regulations regarding stakeholders, or may have different timelines for completion. The time required for document translation may also significantly affect the overall schedule. In planning the stakeholder involvement process, the competent authority should consider these complex issues. A modification in the stakeholder regulations may be required to allow the transboundary input to be taken into account for the EIA process. Information on the general approach to stakeholder involvement can be found in Refs [1, 5].

2.4. Addressing uncertainties in the environmental impact assessment process

The purpose of the EIA process is to support project decision making with the help of environmental and socioeconomic information and analyses. In order to use this information in decision making, it should naturally be available before any significant decisions are made (e.g. selection of site, plant size or technology). It is common that an EIA report is required prior to a definitive decision on the site or nuclear power technology.

This implies that the EIA process in its various phases always involves assumptions and generalizations because sufficient information on environmental or socioeconomic conditions or technical parameters is rarely available at key decision making points. This information accumulates during the process and enables well grounded decisions to be made in each step (e.g. selecting the candidate sites from the potential sites or selecting between direct and indirect cooling). In spite of this, however, the information is not exact or complete. Consequently, the EIA process becomes based on accumulating, but deficient, information.

To address the specific issue of uncertainty in the final design of the plant technology, including that the vendor may not be identified at the time of the EIA report preparation, the plant parameter envelope (PPE) concept was developed. The PPE addresses all technologies under consideration and attributes a value for each technology for the aspects identified to lead to a potential environmental impact. The PPE includes the important physical and chemical parameters that may affect the environment (e.g. water requirements, land use and emissions) for the considered plants, and identifies the parameters with the highest impact value or range of values for each parameter. These 'bounding parameters' which are included in the PPE are then used for environmental analysis in the EIA process. When the final design is known, a comparison is made between the actual value for each

aspect and the bounding value initially identified. If the ranges of actual values for the parameter are lower than, or equal to, values on which the environmental analysis is based, then further environmental assessment is not required. Otherwise, a new environmental assessment will be required.

Other sources of uncertainty, for example insufficient data, should be identified, and their impact on the reliability and accuracy of the assessment should be evaluated in the EIA report.

2.5. Necessary expertise for environmental impact assessments

The EIA is a complex, holistic analysis, and hence, it involves a great deal of knowledge, skills and data interpretation. To review the EIA report effectively, the competent authority has either to develop its capacity in these areas or to utilize the expertise of other relevant organizations. Examples of the types of expertise that may be called upon in evaluating EIA topics range far beyond radiological subjects (see Table 1).

TABLE 1. TYPES OF EXPERTISE REQUIRED FOR ENVIRONMENTAL IMPACT ASSESSMENT REVIEWS

Sciences	Engineering	Social sciences	Other disciplines
Environmental science	Environmental engineering	Demography	Emergency planning
Biology, including human health	Geotechnology	Law	Security
Meteorology	Visual engineering	Economics	Project management
Oceanography	Acoustics	Environmental justice	Quality management
Hydrology	Developed land use	Archaeology and culture studies	Stakeholder involvement
Geology	Grid infrastructure		Permit and licence management
Seismology	Electromagnetism		
Volcanology	External human induced events		

Some of the experts in these areas are involved throughout the EIA process, starting from the initial environmental information stage, while others are involved only after the ESR in the preparation and final review of the EIA report (e.g. monitoring, geotechnology, visual engineering, emergency planning, acoustics and security). The level of their involvement increases throughout the process. Some of this expertise is primarily applied to the SAR rather than the EIA report, although it is used during the EIA to evaluate data.

2.6. Unique issues in nuclear environmental impact assessments

The process of conducting an EIA for a nuclear power project is, in many respects, quite similar to other industry EIAs. This section examines the issues that are unique to the experience of an embarking State conducting such an assessment.

Nuclear power technology possesses unique characteristics that affect the environment, such as routine and accidental radiological releases, principally to air and water. Specialized techniques for modelling these

potential releases have been developed, with particular methodologies for impact assessment. Radioactive waste and spent fuel management is also specific for a nuclear EIA, and would need to be addressed, despite the fact that separate EIA reports will be required. As part of the baseline environmental data collection programme, radiological measurements need to be made. Radiological monitoring is also required throughout operation and decommissioning.

Although thermal and chemical releases are addressed in conventional power plant EIAs, the power rating of most nuclear power plants dictates an increased level of concern for these two types of impact. Depending on the type of plant cooling water system, thermal discharge limits set to protect the environment typically have an impact on the cost efficiency of the plant, and therefore, they are the subject of intense interest. If the plant is designed with a once through cooling system, then water intake impacts may also be significant, including entrainment of aquatic organisms.

In order to allay international concerns with nuclear power plant project development, the EIA process should meet international practice. Even if a State has an existing nuclear power programme, it should not be presumed that the process for conducting the EIA has remained the same. In any event, a State's EIA requirements are unlikely to have all of the components currently expected for evaluating a nuclear power programme. Since environmental concerns are location specific, the EIA report associated with a reference nuclear power plant from another location is not going to be suitable for the new plant.

However, it should be kept in mind that radiological impacts constitute only one type of effect, and, in most cases, may not be the dominant impact of the nuclear power plant during normal operation. Furthermore, there are complex impact interrelations, which need to be assessed in an integrated manner (see Ref. [6]). Nonetheless, the potential impact of the authorized radioactive discharge on humans and the environment should be assessed (see Ref. [7]).

The nuclear power plant project may well be more complex than any other industrial project a State assesses. Its complexity, the amount of land and time required for construction, the distance of cooling water intake and discharge channels (for a once through cooling system), requirements for heavy haul roads or barge transport and unloading, the international interest, quality assurance requirements and the time from initial project planning to active power generation all require new expertise to assess impacts adequately.

Radioactive waste management, from low level to high level waste, as well as spent nuclear fuel management, should be presented in the nuclear EIA report. An overview of the possible technical options for managing radioactive waste is given in IAEA Nuclear Energy Series NW-G-1.1, Policies and Strategies for Radioactive Waste Management. A specific EIA report should be developed for the disposal facilities and the final disposal of spent nuclear fuel.

Another unique issue for nuclear power plants is decommissioning. This complex process requires a dedicated EIA report, treatment or disposal of contaminated construction materials, and monitoring of the situation until release from regulatory control. Since decommissioning may happen 100 years after the start of operation, it is not addressed in detail in the EIA report for construction and operation of a plant, but it is described in principle, with the currently available possibilities for decommissioning. EIAs relating to decommissioning strategies are examined in more detail in IAEA Nuclear Energy Series No. NW-G-2.1, Policies and Strategies for the Decommissioning of Nuclear and Radiological Facilities.

Owing to the international and public attention given to the potential impacts of a nuclear power plant project (both radiological and non-radiological), States should expect to spend significantly more resources and time on EIAs relating to nuclear power plant projects than those associated with other industries.

3. FRAMEWORK FOR ENVIRONMENTAL PROTECTION PROGRAMMES

When establishing a nuclear power programme, embarking States need to ensure that their legal and regulatory framework appropriately accounts for the unique safety and environmental aspects of the programme. It is expected that environmental laws and regulations will need to be developed or supplemented. Additionally, newcomer States will need to ensure that organizations responsible for implementing environmental laws and regulations applicable to the nuclear power programme have sufficient technical capacity and clear responsibility. This section addresses the basic legal, regulatory and organizational requirements necessary for a comprehensive EIA programme for nuclear power facilities.

3.1. Environmental protection laws

It is generally acknowledged that the legal framework for the protection of the environment from the impact of nuclear activities has two distinct bodies of law: nuclear law, which mostly covers aspects related to radioactivity; and environmental law, which covers all types of hazard but may also include requirements for the protection of the environment against the harmful effects of ionizing radiation.

It is expected that most embarking States will have an existing environmental protection framework, and any nuclear facility developed as part of the programme will need to comply with all existing, applicable environmental laws. Although certain laws may need to be supplemented, or new laws may be required to address fully the environmental issues resulting from a nuclear power programme, it is important to keep in mind that nuclear facilities impact the environment in a manner similar to other large industrial facilities (e.g. thermal and chemical releases). While radiological impacts will be mainly covered by nuclear laws, they may not address all environmental impacts and therefore additional environmental laws may be required to ensure adequate protection of the environment.

Many States have a comprehensive law requiring assessment of environmental impacts for major projects. However, such a law generally lacks detail, and States often look to other laws and regulations to implement the requirement fully. For example, separate laws may address the protection of human health, water (groundwater, surface fresh water and sea water), land and soil, air and the atmosphere, and biodiversity and ecosystems. Additionally, laws on cultural heritage, environmental justice and socioeconomic issues are important aspects of the legal framework for environmental protection. Therefore, laws addressing the full range of environmental impacts should be in place — or under development — before a knowledgeable decision is made to proceed with the nuclear power programme.

When augmenting environmental laws, States should give consideration to the harmonization of both nuclear and non-nuclear related environmental laws, and any ambiguities between them should be identified and clarified. In this manner, the programme development will not be impeded later on by conflicting or duplicate legal requirements. A sound legal framework provides developers and investors with a clear understanding of expectations, thus helping to reduce project risk.

3.2. International legal instruments on environmental protection

The body of international environmental conventions and treaties includes instruments with different objectives. Some focus on the development of general principles and decision making practices; others are designed to protect specific environmental media (e.g. air and the atmosphere, oceans and seas, freshwater resources, and soil), particular geographical areas, wildlife and natural resources, and prevent specific types of pollution, including the dispersion of radionuclides.

Many of the most important environmental impacts of a nuclear power plant project are not radiological in nature. For States that are party to conventions, treaties or regional agreements on environmental protection, the non-radiological aspects are often dealt with under such international legal instruments. It should be noted that although these instruments are obligatory only to the States Parties, it might be useful for States that are not party to consider the ethics and principles defined by the relevant instruments for possible positive use in the development of a national nuclear power programme. An examination of those environmental legal instruments is not within the scope of this publication, but further information on international environmental conventions and instruments is provided in Annex I. It should be noted that instruments of paramount importance to the regulation of nuclear activities, such as the IAEA safety standards, contain fundamental provisions in this field. The IAEA safety standards are understood to provide protection to the environment from regulated activities. IAEA Safety Standards Series No. GSR Part 3 (Interim), Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards [6], reports the trend in "the need to be able to demonstrate (rather than to assume) that the environment is protected against effects of industrial pollutants, including radionuclides" (para. 1.33).

International nuclear legal instruments concerning radiological protection of the environment include:

- Convention on Nuclear Safety;
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management;
- Convention on Early Notification of a Nuclear Accident;
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency.

To the extent that they address compensation for nuclear damage to the environment in case of accidents, nuclear liability conventions can also be considered significant in the context of environmental protection. Examples include the Vienna Convention on Civil Liability for Nuclear Damage, and the Convention on Supplementary Compensation for Nuclear Damage.

3.3. Regulatory framework

Following the establishment of a legal framework, regulations on the activities required by law should be implemented. Regulations set requirements on how to comply with laws. EIA regulations generally address such topics as:

- EIA process and methodology;
- EIA scope;
- EIA report content (e.g. public participation, baseline monitoring and socioeconomic issues);
- Cumulative impact assessment;
- EMP;
- Required interfaces with other legislation.

The assumption is made here that an EIA for a nuclear power plant fits within the existing EIA regulatory framework, although, as noted earlier, some modifications may be required to address unique aspects of nuclear projects (see Section 2.6). If the State is not very familiar with evaluating EIA reports for large, complex industrial projects, then significant revisions to the existing laws and regulations covering the EIA may be required. A review of this is outside the scope of this publication.

The development and implementation of regulations is the responsibility of an operational regulatory body competent on issues related to environmental aspects of nuclear power.

3.4. Organizational aspects

IAEA Nuclear Energy Series No. NG-G-3.1 suggests that in phase 1, the focus is put on assessing the capability of national organizations to deal with issues such as the preparation of guidelines, responsibilities and capacity for reviewing EIA related work, necessary authorization steps and interfaces, and coordination of environmental activities. The NEPIO, the nuclear regulatory body — if it exists — and the environmental protection authority are usually involved in this step, and an action plan to resolve deficiencies should be developed. The action plan would also identify who would develop and implement the legal and regulatory requirements, taking into account the necessary independence, as well as procedural relations among the suggested responsible organizations. These are important elements in minimizing potential conflicts of interest that may affect the programme's environmental protection.

Phase 2 entails the NEPIO acceding environmental protection to a designated competent authority. In terms of activities, this phase is related to the actual creation of guidelines, capacity building for review activities, and implementation of authorization procedures for activities and processes related to the nuclear power programme. During phase 2, the majority of the EIA process is conducted with significant organizational requirements for stakeholder involvement, process approvals, and data and assessment finding reviews.

A fully implemented organizational structure to address the nuclear power facility EIA is likely to require modifications to the environmental protection authority structure, capacity and implementing procedures to provide appropriate coverage for radiological environmental protection. However, clear distinctions should be made with the nuclear regulatory body to avoid duplication of authority and effort. The current organizational capacities of States for a new nuclear power programme vary greatly. This section explains the principles of organizational structure and the approach to administering environmental protection requirements.

Environmental protection is achieved through guidance and control performed by various organizations, although one organization typically has overall responsibility for the EIA process. This organization, sometimes referred to as the competent authority, takes the lead on providing coordination with other agencies that may share responsibility for environmental protection. Formal agreements, such as memoranda of understanding, should be developed between responsible organizations in order to define the working arrangements, responsibilities and accountabilities. This would be the case in a number of States where the implementation of nuclear laws is controlled by the nuclear regulatory body, while an environment agency is responsible for the implementation of environmental laws.

In order for the EIA developers, the competent authority, the reviewers and other stakeholders to understand their role in developing a sound EIA report, the process should be clearly described, with all of its steps and interfaces, as well as stakeholder responsibilities and obligations (e.g. financial). A sound report should entail processes and procedures that result in collecting information of sufficient quality to enable informed decision making.

Early in the nuclear power programme, the environmental competent authority grants authorization to the developer, for example an initial (or early) siting permit, to proceed specifically with regards to assessing environmental issues. Since overall, nuclear power project time constraints may be greater than those experienced for other types of project, the requirements for organizational capacity should be developed early and take into account the project schedule requirements. Timely initiation of the EIA is important, as it is frequently the initial step in the nuclear power programme, owing to data collection requirements. Acceptance of the environmental impacts as identified and assessed in the EIA report may be a necessary

part for approval of the site and the project itself, although this is not always the case. Timely approval of the report will be of importance for procurement of nuclear power plant components, since this requires significant lead time for planning, manufacture, delivery and installation.

Competent authority organizational capacity is also of crucial importance when regulatory issues arise. Although not all the required regulations may be in place, it is important to have an organization ready to tackle new issues in a timely and adequate manner throughout construction, operation and decommissioning. The independence of the competent authority from the promotion of nuclear power should be ensured.

4. PROCESS DESCRIPTION FOR CONDUCTING NUCLEAR ENVIRONMENTAL IMPACT ASSESSMENTS

As introduced in Section 2, the EIA process broadly consists of several steps that result in the development of three reports:

(1) Initial environmental information report;

(2) Environmental scoping report (ESR);

(3) Environmental impact assessment (EIA).

The initial environmental information report contains the available information gathered without new site specific sample collection. It is used to support the selection of the site from among other candidate sites during the initial site selection process. This part of the process is examined further in IAEA Nuclear Energy Series No. NG-T-3.7 [3].

The ESR uses the initial environmental information as the starting point for planning the scope of the detailed EIA report. The ESR contains an analysis of the data gaps which need to be filled to permit a comprehensive analysis of the environmental impacts of the planned project. For this reason, stakeholder involvement is required to adequately capture potential impacts from many perspectives. At a minimum, the statutory stakeholders are involved, with coordination by the competent authority. It is also encouraged to include the non-statutory stakeholders in the ESR process.

The process also includes communication with regulatory authorities and stakeholders, and culminates in the finalization of each report and the acceptance by the competent authority (see Fig. 4). The interactive nature of the communications is shown by double-headed arrows.

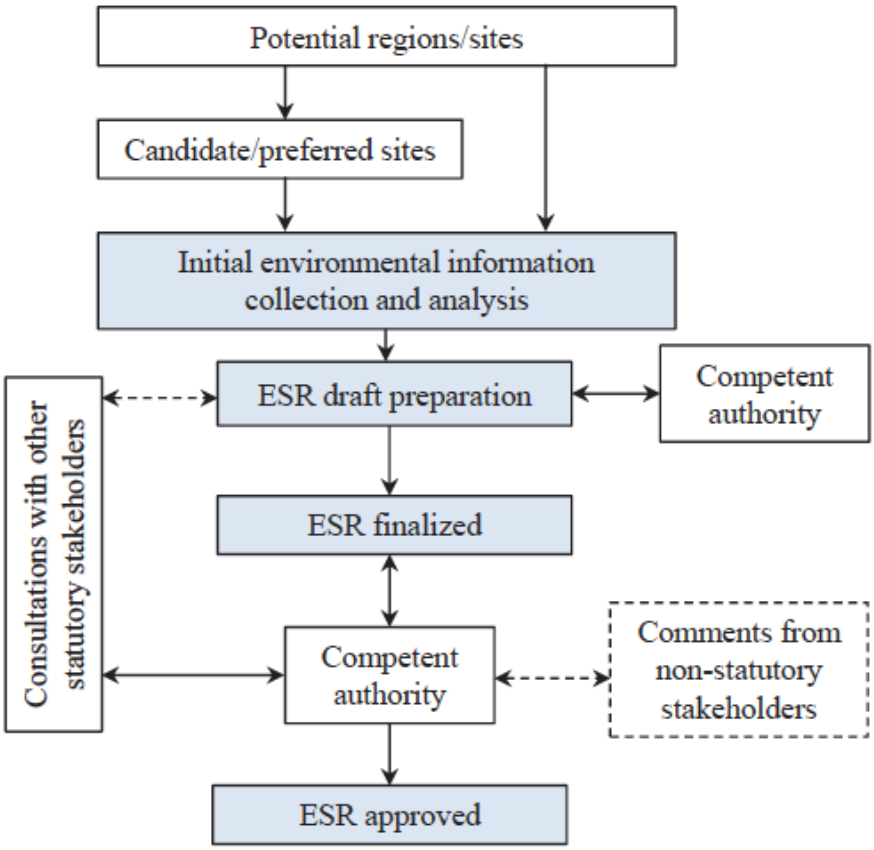

FIG. 4. The ESR development process.

During the ESR planning phase, all available data sources are identified (if they have not already been completed in the initial environmental information report), relevant issues are determined and taken into consideration, study areas are defined, and general methodologies for additional data collection and analysis are specified. Generally speaking, the ESR specifies how the EIA is to be conducted, including methodologies, issues of special interests, legal and regulatory interfaces, and stakeholders to be consulted.

After the initial draft ESR is prepared for review by the statutory stakeholders, consultations are held with the competent authority and perhaps some other agencies. Once their comments have been incorporated into a revised draft, the State may involve the public to gather comments on the draft version. After all the comments have been received and considered, the report is finalized and approved by the competent authority. The ESR provides a roadmap for conducting the environmental assessment and preparation of the EIA report.

Preparation of the EIA report consists of several steps (see Fig. 5). Using the ESR as the basis, environmental monitoring and baseline information collection are fully implemented according to the approved protocols. The results form the basis for the assessment of impacts, which is also conducted according to the methodologies identified in the ESR.

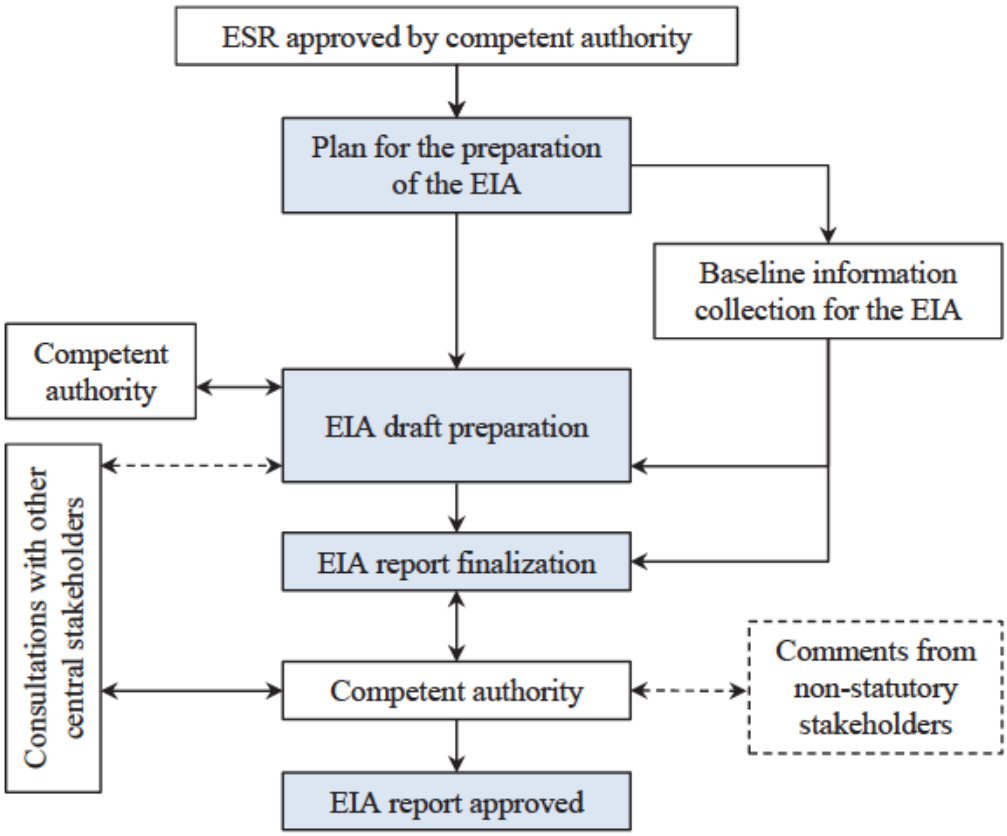

FIG. 5. The EIA report development process.

The draft EIA report is submitted to the competent authority to verify that the collected baseline data and the assessment methodologies are in line with the ESR and that, consequently, the EIA report adequately addresses the project issues. It may be that the information made available during environmental monitoring highlights some issues that were previously unknown, and consultations therefore have to clarify the assessment approach. Additional baseline data may need to be collected to address these issues. Before the draft EIA report is ready for public comment, none of the issues, however, should be left open.

Good practice in stakeholder involvement is that the draft EIA report is also submitted to other key or central stakeholders for comment. Depending on the State, these central stakeholders may include other organizations and agencies that usually support the competent authority or public associations interested in the project.

After all comments from the competent authority and other key stakeholders have been received and addressed, the final draft EIA report is submitted for comments to both the competent authority and the public. As this report will generate significant public debate, it is essential that the roles, responsibilities and authorities of the stakeholders are clearly defined much earlier in the process (as discussed in Section 2.3). During the public comment process, adjustments and amendments to the EIA report may be requested by the stakeholders and required by the competent authority, but in general, if the ESR/EIA process is properly implemented, there should not be a major overhaul of the report.

The final approval by the competent authority represents acceptance of the analyses and conclusions in the EIA report regarding the environmental impacts and environmental feasibility of the nuclear power plant project. The report will also identify the environmental sensitivities that should be addressed in the

bid invitation specification, where unique plant design provisions or construction techniques may be necessary to focus on these sensitivities [1]. The report will also be used in licensing and permitting as well as detailed planning for the required environmental monitoring during the construction and operation of the nuclear power plant. Greater detail on the use of the report is provided in Section 5.

4.1. Schedule

The overall EIA process requires time to be completed in a satisfactory manner (normally years). The schedule is affected by many variables, including: specific State requirements; the time to collect and to evaluate the necessary data; and the amount of stakeholder involvement, including international participation. The schedule for the EIA should be taken into consideration when organizing the interface among the legislative and regulatory processes, overall project development and the stakeholders.

Each State progresses through a nuclear power programme at its own pace, taking into account its own specific situation, dependent on various needs, interests and capacity. Certain milestones within the EIA process require decisions to be made by the competent authority or government, which may affect the schedule. However, the process is a continuum, and, ideally, all of the steps should be completed before a construction licence is issued. However, as noted earlier, some environmental aspects might be addressed prior to issue of the operating licence. The time to complete the general steps of the EIA can be expected to be as follows:

(a) Site survey: This is the initial step preceding the site selection and site assessment stages. The initial environmental information analysis should be included in the site scope of the survey and is instrumental at this stage, capturing relevant information on environmental issues. This stage will typically take about 9–12 months after establishing the siting core team, although it could be longer, allowing for the government decision process [3].

(b) ESR finalization: When site selection has been concluded and the site, or sites, has been chosen for the detailed EIA, all available information is collected and incorporated into the ESR. Preparation of the draft ESR (described in detail below) may be expected to take approximately 6–12 months. Additional time is required for public comments and review by the competent authority. Revision and finalization of the ESR take further time.

(c) EIA report finalization: Following the approval of the ESR, the site assessment stage commences with the implementation and preparation of the EIA report. This is a complex process, with discrete steps that include a minimum of 12 months to collect baseline data and subsequent time for analysis, evaluation of impacts, development of required monitoring and mitigation programmes, and preparation of the EIA report for stakeholder comments. Additional time is required for competent authority review and any necessary revisions of the draft report. The total time from approval of the ESR through to approval of the EIA report depends on many factors, including the experience of the State in evaluating the EIA, and may vary from two to four years.

Some parts of these processes may run in parallel, such as the collection of baseline information prior to finalization of the ESR, shortening the overall schedule duration. Earlier involvement of the public in reviewing the ESR is also likely to improve the overall schedule duration. The review times can vary widely due to issues specific to the State or its appropriate competent authorities, but should be taken into account by the EIA developers when planning the EIA process. Furthermore, when the EIA report is finalized, it may be used for a number of purposes that will have their own schedules.

However, since the construction licence cannot be issued until the EIA report is finalized[3], it is important that the EIA process starts as early in the nuclear power programme as possible. The following sections provide greater detail on the specific stages of the process.

4.2. Initial environmental information

In the first phase, among the activities dedicated to environmental protection in new nuclear power programmes is the early commencement of environmental studies. The first objective of the initial environmental information is to help to identify the most suitable potential nuclear power plant sites within the scope of the site survey (see Ref. [3] for more details). As the number of sites being scrutinized against exclusionary and avoidance criteria is reduced, the amount of environmental information collected for each remaining site may increase. When the final candidate sites are identified, the initial environmental information should represent a thorough compilation of all the existing data to be used later on in the ESR. Data gaps will be identified in the ESR and later filled in the EIA process.

The initial environmental information process extends from phase 1, with the data gathered to evaluate the suitability of a potential site, to the early stages of phase 2, when the study intensifies with collection of additional data and interpretation, providing further guidance to selection of the preferred site or sites and a basis for the development of the ESR. All available archived data on land use, historical and cultural resources, meteorology and air quality, geology, hydrology, ecology, socioeconomics and environmental justice, the radiological and chemical environment, and related national projects should find its place in the initial environmental information report. Ideally, sufficient information is required to be available to describe all the known environmental sensitivities (e.g. animal and plant species, sites of a scientific and cultural value, and visual pollution). In most cases, however, there are significant gaps in the data on the site itself, even if general information about a topic is available.

In addition to its role in developing the EIA report, and use in the site selection process, the analysis of the initial environmental information may also be used in the preparation of a pre-feasibility or a feasibility study for the project, should these studies be required in the State's decision making process prior to the report. The environmental analysis in these studies does not assess all the aspects of the initial environmental information; rather, its focus is on identifying significant environmental issues and feasible measures for overcoming them. By highlighting the key environmental issues of the nuclear power project at this early stage, the use of initial environmental information may indicate areas of concern and information that needs to be gathered for further analysis or assessment prior to completion of phase 1 (decision to proceed with the project).

As the initial environmental information analysis takes place in phase 1, and possibly in early phase 2, its development would typically be the responsibility of the NEPIO. The gathered information and analysis would then be made available for the drafting of the ESR by the developer.

4.3. Environmental scoping report

4.3.1. Purpose of the environmental scoping report

The purpose of the ESR is to provide the necessary guidance to conduct the EIA study. In order to do so, the ESR should review all of the known environmental information and the project scope. It also identifies the data gaps that should be filled to enable a complete assessment of environmental impacts anticipated to be associated with the project. The ESR identifies the baseline information that should be collected and the general methodology to do so, as well as the nuclear

[3] Though specific to each State, view adopted in this publication is that an integrated EIA may provide a more comprehensive overview to evaluate the project's impacts on people and the environment.

power plant technical information and methodology to be used to evaluate the data, assess impacts and address them in the EIA report. A useful example of the typical types of information required for the preparation of the report is provided in Annex II.

The draft ESR is reviewed in the stakeholder involvement process, and stakeholder input is considered when finalizing it. The competent authority responsible for the EIA process should approve the ESR.

4.3.2. Typical content of the environmental scoping report

While the format of an ESR may vary depending on State requirements or preferences, it should, at a minimum, include the following sections.

4.3.2.1. Introduction

This should provide a site description, a brief project outline, and the purpose and objectives of the ESR.

4.3.2.2. Project justification

A statement outlining the necessity of the proposed project should be provided, including the requirement for additional power, and it should be consistent with the State's development goals and energy policies.

4.3.2.3. Description of the EIA process

The ESR clearly describes the steps to be taken in preparing the EIA report, including the timelines and the scope of work included in each step, and a list of regulatory required permits and licences throughout the steps. The ESR also describes the intended public participation process and lists stakeholders to be involved in each step.

4.3.2.4. Description of the project

The project should be described in as much detail as possible based on the information available at that time. Both construction and operational aspects should be described, particularly interfaces with the environment (impacts on the environment and impacts of the environment on the project). In many cases, the nuclear power vendor technology, size or even location of the plant will not have been decided at the time of development of the ESR and the EIA report. However, the environmental assessment process can progress using the PPE principle, as described in Section 2.4. If the vendor technology was not known at the time of preparing the EIA report, then the report will have to be reviewed after the vendor design is known to ensure that it adequately addresses the plant impacts.

4.3.2.5. Alternative options to be considered

The objective to be met by construction of the project may be met by other means. Therefore, these alternatives need to be agreed for further discussion in the EIA, as well as the consequences of not constructing the project (the zero option). In order to have a meaningful comparison, the selected alternatives should be reasonable — that is, implementable and technologically feasible. In addition, the project may have alternative ways of implementation such as alternative sites, alternative sizes, cooling options and plant technologies. The alternatives should be carefully designed, and their number should be limited to a feasible level for evaluation, often between two and five.

4.3.2.6. Scope of the environmental impact assessment report

In addition to the site itself and its environs, the ESR should define whether the EIA report is to include an assessment of additional items such as the nuclear fuel cycle front end, back end, transmission lines and roads.

4.3.2.7. Available baseline environmental information

This section contains a description of the study area based on all available information, most of which is collected as part of the initial environmental information. As much as possible, the baseline information should be presented in maps, figures and tables. The

objective of this section is to provide a clear picture of the existing environmental resources and values for which the impacts should be considered. Data gaps (which vary widely depending on whether the site has been studied before and upon the type of resource being evaluated) should be identified in order to enable the design of a data collection programme.

4.3.2.8. Baseline environmental data collection

The methodology to gather the required information to fill data gaps is described in sufficient detail to ensure that sufficient data, of appropriate quality, is collected. This includes a description of sampling locations and frequency, but also the general time schedule for data collection, since some types of data can be collected even before the ESR receives final approval, while others may require extended time frames for collection. A baseline environmental data collection programme includes all of the elements required for a comprehensive industrial EIA report. However, the sampling programme is more extensive than that typically required for an industrial EIA report. In addition, evaluation of the radiological background of the site, which typically covers radiological parameters such as total alpha, beta or gamma radiation, and an evaluation of radioactive elements usually associated with nuclear projects are required.

4.3.2.9. Methodologies for the environmental impact assessment study

For the purposes of clarity and uninterrupted process flow, the ESR should also define the methodologies to be used in the EIA — that is, a definition of how to assess the significance of the impacts and how the data will be used. This section should also address how uncertainties are handled, including technology design.

4.3.2.10. Public participation plan

The ESR should identify the statutory and non-statutory stakeholders, and address the process for stakeholder involvement, as described further in Section 4.3.3.

4.3.3. Stakeholder involvement in the environmental scoping report

It is recommended that the statutory stakeholders are contacted early in the process of developing the ESR, and their views taken into consideration, so that the ESR includes all the items deemed important by those designated responsible by law. Participation in the creation and review process is not just limited to authorities that have licensing rights; it involves all governmental organizations whose scope of work is (or should be) reflected in the ESR.

In that sense, public participation in the process is recommended after the governmental organizations have provided their initial input (of course, additional inputs by governmental organizations are provided, as necessary, throughout the process). The level of public participation depends on the practices and regulations in the particular State.

Following the response of the EIA developer to the comments and remarks, the revised ESR is sent back to the responsible competent authority. When the revised version is found to be satisfactory, the competent authority provides approval, marking the beginning of the EIA report development stage.

4.4. Environmental impact assessment

4.4.1. Purpose of the environmental impact assessment report

The Principles of Environmental Impact Assessment Best Practice [10] defines the EIA as:

“The process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made” (para. 2.1).

Objectives of the EIA are [10]:

"—To ensure that environmental considerations are explicitly addressed and incorporated into the development decision making process;

"—To anticipate and avoid, minimize or offset the adverse significant biophysical, social and other relevant effects of development proposals;

"—To protect the productivity and capacity of natural systems and the ecological processes which maintain their functions; and

"—To promote development that is sustainable and optimizes resource use and management opportunities" (para. 2.2).

The EIA report should identify all environmental and socioeconomic impacts, including their nature, probability, duration, magnitude and significance. It considers the entire project development programme, from construction through to decommissioning. The report is used for several purposes as described in Section 5, but its primary use is by decision makers to assess whether the suggested nuclear power plant project is environmentally acceptable at the selected site.

Once the EIA report is approved by the competent authority, the document which further on should address the possibility for adverse impacts is the EMP, already outlined in the EIA report. Should the environmental monitoring or new scientific information suggest any negative effects from the construction or operation of the nuclear power plant, mitigation measures should be defined within the framework of this plan (see Section 5).

4.4.2. Typical contents of a nuclear environmental impact assessment report

The content of an EIA report for a nuclear power plant can be considered, to a large extent, to be similar to that of any other large industrial project EIA. The typical content varies depending on the project and the State in which the nuclear power plant is being built, but the general issues concerned are similar for new projects. Therefore, the EIA is likely to contain the following sections.

4.4.2.1. Summary

This section provides a non-technical summary of the EIA report, including a general description of the project, its justification, EIA procedure, magnitude and probability of significant impacts during construction, operation (normal and irregular), principles for decommissioning, as well as mitigation measures. The summary should also provide conclusions which serve as inputs to decision makers and planners.

4.4.2.2. Introduction

This section provides a description of the background of the proposed project, objective of the EIA, scope, national and international legislative framework, and the use of the document for the nuclear power permit and decision making.

4.4.2.3. Environmental impact assessment procedure and communication and participation

This section describes the EIA procedure (objectives and main stages) as well as the stakeholder involvement (e.g. public meetings and audit group work) carried out during the procedure.

4.4.2.4. Description of the project

This section contains identification of the responsible party, evaluated project alternatives (including the zero option) and project timetable, including pre-construction, construction, operation and decommissioning.

4.4.2.5. Description of the plant

This section describes the technical aspects of the nuclear power plant or reference plant, general operation principles, construction work to be carried out and best available technology principles. It may contain a list of

stressors, including PPE data, for consideration during the impact analysis step:

- Radiological and non-radiological emissions (both atmospheric and liquid);
- Water and waste issues;
- Chemicals potentially to be used on-site;
- Transportation and traffic connections.

This section can also contain a description of the nuclear fuel supply and management of spent nuclear fuel. The level of detail required varies depending on the legislative and other requirements of the State.

4.4.2.6. Nuclear safety

This section includes a review of the nuclear related aspects of the safety of the plant. It describes nuclear safety requirements and principles as well as their implementation in the design, construction and operation of a nuclear power plant.

4.4.2.7. Description of the environment

This section provides a description of the present condition of key affected environmental components as baseline information for future analysis, including:

- Meteorology and air quality;
- Land use, buildings and land use plans;
- Soils, geology and hydrogeology;
- Water resources and quality;
- Terrestrial ecology;
- Aquatic ecology;
- Existing radiological and conventional contamination;
- Socioeconomic characteristics of the areas that may be affected by the nuclear power project.

4.4.2.8. Environmental impact assessment for the project

This section describes the analysis used to estimate the magnitude and important characteristics of the impact. The assessment is performed by identifying the gap between the projected environmental quality condition due to project implementation and the baseline condition without the project, within a defined period of time and using the required method for estimating the impact. The method should identify the impact flow mechanism among the various environmental components directly or indirectly during the construction, operation and decommissioning phases. Therefore, this section generally includes the following aspects:

(a) Impact during construction of the nuclear power plant: This provides a description of direct significant impacts of construction work on soil, bedrock, groundwater, flora and fauna, land use and landscape, noise, air quality, people and society. The activities that might cause potential impacts include, but are not limited to:

  (i) Mobilization of material;
  (ii) Human resources;
  (iii) Construction of the base camp;
  (iv) Workshop building;
  (v) Land preparation, land cut and fill;
  (vi) Transportation of project material;
  (vii) Construction.

(b) Impact during normal operation of the nuclear power plant: This provides a description of direct and indirect impacts on people and the environment due to

plant operation. The activities that might create a potential impact include the additional workforce at the nuclear reactor and the operational activities themselves, which could generate heat release, radioactive release, chemical material release from laboratories, sanitation waste and maintenance activities.

(c) Impact during decommissioning of the nuclear power plant: This provides a general description of the impact of the project on the environment during the decommissioning period. Some of the activities that might create a potential impact include removal of the spent fuel element from the reactor core, dismantling of reactor components and the decontamination process. Most of the analysis is only described in this EIA and is not assessed (decommissioning requires a separate EIA in the end phase of the plant life cycle, i.e. after 60–80 years). Considerations at the design and construction phase that later influence decommissioning and the various approaches that are hence stipulated may be found in IAEA-TECDOC-1657, Design Lessons Drawn from the Decommissioning of Nuclear Facilities [11].

Specific impacts on components of the environment should be addressed in each section, including, but are not limited to, the following impacts on:

(a) Air, soil and water quality due to nuclear and non-nuclear releases to the environment: This provides a description of radioactive and non-radioactive emissions (normal and abnormal operation) as well as other emissions (emergency power, heat generation and transportation). Guidance for the modelling of normal and abnormal operation radioactive release and its impact on people and the environment is provided in Refs [12–15].

(b) Aquatic flora, fauna and ecological values: This provides a description of the impact of the new nuclear power plant and infrastructure on the aquatic flora, fauna and ecological values of the area, including:

  (i) Conventional contaminant levels;

  (ii) Aquatic biota populations and structure;

  (iii) Ecological state;

  (iv) Impact of discharge channels on habitat;

  (v) Impact of cooling water on water temperatures (cooling water modelling) and local ecology.

(c) Terrestrial flora, fauna and ecological values: This provides a description of the impact analysis of the new nuclear power plant and infrastructure on the terrestrial flora, fauna and ecological values of the area, including:

  (i) Conventional contaminant levels;

  (ii) Terrestrial biota populations and structure;

  (iii) Ecological state.

(d) Landscape and cultural environment: This provides an analysis of the impacts of the new nuclear power plant and required infrastructure on the landscape (photo montages) and possible cultural values.

(e) Traffic: This describes the impact of the project on traffic amount, type and safety, including construction traffic and workforce traffic during operation and maintenance events.

(f) Noise level: This evaluates the impacts of the nuclear power plant operation and maintenance activities on noise levels around the site area.

(g) People and socioeconomic factors: This provides a description of the impacts of the new nuclear power plant and infrastructure on people and socioeconomic factors, including:

(i) Fishing and hunting activities, both private and industrial;

(ii) Regional structure;

(iii) Economy and employment;

(iv) Changes in living conditions due to influx of temporary or permanent workers;

(v) Requirement for additional infrastructure;

(vi) Additional taxes to be paid to the area.

(vii) Potential health impacts (ionizing radiation and conventional contaminant related).

(h) Waste management: This describes the amount of radiological and non-radiological waste and impacts of the waste management programmes. For the radiological waste management programme, actions should be presented in accordance with the radioactive waste classification and waste minimization principles. A suitable IAEA publication on waste classification is IAEA Safety Standards Series No. GSG-1, Classification of Radioactive Waste [16], with further discussion on typical disposal approaches in IAEA Nuclear Energy Series No. NW-T-1.20, Disposal Approaches for Long Lived Low and Intermediate Level Radioactive Waste [17].

(i) Spent fuel management: Although this is an issue that needs to be fully addressed much later after the start of the nuclear power plant operation, the description of the general concept considered for the spent fuel management would be the minimum to be included in the EIA, together with a timeline to be followed in solving the issue.

4.4.2.9. Cumulative impact

This section includes a description of other projects in the area and the combined impacts resulting from the addition of the nuclear power project. In addition, the cumulative impact over time on environmental resources that continue to be affected is described (e.g. water and air).

4.4.2.10. Impact of irregular operation and accidents at the nuclear power plant

This section should provide a description of impacts on people and the environment due to design base accidents, beyond design base accidents and severe accidents at the nuclear power plant. The area of impact and measures to address these impacts in case of accidents also need to be included.

4.4.2.11. Transboundary impacts (depending on States)

This section describes possible transboundary impacts (e.g. impacts of accident situations, socioeconomic impacts such as employment, and impacts on a shared watercourse).

4.4.2.12. Nuclear fuel production chain

Generally, the production chain is only described and not assessed. It requires a separate EIA report, often in other States, as these activities do not necessarily take place in the project State. A description of a generic nuclear energy chain and methodological approach for estimating health and environmental impacts can be found in IAEA Technical Reports Series No. 394, Health and Environmental Impacts of Electricity Generation Systems: Procedures for Comparative Assessment [18].

4.4.2.13. Other

Other sections can be dedicated to any topic the EIA developer has to address because of specific requirements in a State.

4.4.2.14. Prevention and mitigation of adverse impacts

In this section, the EIA developer should describe the measures to prevent and to diminish significant adverse impacts of the project. The hierarchy of possible approaches for the mitigation of environmental impacts should be presented. Examples typically include:

- Engineering and planning alterations;
- Practice alterations for construction and operation;
- Habitat restoration;
- Financial compensation;
- Communication of information or other measures found fit by the State.

The selection criteria for the proposed mitigation measures, for example, cost, technical feasibility, legal possibility or social acceptability, should be clarified in this section.

4.4.2.15. Environmental monitoring programme

Based on the EIA results, in this section of the report, a description of the environmental monitoring programme for the construction and operation periods should be provided. Monitoring is generally established for the environment that may be affected, such as groundwater, surface water, soil or biota.

4.4.3. Impact evaluation methodology

A clear description of the EIA report scope is required to provide a background for the selection of the assessment methodology, its application and the identification of uncertainties. For the spatial boundaries, the customary approach is to assess at a local level (on-site and immediately off-site) and at a regional level (as far out as impacts are likely to be observed, which varies depending on different environmental aspects). The temporal boundaries take into account the long operational life and possible life extension of the nuclear power plant, as well as the duration of radioactivity beyond plant operation. Details of this scope and methodological approach should be identified in the ESR and agreed with the competent authority prior to proceeding further with the development of the EIA report.

4.4.3.1. Criteria for identifying significant impacts

The definition of what constitutes a significant impact that must be avoided or minimized should be identified in the ESR and is an important early step for the competent authority. The methodology to evaluate the significance of an environmental impact could be based on qualitative, quantitative and perhaps intangible parameters of the impact. Some possible examples include:

- Probability;
- Reversibility;
- Extent: geographical and in population;
- Intensity;
- Duration;
- Uncertainty;
- Cumulative impact with time, together with the impact from sources other than the project in question.

Additional criteria may be used by a State, some of which are defined by expert opinion, and others may be found in the State's regulations. Approaches to considering the beneficial and adverse impacts may vary across States. Some approaches to evaluate the list of potential impacts make use of a checklist and matrices, scale and weight, or an expert opinion. Impacts that are found to be significant and adverse would undergo planning for avoidance or mitigation, and should be addressed in the monitoring plan, although some impacts need not be actively monitored. Beneficial impacts should be identified as well thus providing a holistic

evaluation of the project. An overall cost–benefit analysis may be performed to evaluate the economic value of the entire project.

4.4.3.2. Use of models in the environmental impact assessment report

EIA reports entail a great number of models. For some issues, expert judgement must be used as the only available means of assessment. However, for complex projects such as nuclear power projects, expert judgement should be used as a sufficient argument only in specific topic areas where modelling is not possible or not yet developed. Various calculation methods and modelling approaches have been implemented in large industrial projects, have shown good results in impact prediction and can be used to identify the effect of the impacts on the environment. Table 2 provides some examples of impact model approaches used in nuclear EIA reports. As can be seen, many are shared with impact modelling approaches for large conventional industry projects.

The competent authority may recommend a particular model for use in the EIA report. However, it is the responsibility of the EIA team to choose the model and calculation approach, provided that the team has satisfied the competent authority as to the model's suitability and accuracy.

In addition to the models and approaches used in nuclear EIA (which are also applicable to large conventional industrial projects), specific modelling approaches are required when considering the radiological impacts. A common model approach to estimate the release of radionuclides to the environment is using atmospheric dispersion and dose modelling [13, 15]. The approach requires data on source terms from the technology vendor, as well as knowledge of the pathways and receptors of the radionuclides transmitted via aerodynamic dispersion. The output of this approach is calculation of the dispersion of various radionuclides released in the atmosphere and the estimation of doses received by people and the environment.

The primary sources of radionuclides during normal operation include:

- Radioactive gaseous discharge from the building ventilation exhaust, including the reactor building, reactor auxiliary building and fuel handling building;
- Discharge from the gaseous waste management system;
- Discharge associated with the exhaust of non-condensable gases at the main condenser.

Planned releases of radionuclides below prescribed limits from nuclear power plants do occur during normal operation. Although plants are designed to prevent accidental releases, the EIA should consider that such releases could occur and impact humans and the environment. This is primarily handled in the development of the EMP, since, by definition, an accident that can be foreseen must be addressed in the design in order to prevent occurrence. Figure 6 shows the potential exposure pathways of radionuclide release to the public and environment [4]. Descriptions of nuclear accidents are addressed in the SAR, and should not be separately identified in the EIA report.

4.4.4 Stakeholder involvement in environmental impact assessment report development

As described in Section 2.3, stakeholders are involved in the review of the final EIA report, coordinated by the competent authority. It is also recommended that stakeholders, particularly the statutory stakeholders, be involved throughout the process of preparing the draft report. Such an approach reduces the risk of major conflicts with the stakeholders' viewpoints in the final stages of public participation. Annex III contains a case study of how stakeholders were involved in a recent EIA process.

TABLE 2. SOME IMPACT MODEL APPROACHES USED IN NUCLEAR ENVIRONMENTAL IMPACT ASSESSMENT REPORTS

Impact	Model approach	Disciplines involved	Input	Output	Model specifics
Radiation dispersion	Dispersion and dose modelling[a]	Defining source terms Dispersion modelling Radioactive decay products Radioecology Dose calculations	Source term Pathways[b] Impact receivers	Radioactive releases and nuclide types Dispersion Concentrations and doses caused	Due to its importance, approval of the model should be granted by the competent authority and may require more time
Thermal impacts (once-through cooling systems)	Mathematical dispersion modelling	Dispersion modelling	Discharge temperature and quantity, location and technology	Assessment of impacts on water temperatures and thermal stratification	Model calibration may require time consuming measurements
Aquatic biota (impingement, entrainment, changes in the ecosystem)	Demographic approaches	Hydrobiology Oceanography Fisheries, hydrodynamic and water quality modelling	Aquatic field studies Species population data Ecosystem structure	Impacts on aquatic species Biodiversity changes	Aquatic field studies through the seasonal variations may be very laborious
Terrestrial, marine and freshwater biota (radiological risk)	Integrated exposure/dose/effect assessment with risk characterization	Radioecology	Environmental concentrations Dose conversion coefficients Concentration ratios Distribution coefficients	Dose rates Risk quotients	Tiered approach Selected animals and plants
Regional economy (employment, revenues, economy of the region)	Economic modelling	Economic modelling, analysis and projections	Regional economy data Development plans Project financial parameters	Prediction of the economic impacts on the region	Financial risks may influence the model output
People and society (migration, quality of life, culture, environmental justice)	Expert opinion Social trend projections Computer modelling	Socioeconomic impact assessment Communications Resident surveys Media analysis	Socioeconomic characteristics of the population Personal perceptions, opinions and fears	Social impacts from migration and revenue change Environmental justice and cultural heritage considerations Increased communication	Needs to be carefully coordinated with stakeholder Involvement processes

[a] For more information on the types of model, see Refs [13, 14].
[b] Data from baseline meteorology, oceanography, hydrology and groundwater surveys in the investigated area.

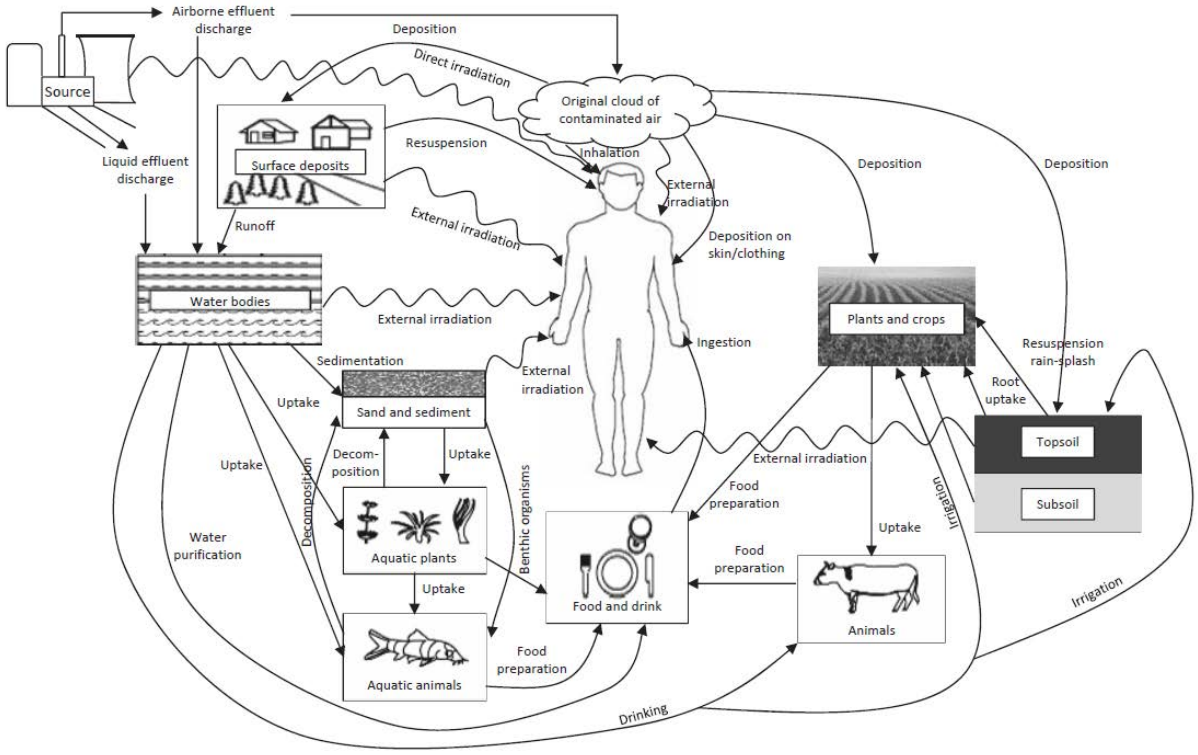

FIG. 6. Potential exposure pathways for use in dose models.

5. USE OF THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

The EIA report is used for:

(a) Preparation of the bid invitation specification or contract;

(b) Basis for subsequent licences and permits;

(c) Creation of the environmental monitoring programme and the EMP.

Figure 7 shows the steps typically taken in order to start construction of the first nuclear power plant.

5.1. Licences and permits

The licence and permit processes for nuclear facilities, including the purpose of the EIA report, should be precisely described in the legislative framework. The various licences and permits will define conditions pursuant to the conclusions of the report, including the mitigation measures and the environmental monitoring programme described in it.

Examples of licences requiring an EIA report as part of their application process may include those issued by the nuclear regulatory authority pursuant to the State's law on nuclear power for siting, construction and operation. An example of the licensing steps and the use of the EIA can be found in IAEA Safety Standards Series No. SSG-12, Licensing Process for Nuclear Installations [19].

The main milestones of the process are:

(a) The decision to build a nuclear power plant, which will allow the start of implementing activities, including environmental studies;

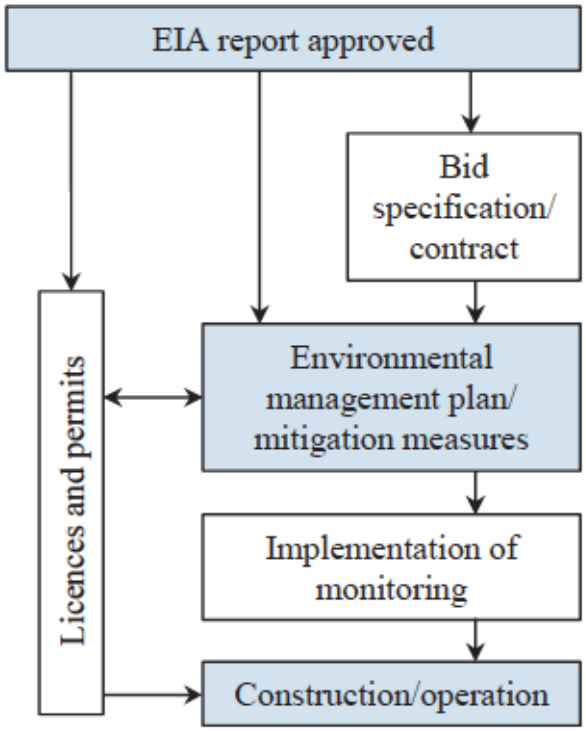

FIG. 7. Use of the EIA report.

(b) An early site permit, clearing the way for further assessment of sites approved for nuclear power plant construction;

(c) The construction licence, allowing the start of nuclear power plant construction and also marking the start of the environmental monitoring programme for construction impacts;

(d) The operating licence, marking the beginning of electricity production from the nuclear power plant and the start of the environmental monitoring programme related to nuclear power plant operation.

Permits are usually issued by various authorities (including regional or local) that have regulatory responsibilities other than those that are radiological in nature. These permits are similar or identical to the ones issued for other industrial projects.

Conditions of operation as outlined in the permits may vary depending on the State's legislative framework, but it is of great importance to formulate the permit conditions precisely and unambiguously. Measurable parameters and respective quantifications should be used as much as possible to define whether the owner, or operator, actions comply with the permit. Conditions can be based on discharge limits, but they can also be outcome based. Clear permit conditions help avoid disputes, problems and unforeseen costs at later stages of the nuclear power plant project.

Attention should also be paid to issues related to the validity of licences and permits, confirmation of compliance and corrective measures, such as:

- Renewal periods of licences and permits;
- Monitoring;
- Review of findings and recording;
- Reporting instances and frequency;

- Appropriate actions when conditions are breached;
- Inspection authority, frequency and costs;
- Enforcement mechanisms.

Depending on how developed a site is, many additional permits may be required for construction of related infrastructure projects, such as roads, transmission lines or waterways. Many of the licences and permits may be interconnected (e.g. approval of one permit is given provided that another is already in force), so a delay in one permit may result in serious delays in the nuclear power plant time schedule (up to a few years). Additionally, approval of the EIA report and the entire EIA process by the competent authority may well be necessary before the nuclear licence is awarded. Therefore, sufficient resources for the regulatory process for licences and permits should be allocated, and proper organizational decisions should be made.

5.2. Environmental impact assessment in a bid invitation specification or contract

Before preparing a bid invitation specification, the owner should have selected a qualified site for the plant, and the EIA report should also be finished or in a very advanced stage. This ensures that a major part of the site data, including the wide range of detailed studies required to identify the sensitive environmental issues needed for bid preparation, is available.

Site conditions have a great influence on the layout, design, construction and costs of the nuclear power plant. Comprehensive specification of environmental site conditions, factors, characteristics and data, including those that may seem not to be directly related to the project, should be provided in the bid invitation specification in as much detail as possible. This will mark the end of phase 2 of the environmental component in the nuclear power programme development.

The owner should offer bidders free access to all detailed site studies, including EIA documents and collected site data. The owner should also establish a procedure for the resolution of vendors' questions regarding the interpretation of the site data and the matters mentioned above. In the event that the EIA report is completed before the bid invitation specification is issued, the owner should include in the bid all commitments, limitations and conditions resulting from the EIA report approval. However, if the report is not finished, the owner should ensure that these commitments, limitations and conditions are handed over to a vendor at least at the contract negotiation stage and incorporated in a contract. Otherwise, the owner can face unforeseen expenses during the course of project implementation. Furthermore, the contract should have mechanisms in place on how to resolve future possible licence and permit issues and conditions to enable continuous project implementation.

The competing bids are judged, among other factors, on the basis of environmental impacts from the proposed nuclear power plant. This means that bids should be evaluated, at a minimum, as to whether they are in conflict with EIA report results.

Further information on the subject of EIAs and their role with the bid invitation specifications or contracts can be found in IAEA Nuclear Energy Series No. NG-T-3.9, Invitation and Evaluation of Bids for Nuclear Power Plants [20].

5.3. Development of an environmental monitoring programme

The objective of the environmental monitoring programme is to ensure that the environmental impact during construction and operation stays within assessed and accepted limits and, in case it does not, to initiate a process to address the activity causing the observed exceedance values.

It is recommended to include in the EIA report a description of the proposed draft environmental monitoring programme. Based

on the findings made in the report and regulatory requirements, this programme is finalized in the permit phase, and approved by the relevant authorities, either separately or as part of permits. Annex IV presents an example of an environmental monitoring programme.

Typically, the environmental monitoring programme is based on:

- Baseline information collected for the EIA report preparation;
- Considerations related to the selected technology (as sources of impacts);
- EIA report results;
- Conditions in various permits and licences.

The environmental monitoring programme should ensure that the significant environmental impacts are monitored to provide timely assurance that they are within the permit limits. The environmental monitoring programme need not monitor every environmental component, as long as a methodology is in place to identify potential release points early enough to activate a more detailed assessment of a release. Thus, soil may not need routine monitoring if air, groundwater and surface water are monitored. Typical examples of monitoring activities include:

- Measurements of concentration in air emissions;
- Groundwater well collection;
- Surface water sampling;
- Temperature measurements for the affected water bodies;
- Bioindicator sampling.

The environmental monitoring programme should include a definition of required data reliability, the frequency of data collection, monitoring and sampling locations (along the exposure pathways) and the density of these locations. Monitoring points will be on-site as well as off-site. Additionally, the monitoring programme may expand and include different activities during the life cycle of the nuclear power plant.

It is commonly accepted that the requirement lies with the plant owner, or operator, for fulfilment of all environmental protection legislative framework requirements, including implementation of the environmental monitoring programme.

Environmental agencies (perhaps local) perform surveillance, auditing, independent monitoring and other defined activities according to an environmental protection legislative framework to ensure that the owner follows all prescribed duties. Environmental auditing is generally also performed by the competent authority at appropriate time intervals.

A nuclear power project specifically requires an operational radiological environmental monitoring programme (REMP). The baseline environmental data collection programme to support the REMP must include the same elements and sampling points, but it may start after the EIA report has been completed and prior to commencement of operations. Therefore, the baseline radiological sampling programme may not be as extensive as that required to support the REMP.

Guidance on radiological monitoring programmes and activities, including techniques, procedures, and data interpretation and evaluation, can be found in Refs [4, 21]. An example of an REMP is included in Annex IV.

The environmental monitoring programme, especially its radiological component, is usually designed for normal operations. Following abnormal occurrences, specific monitoring would be developed and modified to adapt to the status of the event (ongoing, ended, pre-remediation and post-remediation). The specific objectives of the ongoing event, or the emergency radiation monitoring in the environment, are:

(a) To provide accurate and timely data on the level and degree of hazards resulting from a radiation emergency, in particular, on the levels of radiation and environmental contamination with radionuclides;

(b) To assist decision makers on the need to make interventions and take protective actions;

(c) To provide information for the protection of emergency workers;

(d) To provide information to the public on the degree of hazard;

(e) To provide information required to identify any people for whom long term medical screening is warranted.

5.4. Environmental management plan

After the EIA report has been approved by the competent authority, it may come to light that project impacts have been underestimated or overestimated. If this is the case, and changes therefore become necessary, the mitigation measures are then included in the EMP.

One of the objectives of this plan is to ensure adaptive management as a key feature to address uncertainty in the EIA. An established process to review the unexpected impacts and to develop a suitable response is a good framework for adaptive management. If an unexpected change is found by monitoring, then a case specific remediation plan and post-remediation monitoring is to be developed and implemented. Entities involved in resolving deviations beyond permit conditions need to have a clear role in such situations, with obligations and means to meet these obligations. Communication lines, coordinating mechanisms and time schedules for action need to be in place before the nuclear power plant commences operation.

This plan may not be limited to adaptive management protocols. It may well contain the mitigation measures examined in the EIA report, action protocols that are part of permit conditions, and agreed processes and schedules for reviewing EMP adequacy. The plan allows for the actual impact assessment and mitigation measures to be revisited for suitability, not only after operational experience, but also after selecting the nuclear power plant technology.

In case of changes that have been foreseen as possible, and after the monitoring results indicate an absence of compliance with the permit conditions, the responsible entities (institutions, operators and regulators) will take an appropriate action as specified in the permit and included in the EMP.

In order to facilitate an appropriate mitigation action, a characterization and potential response for out of the ordinary situations need to be developed per impact factor including, for example:

- Higher water outlet temperatures;
- Increased alpha or beta activity;
- Reduced visibility by fogging;
- Biodiversity loss or a significant decrease in the local species population.

The response may be defined by the competent authority that issued the permit, but it may also suffice to require that the operator defines suitable response actions in the EMP as a precondition for issuing a permit.

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Annex I

INTERNATIONAL LEGAL INSTRUMENTS

I–1. Main principles and decision making in international legal instruments

With few exceptions, international environmental law instruments started developing after 1972, when the Declaration of the United Nations Conference on the Human Environment (Stockholm Declaration, 1972) defined most of the basic common principles to protect the environment. Since then, the number of international agreements has grown, and the main concern nowadays is how to develop a means to coordinate the implementation of related legal instruments. It is estimated that more than 900 international legal instruments either focus on the environment or contain important provisions in this field.

Several international legal instruments have been produced which form a compound of ethics that can be used as a reference in the field of environmental protection. Fundamental principles of environmental law were mainly defined during the United Nations Conference on the Human Environment, in Stockholm (1972), and the United Nations Conference on Environment and Development, in Rio de Janeiro (1992). The latter resulted in the Rio Declaration on Environment and Development, setting the ground for the main methodological principles of environment protection by specifying implementation means for environmental protection. The Rio Declaration defines public participation as a way to better handle environmental issues, and develops the idea that environmental damages should be compensated, as well as the precautionary principle that the "lack of full scientific certainty shall not be used as a reason for postponing cost effective measures to prevent environmental degradation."

The Rio Declaration also stresses that environmental impact assessments (EIAs) are necessary before activities likely to have a significant adverse impact on the environment are undertaken.

Other examples of international legal instruments specifying public participation in EIAs include:

- Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus Convention, 1998);
- Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention, 1991).

I–2. International legal instruments for the prevention of pollution and the preservation of nature and the ecosystem

Beyond giving general methodological guidelines, a number of international legal instruments were produced to protect particular areas or components of the environment or to prevent certain activities or behaviour which may damage the environment. These legal instruments encompass two different goals: the prevention of environmentally harmful practices, including pollution limitation and remediation, and the preservation of resources. The following are some examples of international legal instruments for the prevention of pollution and the preservation of nature and the ecosystem:

- Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention, 1971);
- Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention, 1972);
- Basel Convention on the Control of Transboundary Movements of

Hazardous Wastes and their Disposal (Basel Convention, 1989);

— Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa (Bamako Convention, 1991);

— Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention, 1992);

— Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention, 1995).

Annex II

PREPARING A NUCLEAR POWER PLANT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

TABLE II–1. MAIN TECHNICAL SOURCES OF INFORMATION REQUIRED

Main issues	Specifications
Description and statistics of present operations on-site	None
Fuel sources, processing phases and transportation	None
Location of the plant	None
Layout of the area in construction and operation phases	None
Dimensions of the plant for photomontages and animations	None
Technical information of the nuclear power plant	Number and type of reactors Electric and thermal effects Efficiency Description of operating principles Fuel properties, loading patterns and consumption Process description Annual energy production Nuclear safety principles Emergency power systems
Fuel mining, processing phases and transportation	None
Cooling water arrangements	Location and type of cooling water inlets and outlets Cooling water requirements (m^3/s) and temperature change Thermal load to recipient (PJ/a) Cooling water treatment (inlet and outlet)
Waste (source, amount, quality, management)	Construction phase Operation phase — Conventional waste — Liquid waste — Low and medium active waste Decommissioning — Conventional waste — Low and medium active waste
Spent nuclear fuel	Amount over time and total Intermediate storage Final disposal
Water consumption in construction and operation phases	Consumption for different purposes (m^3/a) Sources and treatments for different purposes
Wastewaters in construction and operation phases	Amounts (m^3/d) and (m^3/a), types and qualities Treatments Loads to recipient
Emissions into air in construction and operation phases	Construction machinery, reserve power sources, radioactive releases

TABLE II–1. MAIN TECHNICAL SOURCES OF INFORMATION REQUIRED (cont.)

Main issues	Specifications
Noise emissions and sources in construction and operation phases	None
Accidents	Accident classification, source term definition
Related projects	Grid connections and reinforcements Land traffic connections and logistics Shipping connections and logistics

Annex III

ROLE OF PUBLIC PARTICIPATION AND COMMUNICATIONS IN A GREENFIELD NUCLEAR POWER PLANT PROJECT IN FINLAND

In January 2008, Fennovoima Oy launched an EIA procedure regarding the construction of a new greenfield nuclear power plant in Finland. The EIA dealt with the construction of a power plant consisting of one or two reactors with an electrical output of 1500–2500 MW to one of the following municipalities: Pyhäjoki, Ruotsinpyhtää or Simo. The EIA procedure was concluded in 2009, when the Ministry of Employment and the Economy (MoEE) gave its final statement. Following the approval of the EIA, the Finnish Government and Parliament gave Fennovoima a Decision in Principle (DiP)[4] in 2010, which granted Fennovoima the right to build a new nuclear power plant.

The following sections briefly introduce the role of public participation in Finnish EIA procedures and illustrate the interaction between the participation and communication procedures and project development. The Fennovoima EIA procedure is used as a case example, but the principles of the role of public participation and communications apply to other large scale EIAs.

III–1. Introduction to public participation and communications in environmental impact assessments

The EIA procedure is the key tool for communications in the early project development phase. The objective of the procedure is to improve the EIA and to align its consideration in planning and decision making. Another objective is to increase the availability of information to all citizens and the possibilities of public participation in the planning of projects. The Finnish EIA procedure does not require the plant design or layout to be strictly defined, and the EIA report is not a licence but a prerequisite for several licences.

Figure III–1 shows the linkages between procedure, public participation and communications in the Fennovoima EIA. It also illustrates activities required by law, other means of public participation commonly part of the EIA procedure and examples of the supporting communication efforts. The figure shows that interaction between the project developer, the public and the authorities is commonly regular throughout the process and includes both 'formal' communication (statements and opinions) and more informal interactions (information events and meetings). The public participation practices in the procedure are well established, and authorities, the public and project developers have all defined roles, which eases the participation significantly. It should also be noted that information and opinions gathered during the procedure feed into the plant

[4] In accordance with the Nuclear Energy Decree, the DiP shall include, among other items, an EIA report. The DiP is only required for nuclear activities, and is not a formal part of the Finnish permit system.

design and later decision making procedures. For example, one of the original alternative sites in the Fennovoima case was excluded during the procedure partly due to environmental reasons.

III–2. General participation chronology

In January 2008, Fennovoima submitted the environmental scoping report (ESR) to the MoEE, which acts as the coordinating authority for nuclear power projects in Finland. The programme was placed on display for public inspection for two months. During this time, the MoEE and Fennovoima organized open public meetin1gs in each alternative location. Project related plans and the associated EIA procedure were presented to the public at the meetings. The public had the possibility to voice their opinions on the EIA work and its sufficiency and to discuss with Fennovoima, the MoEE and the experts who had been involved in composing the EIA programme.

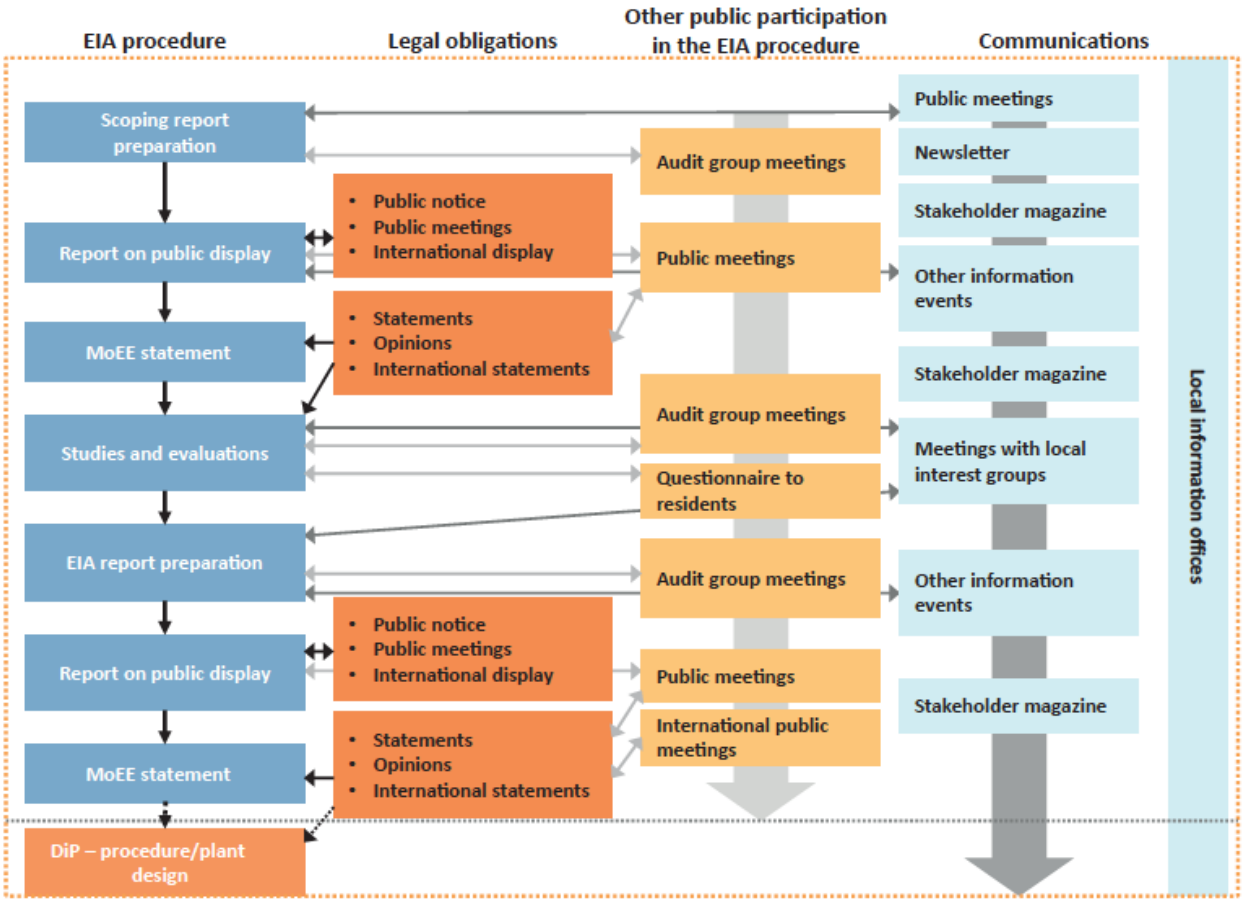


FIG. III–1. Public participation and communications as part of the Fennovoima EIA procedure (courtesy of Pöyry Energy Oy).

Following the MoEE request for statements, 69 communities submitted a statement concerning the ESR. A total of 153 opinions on the programme were submitted. Of these, 35 were from Finnish communities and organizations, four were from foreign communities and organizations, and 113 were from private individuals from various States. The MoEE issued a statement on the programme in May 2008. The statement took into account the comments and opinions received. It defined which issues the EIA report

had to cover, and thus provided a way to incorporate the topics seen to be important by the general public into the report. In its statement, the MoEE specifically referred to an opinion from a nature conservation organization and requested the project developer to assess the specific concerns expressed on waste management, among other things.

The report was finalized towards the end of 2008 and submitted to the MoEE and placed on public display for two months. During this phase, open public meetings were also organized in each alternative location, providing a possibility for questions and comments on the report. Following the request by the MoEE, a total of 66 statements and 89 opinions were submitted.

The MoEE final statement concluded the EIA procedure in February 2009. The statements and opinions submitted were considered by the MoEE, which used some of the issues raised in its final statement. Based on the MoEE statement, the developer had to conduct additional studies to be attached to the DiP application, which addressed the concerns raised by authorities and the public.

III–3. Involving authorities and interest groups

Regional 'audit groups' were established at each alternative location to follow and to guide the EIA procedure and to advance communication between the project developer, authorities and interest groups. Local authorities also helped to identify the relevant organizations to be invited. The audit groups consisted of members of stakeholder associations, such as nature conservation groups and local businesses, as well as members of municipal and regional authorities. The aim was to gather as extensive representations as possible, and the outcome showed significant variations in the presented views.

Each audit group met three times during the procedure. The first meetings took place in the scoping phase. At the meetings, the project, procedure and the project's EIA programme draft were presented to the audit group members. The comments received from the audit groups paid attention to, for example, the project's impacts on waters, fish, land use and value of properties, as well as the means of livelihood and opportunities for leisure activities. Matters of particular interest also included the safety of the nuclear power plant.

All comments and specifications received at the meetings and afterwards were comprehensively taken into account when drawing up the EIA programme, as far as they related to the programme. Comments, information and sources of information not related to the programme were taken into account in the implementation of the EIA procedure and in the EIA report and related surveys. Important information was received on, for example, the nature conservation (such as bird sanctuaries) and cultural historical environments in the immediate surroundings of the site locations. The audit groups also provided important additional information for surveys carried out in the assessment and planning.

The audit groups met for the second time in the EIA report composition phase. The statement on the EIA programme by the MoEE and the composition of the report were discussed at the meetings. In addition, the contents of the surveys made for the EIA, their current status and some results available at the time were presented to the audit group members.

At the third meeting of the groups, the draft report was presented. The groups were able to comment on the draft report and to request clarification. Based on the comments received, the report was revised before publication of the final version.

III–4. Involving the local public

The realization of a nuclear power plant project in Finland requires a statement of recommendation concerning its construction, which is issued by the municipality responsible. This means that general opinion at the municipal level has to be positive towards the

planned nuclear power plant for the project to proceed, and, thus, it is essential to place adequate focus on communication activities at the local level. Moreover, local people often possess knowledge of the site and environment that would not be available from other sources. Therefore, involving the public in the planning phase of the project is important.

Public participation and communication in the EIA phase of the Fennovoima project also included activities which were specifically designed to involve local people. For example, Fennovoima opened offices at each alternative EIA location in 2008. The local public and others interested in the project had the possibility to visit the offices to gather information about the project, raise questions and discuss possible concerns. During the EIA procedure, the offices were visited by approximately 1000 people. The offices could also be contacted by telephone. The most common discussion and question topics included the project's financial impact on the municipality and region, the selection criteria for the locations, Fennovoima's ownership and background organizations, the impact on nature and the living environment, technical and safety issues, and waste issues.

The project developer organized information events, seminars and public meetings, at which the project was presented and participants could pose questions to Fennovoima's technical, safety and environmental experts of the project developer. In addition, representatives of the Radiation and Nuclear Safety Authority participated in various meetings.

A newsletter from the project developer was also distributed with local newspapers to the residents of the alternative sites. The newsletter reviewed the EIA procedure, Fennovoima and nuclear power and safety in general, as well as some region specific topics. Moreover, the project developer regularly published a stakeholder magazine, which was distributed to the public.

Local knowledge was utilized, where possible, as part of the EIA. The observations of local bird watchers were used in surveying the avifauna of the site locations and their surroundings. The bird watchers' observations provided the experts who composed the report with long term information in support of their assessment work. The experts who assessed the present situation of fish stocks and impacts on them were in contact with local fishermen to gather additional information in support of their work. Information from the public was also used in detailed site planning.

III–5. Transboundary environmental impact assessment procedure

Nuclear power plants are subject to a transboundary EIA procedure pertaining to the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention), to which Finland is a State Party. The Espoo Convention sets out obligations for States Parties to notify and to consult each other on all major projects under consideration that might have adverse environmental impacts across borders.

The EIA documentation in both the scoping and the report phase was submitted to States wishing to participate in the Espoo procedure. Finland received statements from seven States. Comments on the ESR were taken into account in the preparation of the EIA report, and the developer provided separate written answers to the comments. Information events to present the results of the report were organized for authorities (such as in Austria) and the public (such as in Estonia).

III–6. Conclusions

Nuclear power projects are, by definition, seen as controversial by the general public. Providing the public with adequate, reliable information of the planned project is of significant importance in creating public trust and acceptance. In a nuclear power plant project, the means of public participation and communication have to be designed to cover the information requirements of the general public at local, national and international levels

alike. However, it is especially important to involve local people in the process, as they often play a key role in making the decision about the project and because they also possess important local knowledge to be taken into account in project planning.

The EIA procedure provides a structured, well established process for distributing information about a planned project and for involving the public in project development. The Fennovoima case provides a good example of a project in which the EIA procedure was properly utilized in communications. The process involved extensive public participation arrangements at local, national and international levels. During the process, public opinions were addressed in a more official manner in the EIA report, but probably more significant were the numerous discussions on various participation events where concerns and questions were addressed. Finally, it can be concluded that the successful completion of the procedure, among other factors, paved the way for the positive DiP.

Annex IV

EXAMPLE OF ENVIRONMENTAL MONITORING APPROACHES: CASE OF THE CERNAVODĂ NUCLEAR POWER PLANT

The following example of a monitoring programme and its constituents is taken from the Cernavodă operational monitoring of Canada deuterium–uranium (CANDU) reactor units 1 and 2 (heavy water moderated reactors).

IV–1. Routine environmental radiation monitoring programme

The purpose of a routine environmental radiation monitoring programme is to provide reliable and accurate data, including statistically valid datasets for significant nuclide and environmental media on an annual basis. The monitoring programme is designed to meet the following objectives under normal nuclear power plant operating conditions:

(a) To measure the radionuclide concentrations in environmental media and to assess the increased radiation levels in specified environmental pathways, which might be modified as a result of the Cernavodă nuclear power plant operation;
(b) To provide an independent assessment of the effectiveness of the source control, effluent control and monitoring based on measurements in the environment;
(c) To validate the models and parameters used to calculate the derived emission limits (DELs);
(d) To demonstrate the negligible environmental impact of the Cernavodă nuclear power plant operation and, hence, to contribute to public reassurance;
(e) To provide data to aid in the development and evaluation of models and methodologies that adequately describe

the movement of radionuclides through the environment.[5]

IV–1.1. Basis of the programme

The radiological impact from the operation of the Cernavodă nuclear power plant is measured in terms of dose to people. The derived emission limit (DEL) is the amount of radionuclide that, if emitted consistently for one year, would result in a maximum additional annual whole body dose of 1×10^{-4} Sv to a individual in the most exposed ('critical') group. This upper limit is derived from the regulatory dose equivalent limit by analytical models for all radionuclides and all critical pathways.

The basis of the programme is the site specific DEL document for the Cernavodă nuclear power plant. This document identifies the radionuclides that are likely to be released from the station and the likely environmental pathways for them.

Based on DEL results regarding the significant pathways and critical groups taken into account, the environmental monitoring programme specifications have been prepared for nuclides or groups of nuclides in environmental pathways.

IV–1.2. Monitoring programme elements

The major components of the monitoring programme are:

- Monitoring locations;
- Environmental media and specific nuclides to be monitored;
- Monitoring frequency;
- Analytical frequency;
- Minimum required specific activity;
- Assessment of adequacy of source control.

The applicable requirements and structure for each component are developed and presented below. These elements are specific for the Cernavodă nuclear power plant.

IV–1.3. Locations and specific media

There are four types of monitoring location:

(1) Indicator locations: Outside the plant perimeter, established depending on emission type, critical groups and pathways used for DEL calculation.
(2) Background locations: Monitoring conducted beyond the influence of station emissions.
(3) Control locations: Used together with the indicator location to determine the dilution factor as a function of distance from the nuclear power plant site.
(4) Supplementary locations.

IV–1.4. Specific radionuclides

For each emission category, a group of radionuclides, or a representative radionuclide, is selected to identify the category (see Table IV–1).

IV–1.5. Monitoring frequency

The frequency of monitoring or sampling depends on the mean lifetime of the nuclide in a pathway. Air monitoring frequency was established as a function of plant emissions.

IV–1.6. Minimum required detectable activity

The minimum required detectable radioactivity above background values are used to detect radionuclides present in the environment as a result of the Cernavodă nuclear power plant operation. Consequently, they are used to select sampling equipment, analytical techniques and procedures.

Measuring equipment and methods are selected to allow measurements at substantially lower levels (at least one order of magnitude) than those defined for dose constraints. For each monitored exposure

[5] See http://www.umweltbundesamt.at/fileadmin/site/umweltthemen/umweltpolitische/ESPOOverfahren/UVP_Cernavoda/UVE/UVEengl/chapter_6/UVECernavoda_6.pdf.

route, a certain fraction of the dose constraint is allocated. Minimum detectable radioactivities are calculated to guarantee detection of all possible contributions to the total dose.

IV–2. Non-radioactive liquid and gaseous effluent physical–chemical monitoring programme

The purpose of this part of the environmental management programme is to provide reliable and accurate data regarding the non-radioactive liquid and gaseous effluent quality to demonstrate the compliance with the environmental licence for the Cernavodă nuclear power plant. The basis of the non-radioactive liquid and gaseous effluent physical–chemical monitoring programme is the environmental licence for the Cernavodă nuclear power plant and the agreement with the local environmental protection agency.

Sampling points for air quality in the startup boiler emission impact area are chosen for analysis of CO, NO_2, O_3, SO_2 and suspended powder (in correlation with wind direction and speed). The monitoring and reporting frequency are agreed with the local environmental protection agency. The specific values for the approved discharge limits for non-radioactive liquid effluent are presented in an operating manual.

IV–3. Routine non-radioactive liquid effluent physical–chemical monitoring programme

The basis of the non-radioactive liquid effluent physical–chemical monitoring programme is provided by the water management licence (listing chemicals, possible pathways and maximum acceptable ranges concentration), as well as an agreement signed with the local water administration (listing physical–chemical parameters that must be analysed, the monitoring frequency and sampling points).

The monitoring programme consists of two parts:

(1) The routine non-radioactive liquid effluent chemical monitoring programme with parameters, analytical methods and sampling points chosen to ensure compliance, encompassing both the liquid influent and the non-radioactive liquid effluent;
(2) The chemical spill part, with actions, increased monitoring frequency, supplementary sampling points and reporting procedures.

TABLE IV–1. COMBINATIONS OF RADIONUCLIDE/ENVIRONMENTAL COMPARTMENT RELATED TO CRITICAL RADIONUCLIDES AND POSSIBLE CRITICAL EXPOSURE PATHWAYS SPECIFIC FOR THE CERNAVODĂ NUCLEAR POWER PLANT SITE

Emission type	Critical radionuclide	Critical exposure pathways	Representative radionuclide	Representative environmental compartment
Atmospheric emission	Tritiated water vapour	Inhalation and skin absorption	H-3	Air
		Uptake in plants → Ingestion of vegetables, fruit, dairy products, beef, pork and poultry		Most abundant edible parts of fruit and vegetables grown for consumption, dairy products and meat
	Noble gases	External exposure from immersion in the radioactive cloud	Ar-41 Kr Xe	Air (external gamma dose rate)
	I-131	Deposition on pasture → Dairy product ingestion	I-131	Milk
		Inhalation		Air
	Radioactive particulates	Deposition on vegetables, fruit and pasture → Ingestion of vegetables, fruit, dairy products, beef, pork and poultry	Co-60 Cs-134 Cs-137 Nb-95 Zr-95	Dry and wet deposition
		Inhalation		Air
		External exposure from soil deposition		Soil (external gamma dose rate)
	C-14 (CO_2)	Uptake in plants → Ingestion of vegetables, fruit, dairy products, beef, pork and poultry	C-14	Products with maximum carbon content in edible parts
		Inhalation		Air
		External exposure from immersion in the radioactive cloud		Air (external beta dose rate)

TABLE IV–1. COMBINATIONS OF RADIONUCLIDE/ENVIRONMENTAL COMPARTMENT RELATED TO CRITICAL RADIONUCLIDES AND POSSIBLE CRITICAL EXPOSURE PATHWAYS SPECIFIC FOR THE CERNAVODĂ NUCLEAR POWER PLANT SITE (cont.)

Emission type	Critical radionuclide	Critical exposure pathways	Representative radionuclide	Representative environmental compartment
Liquid emission	Tritiated water	Ingestion of drinking water	H-3	Potable water
		Uptake in fish → Fish ingestion		Water from fish
		Irrigation → Ingestion of agricultural and animal products		Most abundant edible parts of vegetables and fruit grown for consumption, dairy products and meat
	Dissolved radionuclides or suspensions other than tritium	Uptake in fish → Fish ingestion	C-14 Co-60 Cs-134 Cs-137 Nb-95 Zr-95	Edible fish meat
		External exposure from coastal deposits or sediments dredged out		Sand beaches (external gamma dose rate)

STRATEGIC ENVIRONMENTAL ASSESSMENT FOR NUCLEAR POWER PROGRAMMES: GUIDELINES ("IAEA SEA GUIDELINES")

IAEA Nuclear Energy Series No. NG-T-3.17

SUMMARY

Strategic environmental assessment (SEA) aims at avoiding or mitigating any expected significant negative environmental impacts and, importantly, at enhancing positive environmental and related sustainability outcomes of polices, plans and programmes. The guidelines in this publication have been prepared to support decision makers and other stakeholders in their attempts to conduct and contribute to such an SEA if applied to nuclear power programmes. Nuclear power programmes are prepared once a country has determined that additional energy supplies are needed and that nuclear power could play a role in meeting these needs. As such, the nuclear power programme responds to elements of an energy policy and aims to guide actual project implementation. An associated SEA will, therefore, focus on issues directly relevant to the development of nuclear energy. The underlying assumption of these guidelines is that impacts related to other issues, such as the wider energy mix and the role nuclear energy should play within it, are considered in other policies, plans and programmes, and their associated SEAs. They are thus outside the scope of these guidelines.

Subject to national legislative frameworks, an SEA would normally be conducted when developing a nuclear power programme, building on any preceding SEAs for national energy strategies, policies and any associated plans. Such an SEA for a nuclear power programme would then provide the framework for subsequent environmental impact assessments (EIAs). When considering a systematic approach to the development of nuclear energy, higher level SEAs for energy strategies, policies and plans focus on issues such as overall energy needs, the energy mix and, within this, the role of nuclear energy. Subsequent EIAs then focus on implementation details at the project level, when, for example, nuclear power plants or spent fuel storage facilities are to be constructed. In this context, the objectives and main focus of an SEA for a nuclear power programme depend on what is covered in those earlier SEAs, and may also be informed by related EIAs.

Once a decision has been taken that nuclear power could play a role in meeting the energy needs of a country, several areas related to nuclear power need to be considered for their relevance to a specific SEA. These areas have been combined into seven 'nuclear power impact areas' (see Section 3.2). The assessment of these impact areas should be guided by those environmental and related sustainability issues that are central to a nuclear power programme. These issues have been combined into eight 'environmental impact themes' (see Section 3.3), detailing infrastructure related environmental effects and wider impacts resulting from the programme, and also impacts on the programme. These environmental impact themes were defined for the purpose of these guidelines and are based on existing legislation and practices. As with the nuclear power impact areas, they will need to be adjusted to best suit the actual context an SEA is applied in. It is important that not only the impact on the themes but also the impact from them on nuclear power programmes be considered in an SEA.

The SEA process includes the following eight main components: screening, scoping, stakeholder engagement and public participation, assessment, SEA report, decision making, monitoring and wider follow-up, and quality review. The 'heart' of an SEA for a nuclear power programme is the assessment process, which is conducted in parallel to the preparation of the programme itself, closely connecting with it at various points in time. This is likely to take at least six months and may require one or more years for something as complex and, potentially, controversial as a nuclear power programme. The process needs to start as early as possible, ideally immediately after a decision has been made to prepare a nuclear power programme. This is required in order to be able to proactively influence the programme development.

Stakeholder engagement, including consultation with statutory and non-statutory bodies, as well as public participation, is a key component of SEA, as it helps identify and address stakeholder and public acceptance issues during the process of developing nuclear power programmes. SEA for nuclear power programmes can thus provide a platform for informed and fair public debates. A variety of methods can be used to encourage adequate stakeholder engagement and public participation in different application situations. This includes the development of an overall associated plan and a communication strategy that is adjusted to individual groups, from communities to institutions and the press/media. Given the time frame from the initial concept to the implementation of a nuclear power programme, it is important to consider whether and how the stance of the public and decision makers will change over time.

The SEA report is the main document used by all stakeholders (including the general public) that describes the environmental impacts of a nuclear power programme and the options identified within the SEA and the programme. The SEA report needs to focus on those issues that are relevant with respect to any expected significant environmental and sustainability impacts of the different nuclear power programme options. It needs to be written in such a way that decision makers, stakeholders and the general public are able to understand it, and it needs to be accompanied by a distribution strategy, taking transboundary stakeholders into account.

Importantly, the SEA report is just one component of the SEA process, and not the final one. An SEA can only be considered effective if its findings feed into the decisions taken, and thus influence the subsequent developments. Continuous and comprehensive quality assurance, ideally by an external, unbiased body, can facilitate achievement of this objective.

1. INTRODUCTION

1.1. Background

A key requirement for the peaceful use of nuclear energy is that its use be beneficial, responsible and sustainable, while ensuring protection of both the public and the environment [1]. Strategic environmental assessment (SEA) can be applied in line with this key requirement. SEA is a decision support tool that aims at assisting the preparation of environmentally sustainable policies, plans and programmes by (public) authorities. It, thereby, targets strategic levels and is meant to guide the subsequent development of projects.

One of the main purposes of SEA is to support the understanding of both potentially significant negative as well as positive environmental implications when implementing a nuclear power programme. It does this by identifying different development options (which, in some jurisdictions, may also be labelled as 'alternatives') and mitigation measures, and assessing their environmental impacts from the outset of the formulation of policies, plans and programmes. By identifying options that are not viable, SEA can help to significantly reduce the costs that would be

associated with further pursuing them.[6] Furthermore, SEA provides a platform for effective communication with the public and other stakeholders, thereby offering opportunities for addressing the concerns that they may have.

For countries that are in the process of considering nuclear power as a part of their energy mix in national policy making, SEA is, thus, a crucial tool that needs to be applied at the policy and associated plan levels, followed by the programme level. These guidelines focus explicitly on the programme level.

Currently, SEA is formally required in about 60 countries, and there are experiences with its application in many others worldwide. The term 'strategic environmental assessment' was invented about 30 years ago, thus making it more recently established than 'environmental impact assessment' (EIA) for projects, which was put in place about 50 years ago [3]. As a consequence, there is still less experience with SEA than with EIA. Countries with formal requirements include those subject to international regulations, such as members of the European Union, which need to comply with European Commission Directive 2001/42/EC on the Assessment of the Effects of Certain Plans and Programmes on the Environment (EU SEA Directive) [4], or members of the United Nations that have ratified the United Nations Economic Commission for Europe (UNECE) Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a Transboundary Context[7] (UNECE Protocol on SEA)[8][5].

Many other countries have other formal (sub-) national strategic assessment frameworks in place. However, not all of them explicitly refer to the assessment as an SEA. These countries include Australia, Bhutan, Brazil, Canada, Chile, China, Ghana, Kenya, the Republic of Korea, Malaysia, Pakistan (for Khyber Pakhtunkhwa Province), Thailand, Ukraine, the United States of America, Viet Nam and others. In addition to these national and international requirements, lenders may also impose SEA for sectoral financing, for example, to comply with the Equator Principles for financial institutions [6]. The Annex provides an overview of specific requirements for an SEA, as outlined in the EU SEA Directive [4], the UNECE Protocol on SEA [5] and selected national frameworks. Practical SEA examples in a development cooperation context are provided by the Organisation for Economic Co-operation and Development [7].

1.2. Objective

While SEA is widely applied in general, only a small number of SEAs have been performed for nuclear power programmes (or subcomponents thereof; for example, spent fuel management strategies). Examples include SEAs in Germany, Poland, the United Arab Emirates and the United Kingdom [8–11]. Given the currently rather limited experience with SEA in the nuclear power sector, these guidelines aim to indicate what SEA for nuclear power programmes may constitute, building on the rich experiences with SEA outside of this sector. The guidelines aim to support those involved in the preparation of an SEA for nuclear power programmes. This includes new programmes and revisions to existing programmes, for example, when considering the construction of new reactors or the extension of the lifetime of existing reactors, or when developing or revising waste management and decommissioning strategies.

1.3. Scope

The underlying assumption of these guidelines is that an SEA has already been applied to the energy policy and associated plans and programmes, and that nuclear energy had been identified as one of the potentially

[6] For England and Wales, savings of £15 million (€18 million) were reported during the period 2005–2010 through effectively coordinating environmental assessments in the area of flood risk management [2].
[7] This convention is also known as the Espoo Convention.
[8] As of September 2018, the protocol has 38 signatories and 32 parties, which includes the European Union and its Member States.

suitable energy options.[9] If no SEA was conducted earlier for the energy policy, an SEA for a nuclear power programme will need to acknowledge this, but will not be able to fill the ensuing gap. Filling this gap goes beyond the scope of these guidelines, in particular with regard to the energy options considered in the SEA [13].

The guidelines have been prepared on the basis of the best available knowledge on how to apply SEA as an effective decision support tool. In this context, 'effective' means SEA being a tool which is able to support environmentally sustainable decisions that are transparent, fair and objective, and which aim at equitable and (to the extent possible) consensus based decisions, while adding scientific rigour to the decision making process.

These guidelines go beyond the minimum requirements found in most current legal texts. They do not aim at simply introducing a one-off assessment procedure. When engaging in SEA for a nuclear power programme, decisions are made on various important issues at different points in time and within varying national legal frameworks and practices governing policy, plan and programme making. These guidelines, therefore, acknowledge that a nuclear power programme SEA represents a highly complex decision making context, which requires a customized approach.

These guidelines are not written as a technical manual that a user can mechanically follow. Rather, the approach used in these guidelines is based on presenting suggestions and posing questions to those applying them, allowing them to develop a situation specific assessment approach. This will involve engaging in what, at times, will be challenging professional as well as public discussions.

In line with this spirit, these guidelines should not be used in a reactive manner, but rather in a proactive and creative way to ensure that SEA is applied as a process that accompanies and interacts with the development of a nuclear power programme and influences its structure. Further, these guidelines should not be considered static, and the IAEA appreciates any feedback on their usage and any suggested improvements.[10] This includes issues where guidance on the implementation of SEA would have been helpful but was not provided by these guidelines.

1.3.1. Framing SEA within the nuclear infrastructure development process

To support a country in developing the necessary infrastructure, the IAEA has published Milestones in the Development of a National Infrastructure for Nuclear Power [14]. It describes a three phased approach through which a number of different infrastructure issues are addressed. Figure 1 shows these phases and milestones in the development of nuclear energy and locates SEA for nuclear power programmes and subsequent EIAs within them (see Section 2.3.1 for a more detailed differentiation between SEA and EIA).

After the nuclear power option is included in a national energy strategy (which, ideally, should be subject to policy SEA (see Figs 2–5)), initially, during phase 1, further issues are considered before a decision is taken to launch a nuclear power programme at the end of phase 1. Such issues may include pre-feasibility studies on, for example, the impacts on the national economy or financing options.

The majority of the nuclear power programme SEA process is, therefore, clearly positioned within phase 1 of Fig. 1, while, for example, project specific assessments are part of EIA processes, which will largely be conducted during phase 2 (for further information on the EIA process for nuclear power projects, see Ref. [15]). However, SEA and EIA are linked in the sense that the SEA process at the end of phase 1 is expected to identify some of the projects that will require an EIA.

[9] In this regard, the reader is referred to the IAEA publication Considerations to Launch a Nuclear Power Programme [12].
[10] Comments can be addressed to Official.Mail@iaea.org.

An SEA may also target the period after milestone 3. This can be the case when a nuclear power programme (or a subcomponent thereof) is adjusted or newly developed after nuclear power plants become operational. Reasons for this could be that an extension to the lifetime of power plants is being considered or that an updated and more detailed radioactive waste management strategy is being developed[11]. Across its three phases, Ref. [14] lists 19 infrastructure issues that should be addressed in the development of nuclear energy (see Table 1). A selection of those will be considered in an SEA for a nuclear power programme.

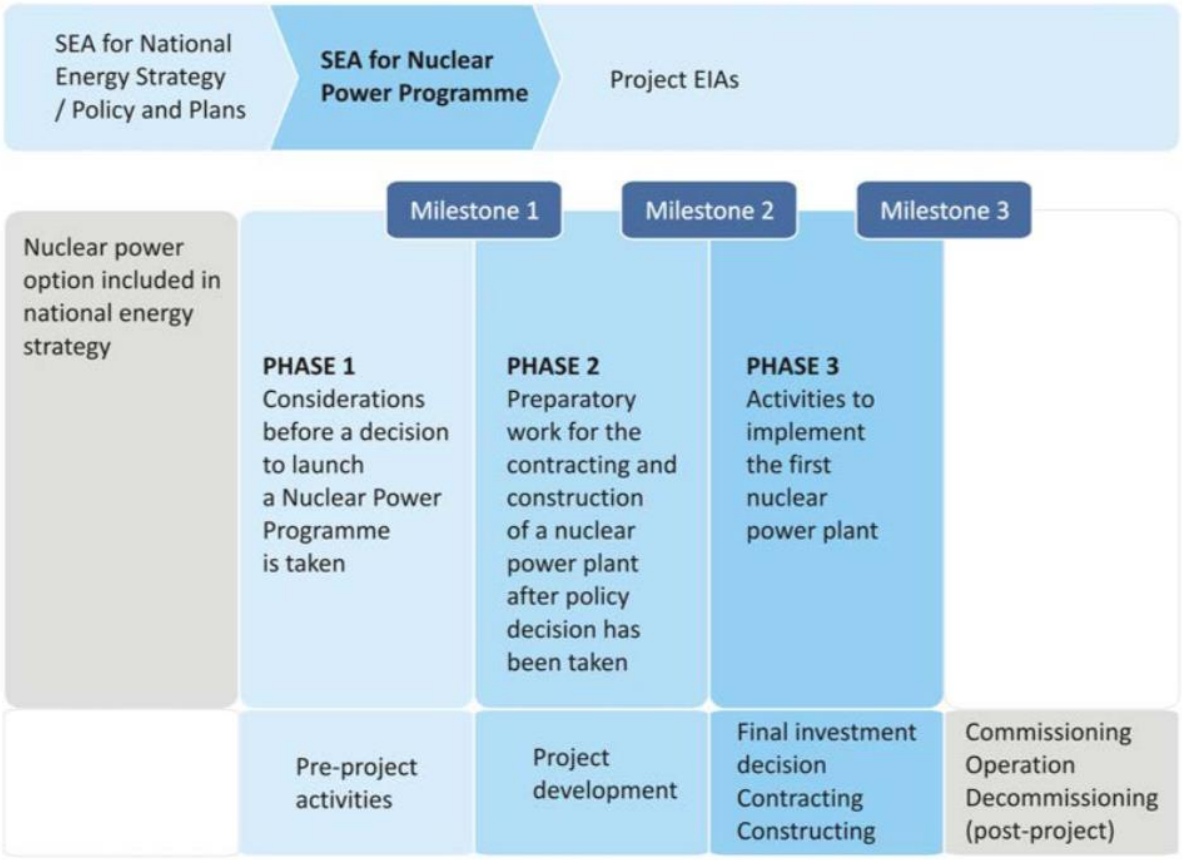


FIG. 1. Phases and milestones in the development of nuclear energy and associated SEA and EIA.

Reference [14] recommends that the nuclear energy programme implementing organization develop a comprehensive report at the end of phase 1. The SEA will directly inform related aspects of this comprehensive report, especially those relating to infrastructure issue 13 (environmental protection; see Table 1), which is a core issue for consideration in SEA. However, all of the issues listed in Table 1 may directly or indirectly have an impact on SEA and the scoping stage will clarify the issues to be addressed in each programme SEA. Depending on the specific circumstances, some will be of higher relevance and others may be excluded.

For the purpose of these guidelines, infrastructure issues will be implicitly considered through the following seven nuclear power impact areas:

[11] While radioactive waste management will also need to be covered in the overall nuclear power programme, an SEA is a continuous and multilayered process that evolves over time and requires adjustments accordingly (see Section 2.3).

(1) Main siting and technological considerations;
(2) Power plant construction, operation and decommissioning;
(3) Nuclear fuel cycle;
(4) Spent fuel management strategy/radioactive waste storage and disposal;
(5) Physical protection and security;
(6) Emergency preparedness and response;
(7) Wider physical infrastructure requirements.

These areas are key considerations for nuclear power programmes that will need to be adjusted on a case by case basis to suit the given circumstances. They are further elaborated on in Sections 3–6. The process of selecting what to include or exclude in SEA is explained in more detail in Section 4.3 in the scoping stage description.

TABLE 1. INFRASTRUCTURE ISSUES IN THE DEVELOPMENT OF NUCLEAR POWER [14]

Infrastructure issue number	Infrastructure issue
1	National position on nuclear energy
2	Nuclear safety
3	Management
4	Funding and financing
5	Legal framework
6	Safeguards
7	Regulatory framework
8	Radiation protection
9	Electrical grid
10	Human resource development
11	Stakeholder involvement
12	Site and supporting facilities
13	Environmental protection
14	Emergency planning
15	Nuclear security
16	Nuclear fuel cycle
17	Radioactive waste management
18	Industrial involvement
19	Procurement

1.4. Structure

While the initial sections explain the context and background of SEA for nuclear power programmes, from Section 3 onwards, these guidelines focus more concretely on how to perform an SEA and the various methodological aspects of SEA application.

The guidelines are divided into eight sections, starting with this introduction. Section 2 describes the context and the substantive focus of SEA, while in Section 3 the environmental and related sustainability issues to be considered in SEA for nuclear power programmes are provided. Next, an SEA methodology is introduced, consisting of four sections, describing the process for conducting an SEA (Section 4) and the associated stakeholder engagement and public participation (Section 5), assessment methods and associated data requirements (Section 6), as well as the structure of the SEA report, including a quality review checklist (Section 7). Finally, Section 8 consists of concluding remarks. The Annex presents requirements for

SEA based on the EU SEA Directive [4] and the UNECE Protocol on SEA [5] as well as country experiences.

1.5. Users

The guidelines are written for a wide range of actors and stakeholders. These include authorities responsible for the preparation and implementation of nuclear power programmes (including advisors and senior managers), as well as those in charge of conducting SEA. However, the audience of these guidelines also includes all other parties involved or interested in SEA, including industry; authorities in charge of regulations, public health, safety and the environment; consultation bodies; and the concerned public and media.

2. CONTEXT OF THE SEA

The political, social, environmental and economic context within which an SEA is conducted is key to the question as to how it should be applied. This includes underlying environmental and other policy objectives that are used as a basis for SEA. Furthermore, it includes the overall decision making framework (i.e. the portfolio of relevant policies, plans and programmes that should be consistent and compatible), which is important for deciding what to address when and where, as well as societal attitudes to both nuclear power and environmental issues. Importantly, SEA can only be effective in the presence of full political endorsement and 'buy-in'. It is thus important to critically review institutional capacity to conduct an SEA and, if necessary, address any identified shortcomings.

The context of SEA is further explored in this section. It starts by presenting the main objectives and focus of SEA in Section 2.1, before establishing when SEA is needed in Section 2.2. Section 2.3 positions SEA within the space between policies and projects, and discusses requirements regarding the regulatory framework and institutional capacity. The section concludes by introducing the components of the SEA process in Section 2.4.

2.1. Objectives and main focus of the SEA

SEA is a proactive decision support tool, acting as a 'critical friend' to those involved in preparing strategies (i.e. policies, plans and programmes). It facilitates more transparent, accountable and, ultimately, more environmentally sustainable decision making above the project level. It, thus, supports the creation of a future in which decisions are widely respected and which is marked by mutual trust and respect. In this context, it does not simply assess the impacts of the proposed action (i.e. of a proposed policy, plan or programme) in a reactive manner — it does not just quantify emissions or resource use, for example. It is also not intended as a tool to justify a strategy which is already largely finalized. Rather, it aims at steering the thinking of those involved in policy, plan and programme making[12], with regard to alternative actions for achieving overall environmental aims and objectives, but without ignoring their economic and social implications. It investigates ways to avoid, reduce or otherwise mitigate negative impacts while enhancing positive outcomes, also taking indirect, cumulative, short to long term, synergistic, local, regional and global (including transboundary), as well as residual impacts into account.[13] The potential benefits meant to accrue from an SEA [16] are summarized below:

- Achieving environmentally sound and sustainable development;
- Strengthening policy, plan and programme making processes;

[12] It should be noted that the terms 'plan' and 'programme' are not consistently defined across countries. For the purpose of these guidelines, when using the term 'plans and programmes' in combination, this implies no differentiation between the two terms and refers to the decision making level between policies and projects. In the context of nuclear power, the term 'programme' is used as outlined in detail in Ref. [14].

[13] An explanation of these types of impact can be found in Section 4.4.2.

— Saving time and money by avoiding costly mistakes;

— Improving good governance and building public trust and confidence in decision making.

In many countries, SEA focuses mainly on biophysical aspects, with flora and fauna, air, water and soil being central to the assessment. There may be good reasons for this, such as a limited capacity to consider more aspects or a responsibility to look after certain issues only. However, in a time and age in which sustainable development is often the key development aim, environmental issues are also understood to include wider social aspects (e.g. those that are related to health or rights of minorities as well as institutional capacity) and, in this context, also publicly and environmentally relevant economic aspects, such as the potential costs and economic benefits of different options and associated mitigation measures. This should, however, not compromise the need for the SEA to be guided by environmental considerations.

2.2. When is an SEA needed?

While the need for an SEA may be prescribed in national legislation, with further details provided in implementing regulations, in general, it is suggested to conduct an SEA whenever significant negative environmental impacts are likely to occur as a consequence of a policy, plan or programme. For example, an SEA is recommended in the following cases:

— If a new nuclear power programme is initiated;

— If an existing nuclear power programme is extended by the construction of new reactors;

— If a waste management or decommissioning strategy is newly developed or significantly revised;

— If considering the extension of the lifetime of a reactor requires SEA or would profit from it.

An SEA may not be required if only very minor changes to an existing nuclear power infrastructure are intended (e.g. power upgrading or safety related improvements). Furthermore, results of an SEA will not be valid indefinitely, but only for a certain amount of time; there may be a need to revisit and revise the SEA in the case of a major policy change or other new developments.

The procedural stage at which a decision is made on whether or not to conduct the SEA is referred to as ‘screening’. The first task to be addressed is to check national SEA legislation on whether an SEA is obligatory for a particular nuclear power programme. If this is the case, no screening may be necessary. Case by case screening means that a careful assessment is conducted of the development likely to occur and the possible magnitude of associated impacts (e.g. hectares of land use, quantity of emissions or risk characteristics).

While the decision to conduct SEA is based on the possibility of significant negative environmental impacts, when the SEA is actually conducted, both negative and positive environmental impacts should be assessed. Positive impacts, in particular, should be considered in the light of the likely impacts of other options (for nuclear power programmes, the saving of greenhouse gas emissions that would be generated by other power plant options). Some of these will be addressed when assessing the environmental impacts of energy options within the SEA targeting the policy level. The nuclear power programme SEA would then provide a summary of the main (positive and negative) outcomes of this associated policy level SEA.

It is important not to attempt to take all relevant decisions at once, but to take due account of the complexity of the task at stake. This has led to the development of a so-called ‘systematic framework’, the idea of tiered environmental assessments. In this context, ideally, individual environmental assessment processes are conducted at every point when decisions on the development of nuclear power are made (i.e. at policy, plan and programme tiers of different sectors and

administrations). In this context, reference is made to Figs 1–5.

If there are no policy and associated plan level SEAs, the programme level SEA will need to acknowledge this, but will not be able to comprehensively address issues that should have been addressed at the policy and associated plan levels. Going beyond the programme level would make the SEA considerably more complex, and it is questionable whether this would result in an effective SEA. An extended SEA of this type is outside the scope of these guidelines, as pointed out in Section 1.3.

2.3. A framework for a more systematic approach to decision making

SEA is a science and an art [17] in that it aims at bringing scientific rigour to decision making processes while acknowledging the political nature of those processes which they attempt to influence. In this context, the SEA mainly functions in the following two ways:

(1) To provide a framework for a more systematic approach to decision making;

(2) To establish a methodology, consisting of several components for evaluating environmental implications, to be followed in the SEA, as well as methods associated with these components.

The following two subsections provide more detail on (1) above. The components of the SEA process mentioned under (2) above are then introduced in Section 2.4.

2.3.1. Placing SEA for nuclear power programmes within the tiers of decision making

The SEA acts as a proactive decision support tool and as a framework for structuring decisions in a systematic way. The SEA will help those involved in policy, plan and programme processes to address all relevant decision making questions in a tiered environmental assessment system, ranging from the tiers of (i) policy SEAs over (ii) plan and programme SEAs to (iii) project EIAs (see Fig. 2). This can be understood as a strategic–operational continuum.

SEA and EIA processes performed at different tiers need to consistently refer to each other, as with environmental assessments that are applied across different administrative levels (e.g. national, provincial, regional, local) as well as across sectors (e.g. energy, transport, waste, land use). Box 1 and Fig. 3 show differences and linkages between SEA and EIA approaches.

FIG. 2. Decision tiers across a strategic–operational continuum.

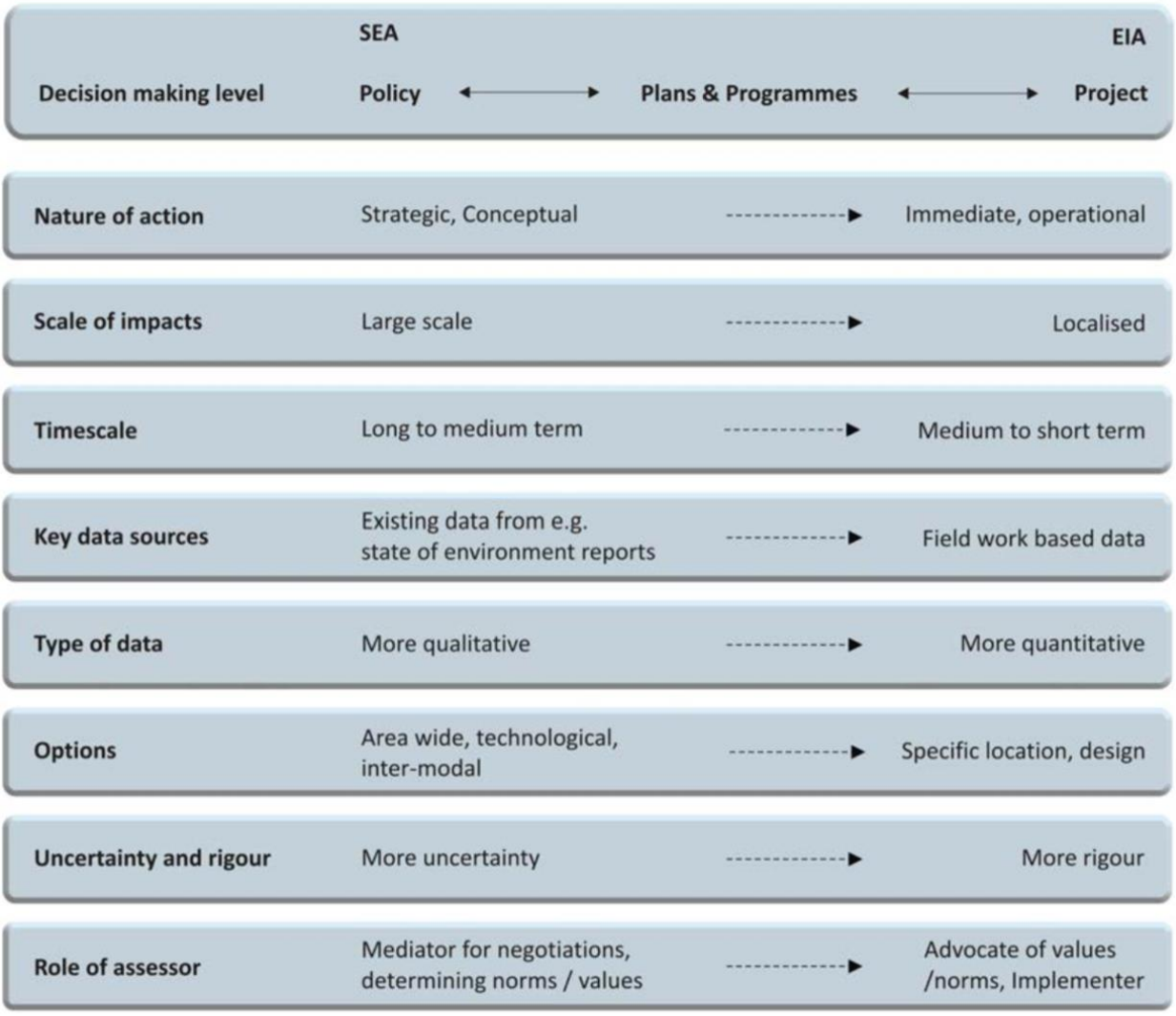


FIG. 3. The strategic–operational continuum (key components).

BOX 1. DIFFERENCES AND LINKAGES BETWEEN SEA AND EIA APPROACHES

While there are a number of differences between SEA and EIA, there are no clear boundaries between them, and there is a gradual shift from strategic to operational thinking, from policy over plan and programme (SEA) to project (EIA). Policies are situated at the strategic end and projects at the operational end of what may be described as the strategic–operational continuum. Differences between an SEA and an EIA are outlined in Fig. 3 and can be described using a number of components, including:

— *The approach:* The SEA is an upstream proactive tool which assesses and informs development policies, plans and programmes, while the EIA assesses project proposals.

— *The nature of actions and outputs:* These range from conceptual and general at the SEA end of the continuum to specific at the operational EIA end.

— *The scale of impacts:* These range from macroscopic and more unclear at the policy level addressed by the SEA to more localized at the operational end addressed by the EIA.

— *The timescales of actions:* These tend to range from more medium to long term at the policy SEA end to more short to medium term at the operational EIA end.

- *Key data sources:* These range from existing in, for example, strategic state of the environment reports used for SEA to fieldwork and sample analysis used for EIA at the operational end.
- *Types of data:* These range from more aggregated at the strategic end (SEA) to more detailed at the operational end (EIA).
- *Options:* These range from political, area wide, technological, fiscal, institutional and economic at the strategic end (SEA) to specific locations, design and construction options at the operational end (EIA).
- *Uncertainty and rigour:* There is usually more uncertainty at the strategic end (SEA) and more rigour at the operational end (EIA).
- *Roles of assessors:* These range from mediators for discussions at the strategic end (e.g. in order to assess and influence policy development through the SEA) over advocates of agreed objectives and norms, to technicians for implementation of objectives at the operational end (EIA).

While it is unrealistic to assume that policies, plans, programmes and projects prepared at different points in time are fully consistent, deviations from established aims and objectives should always be made in a conscious manner and be explained. Decisions on different issues across sectors are taken at different tiers and levels. However, in many countries, it remains unclear which issues and associated assessment tasks should be addressed at a specific tier. This can result in important issues either remaining inadequately addressed or not being covered at all. Therefore, a clear understanding needs to be developed regarding all policies, plans, programmes and projects that are prepared at different administrative levels and which are relevant for the nuclear power programme. In this context, it is useful to map them in a matrix, showing both administrative levels and systematic decision tiers.

Figure 4 shows an outline of such a matrix, which can be useful to map the relevant policies, plans, programmes and projects, as well as their interdependencies. Reflecting these interdependencies, processes conducted at each level and tier should take account of, and consistently refer to, each other. They should not be understood in a top-down manner.

Furthermore, energy planning does not happen in isolation but is part of overall national sustainable development planning. It may affect, or be affected by, the planning processes of other sectors, such as spatial planning/land use and transport. Therefore, a multilayered approach needs to be applied, considering the policies, plans and programmes, and associated SEAs of non-energy sectors that may affect the design of a nuclear power programme. Related international conventions/treaties and national regulations designed to protect the public and the environment also need to be considered. These may focus on issues such as sustainable development, hazardous substances, mining, industry, wild life protection, and import and export or transit of materials. It is essential to develop a clear understanding of how these cross-sectoral requirements and strategies interact. Again, it is recommended that they be mapped early in the SEA process and that potential interactions be pointed out.

As stated in Section 1.1, these guidelines aim at one specific tier of decisions, namely nuclear power programmes. These are assumed to be prepared at the national administrative level. At this particular tier, the focus is not on why to consider nuclear power (as it is assumed that this has already been addressed earlier in a policy SEA), but rather on questions regarding how and where this could be implemented (i.e. based on which siting criteria[14]) (see Fig. 5 and Table 2). Helping to define the framework to answer these questions will be at the heart of the subsequent sections.

[14] It should be noted that detailed assessments of individual sites form part of an EIA.

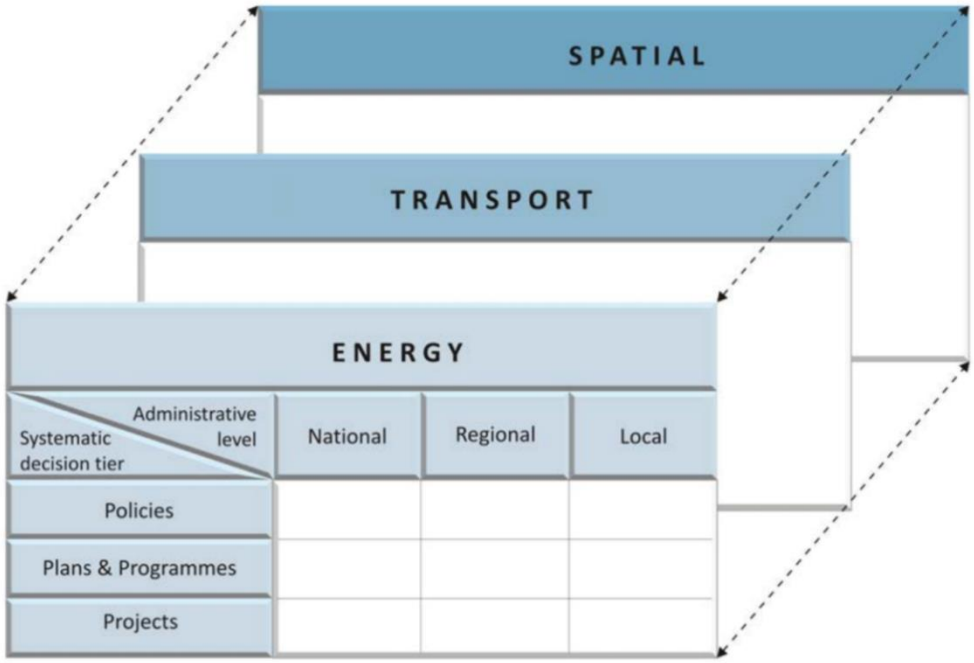
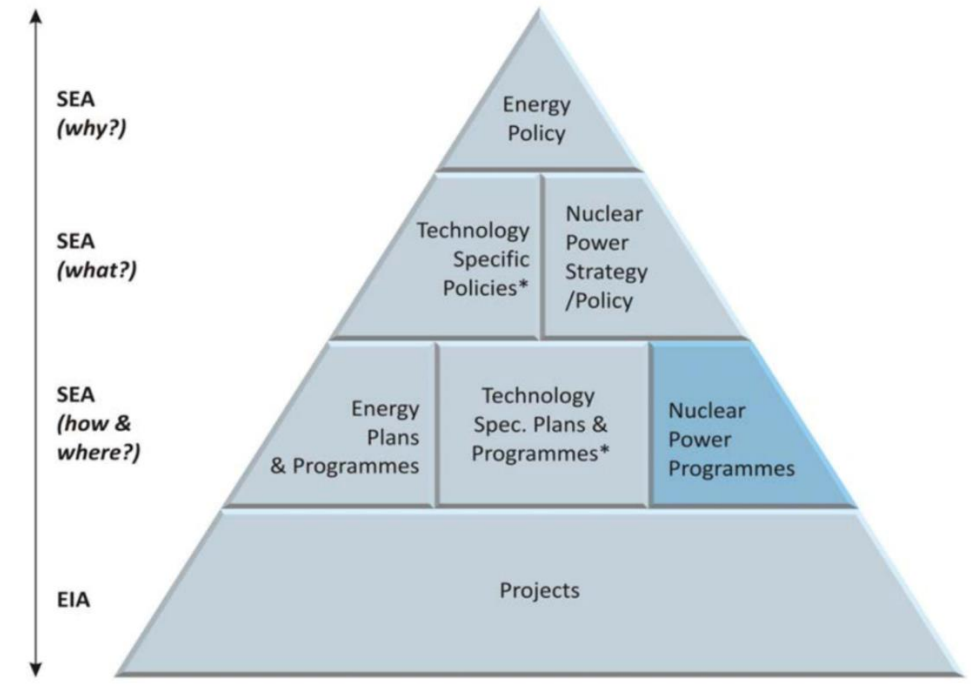


FIG. 4. Mapping the country framework across tiers and levels beyond the energy sector. It should be noted that three example layers are presented here. The actual layers are determined based on the country context.



* There may be a range of energy policies, plans and programmes, including for various renewable and non-renewable energy sources.

Focus of guidelines.

Note: This pyramid does not reflect a top-down approach; rather, it indicates that there are usually more projects than plans and programmes, as well as more plans and programmes than policies.

FIG. 5. Energy decision tiers, questions to be addressed and focus of guidelines.

2.3.2. Regulatory frameworks, institutional capacity and responsibilities

Together with the necessary political buy-in, the existence of an appropriate legislative and regulatory framework, and appropriate institutional capacity are key to being able to effectively lead and conduct SEA. In this context, a clear allocation of responsibilities is vital. Institutions in charge of SEA may differ, depending on the country or specific planning system. Table 2 provides an example of what issues may be addressed at different tiers and institutions in a systematic energy planning hierarchy. The particular questions addressed set the context and scope for the associated SEAs.

Working as a critical friend, the SEA will aim at evaluating how, when and where questions are addressed in the existing policy, plan, programme and project framework. Gaps with regard to questions that remain unaddressed will need to be identified. Those involved in conducting an SEA can then make suggestions on how such gaps may be addressed.

Legislation may give rise to the preparation of specific policies, plans, programmes and associated SEAs. Legislation may also define issues to be considered in an SEA and set the rules for wider engagement and public participation. When involved in an SEA, it is important to be aware of any constraints put on effective assessments by the existing legal and wider decision making framework. For example, in many countries, SEA is not accorded a proactive role, but is used strictly to test ideas brought forward by, for example, planners. Constraints need to be made explicit in the interests of transparency (Box 2).

BOX 2. THE IMPORTANCE OF USING SEA AS A PROACTIVE DECISION SUPPORT TOOL

In order for SEA to be a beneficial decision support tool, it needs to be understood as being proactive, influencing decisions by generating new ideas for possible environmentally sustainable options and mitigation measures. It can only act as a critical friend if it is allowed to be more than just a tick box exercise on how a proposed action meets overall policy objectives. Any public decision normally comes with some trade-offs between different policy objectives. Those taking decisions usually have a remit to facilitate development in a certain area and may often place little emphasis on environmental issues and implications. SEA is an advocate tool of the environment and can provide solutions that are environmentally sustainable and may otherwise not be considered by decision makers.

Most of the issues and questions raised in Table 2 are generally covered in the decision making process, depending on how well an energy policy, plan, programme and project framework is developed in a particular country. Still, there could be several gaps in addressing all of these issues and questions in a systematic and transparent manner. As a consequence, SEAs for nuclear power programmes may need to fill these gaps and, therefore, become more complex.

A key issue in preparing energy policies, plans and programmes is the definition of clear objectives. The objectives at the programme level are ideally derived from the higher policy level. They are not subject to SEA but are used to set the thematic framework for the preparation of the programme and, thus, also for the SEA. Objectives for a nuclear power programme should give sufficient space to assess different strategic approaches, which is crucial to perform effective SEA. Therefore, the objectives should not exclude potential alternatives from the outset.

It is also important to involve the actors responsible for the various tiers of the decision framework when addressing issues and questions at one specific tier. For example, when preparing policies or plans and programmes, it is recommended that those responsible for deciding on their implementation through projects be closely involved in the process. Ownership and coordination of all those involved, from the local to (possibly) the international level, is a key issue for effective policy, plan and programme decision making, and for effective

SEA. This includes, for example, national policy makers along with those implementing programmes at regional and local levels.

Depending on the country, the institutions in charge of the SEA process may vary. Building institutional capacity and topical linkages among institutions takes time and is unlikely to be achieved overnight. Central to such capacity building are human resources and the technical capacities to conduct an SEA and to allow effective preparation of policies, plans, programmes and projects.

TABLE 2. ISSUES AND QUESTIONS TO BE ADDRESSED IN ENERGY AND NUCLEAR POWER PLANNING IN A SYSTEMATIC DECISION HIERARCHY

Tier	Issues and questions
Energy policies	— What is the likely future need for energy? What possibilities are there to reduce anticipated demand (e.g. by increasing energy efficiency)? — Is the existing capacity sufficient to satisfy the likely future energy need? What additional capacity may be needed, taking into account decisions on increasing efficiency? — How can anticipated future energy needs be met? What renewable and non-renewable energy options are there? — How may a realistic future energy mix look? Should nuclear power play a role in this? — If a decision is made to include nuclear power in the energy mix, what would be the optimal capacity installed? — What are the security concerns around nuclear power?
Nuclear power plans/ programmes	— How can the nuclear power programme be designed to maximize positive outcomes and minimize negative impacts? — What are the implications of the nuclear power programme with regard to associated wider (energy) infrastructure requirements? — What siting options are there? Which of them are likely to be suitable/unsuitable (in terms of population, seismicity, water availability, flora, fauna, physical infrastructure, physical protection and security, waste storage and disposal)?* — What site specific technology options are there across the fuel cycle and its associated nuclear facilities? Which options are the most beneficial and least detrimental?*
Projects	— What are the environmental, social and economic impacts of the specific power plant, including its associated fuel cycle, nuclear facilities and other resulting infrastructure development needs?

* These questions denote the focus of the present guidelines on SEA for nuclear power programmes.
Note: There is unlikely to be just one policy or plan or programme, but numerous ones, as indicated in Figs 2 and 3.

2.4. Components of the SEA process

As mentioned above, SEA helps to establish a methodology comprising several defined components. These are illustrated in Fig. 6, briefly introduced below and described in more detail in Section 4. A segment on specific methods and techniques to be used for the different components of SEA is provided in Section 6.

2.4.1. Screening: Is SEA necessary?

This decision is based on an initial evaluation of whether significant negative environmental impacts or risks inherent to an activity are likely to arise (see also Section 2.2). If conducting SEA for a nuclear power programme is a legal requirement, no screening would be required. Considering public perceptions of risks associated with a nuclear power programme, an SEA would normally be expected to be conducted whether or not it was legally mandated. Exceptions may include programmes that focus on some very minor changes, for example, to existing nuclear infrastructure only. It is suggested that interested stakeholders (e.g. ministries or environmental agencies) be involved in screening as early as possible.

The outcomes and suggested outputs of this component are:

— Decision on whether subsequent stages of the SEA need to be performed;

— Preparation of a screening report.

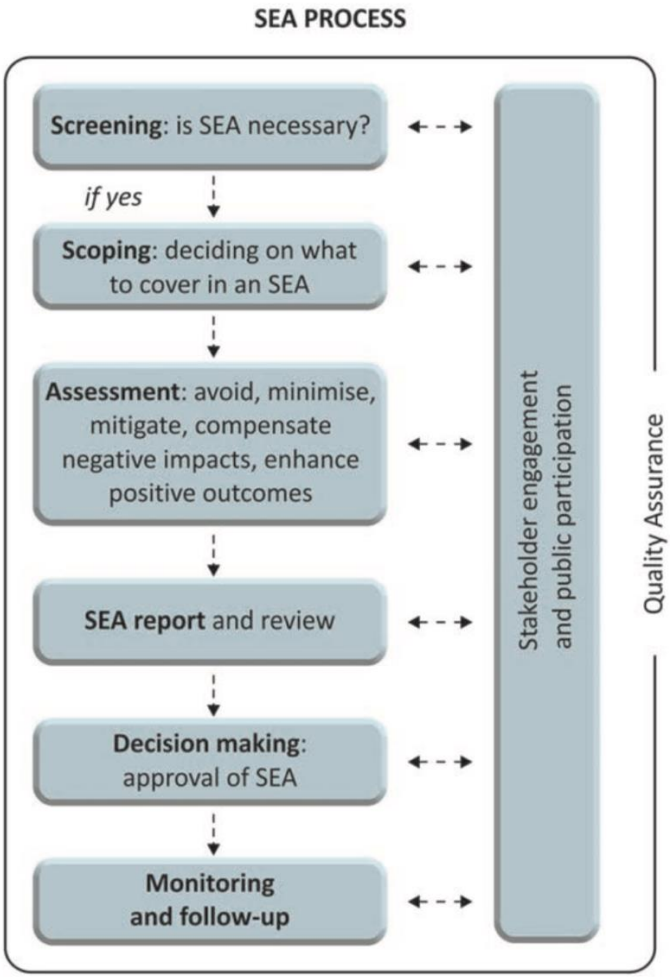


FIG. 6. Components of the SEA process.

2.4.2. Scoping: Deciding what to cover in the SEA

This includes identifying environmental, social and environmentally relevant economic issues to be assessed. Furthermore, already at this stage, options or issues may be identified that should be assessed with regard to their potential to avoid, reduce or otherwise mitigate negative environmental impacts, and to enhance positive outcomes. An important outcome of scoping could be a process management checklist, which lists all procedural components of the SEA and allocates tasks and responsibilities, including anticipated time requirements.

Getting the scoping stage correct is of great importance for the overall success of the SEA, not only in terms of which issues and options to 'scope in', but also which ones to 'scope out' of the assessment. Not considering relevant aspects (i.e. scoping out important issues) may mean that the SEA misses relevant impacts. Scoping in issues that are not important, on the other hand, may make the assessment unwieldy and difficult or even impossible to comprehend. Issues to be potentially considered are introduced in Section 3.

Depending on the geographical scale of a programme, transboundary aspects will need to be considered. It is suggested to include consultations with statutory and non-statutory bodies, as well as public participation, as part of scoping.

The outcomes and suggested outputs of this component are:

- Transparently establishing and justifying issues and options to be considered in subsequent SEA stages;
- Preparation of a scoping report, including a process management checklist.

2.4.3. Stakeholder engagement: Engaging stakeholders and ensuring public participation

Engaging stakeholders (environmental, health and other authorities, statutory and non-statutory bodies, neighbouring countries) and wider participation of the general public is another key SEA component. Stakeholder engagement and public participation is recommended at least during scoping and also later when developing the SEA report, and may be informed by an engagement plan. Furthermore, it is advisable to give stakeholders and the general public a role in monitoring and follow-up. A more detailed discussion on stakeholder engagement and wider public participation is provided in Section 5.

The outcomes and suggested outputs of this component are:

- Providing opportunities for stakeholders and the general public to influence a transparent decision making process;
- Preparation of an engagement report (which may form part of the overall SEA report).

2.4.4. Assessment: Identifying and describing likely environmental (including health) effects; and avoiding, minimizing and mitigating significant negative impacts, and enhancing positive outcomes

Issues and options that are scoped in need to be evaluated with regard to the significant impacts likely to occur. This is normally an iterative process, each iteration taking into account factors such as the implications of mitigation measures and new or discarded options. The assessment stage, ultimately, aims to avoid, minimize and mitigate negative impacts and to enhance positive outcomes.

The outcomes and suggested outputs of this component are:

- Obtaining clarity on the best practical environmental option to take forward;
- Preparation of a summary of the assessment to be included in the SEA report.

2.4.5. SEA report

The SEA report is the main document produced during the SEA process. It summarizes the process itself and explains the main outcomes of the assessment with reference to the significant environmental impacts of different options and mitigation measures. It is recommended that the SEA report provide clear recommendations on how to proceed with the programme and, in this context, include aspects of monitoring and follow-up.

The outcome and suggested output of this component is the preparation of a report, summarizing the results of screening, scoping and assessment, as well as consultation and participation in a clear, simple and comprehensible manner.

2.4.6. Decision making: Consideration of the SEA

An SEA needs to influence actual decisions, not only for the programme it is applied to, but also for other policies, plans, programmes and

projects. If SEA results are not taken into account in decisions taken, then the SEA is ineffectual in achieving its main aim, namely, to make development more environmentally sustainable. When taking a decision to proceed with a nuclear power programme, it is, therefore, advisable to include a justification of the decisions taken in the light of the suggestions made by the SEA.

The outcomes and suggested outputs of this component are:

- Effective consideration of the programme decision taken;
- Preparation of a report showing how the SEA influenced decision making, explaining how the suggestions made in the SEA report were or were not considered.

2.4.7. Monitoring and wider follow-up: Implementing decisions and checking predictions

Once the decision to proceed with a particular option is taken, subsequent developments need to be monitored in the light of the SEA recommendations. This includes, for example, whether mitigation measures agreed on in the decision making report are actually implemented at subsequent project stages. Furthermore, performance monitoring is required with regard to whether future impacts are in line with what was foreseen in the SEA. Corrective action should be taken if significant deviations occur from what was initially envisaged. This needs to be laid out in the SEA follow-up actions (see Section 4.7).

The outcome and suggested output of this component is continuous monitoring and follow-up with regular reporting over an agreed period of time.

2.4.8. Quality assurance: Checking whether the SEA is of adequate quality

While listed last, SEA quality review is an overarching process that may start as early as SEA screening and then, subsequently, be applied to all SEA components. Quality review is part of SEA process management and should, ideally, be performed by an independent third party or person. A central part of it may focus on the SEA report (see Section 7). After considering the quality of the various documents and reports prepared during the SEA, quality review may also consider other issues, including, for example, the expertise of those responsible for conducting the SEA process, the quality of the SEA as a platform for open and fair debates, and its effectiveness in influencing decision making.

The outcome and suggested output of this component is quality assurance through reviews of the SEA process, as well as of SEA expertise, transparency and effectiveness (see Section 4.8).

3. ENVIRONMENTAL AND RELATED SUSTAINABILITY ISSUES

This section focuses on environmental and related sustainability issues associated with the development of nuclear energy. Principles of environmental protection and environmental development are at the heart of SEA. This goes beyond an assessment of sites suitable for nuclear facilities, such as power plants, and, in this context, the site specific technology used, and also includes the associated infrastructure which is reflected in the nuclear fuel cycle. This means that there is likely to be a wider geographical area to be considered, in particular if the whole fuel cycle is taken into account. In addition to the actual site, supporting facilities will need to be considered. Another key consideration will be requirements with regard to the electrical grid (i.e. whether the existing grid infrastructure would be sufficient and, if not, what would be required in terms of its further development). Where nuclear fuel will be coming from and where waste would be disposed of also need to be considered.

Central to these aspects is the consideration of the safety measures that are in place to minimize the risk of accidents, the physical protection and security of the materials and facilities, and the emergency preparedness

and response at all steps of the nuclear fuel life cycle. While these issues need to be covered in the development of the nuclear power programme, assessing their environmental (including health) implications is a core task of the SEA.

In this context, it will be important to be clear about which options to include and which options to exclude early on during the scoping stage of the SEA (see Section 4.3). With regard to the geographical scope of impacts, while all are of a local and regional nature, some are also national or international, the latter depending on the locations of activities and facilities. The choice of options will have to be decided on in close collaboration with stakeholders. Options need to be real, which means they should not be made up in order to support the development of a preconceived preferred option. Overall, the consideration of cumulative effects will be important.

This section starts by highlighting the relevance of safety considerations for the environmental sustainability of nuclear power programmes. It continues by introducing nuclear power impact areas — the technical and organizational areas within a nuclear power programme that may be addressed within the assessment (Section 3.2). It then describes the environmental impact themes (Section 3.3) that may be considered within each of the nuclear power impact areas. In this regard, guiding questions are presented that SEA may be able to answer (Section 3.4).

3.1. Safety considerations

Generally speaking, the routine environmental and health risks associated with the operation of nuclear power plants are small. However, this changes if containment (i.e. keeping risks under control) fails. Given the potentially severe radiological consequences of an accident, safety considerations are, therefore, central to ensuring sustainability.

The key safety objective of a nuclear power programme is to protect the public and the wider biophysical environment from the harmful effects of ionizing radiation arising from nuclear material and nuclear facilities. In support of this objective, ten fundamental safety principles were formulated by the IAEA in 2006 [18]. These cover issues including responsibility for safety, protection of present and future generations, prevention of accidents, and emergency preparedness and response. On the basis of these safety principles, 14 requirements for leadership and management for safety were developed [19], such as demonstration of leadership for safety by managers or interaction with interested parties.

The safety objective with its principles and requirements governs the safety culture, supported by IAEA safety guides and requirements as published in the IAEA Safety Standards Series. The IAEA's Statute makes these standards binding on the IAEA in its own operations and also on States in relation to IAEA assisted operations. Furthermore, they can be used by Member States as a reference for their own national regulations. There are about 130 standards published. IAEA publications that cover issues of relevance for SEAs for nuclear power programmes include (but are not limited to):

- IAEA Safety Standards Series No. SSG-9, Seismic Hazards in Site Evaluation for Nuclear Installations [20];
- IAEA Safety Standards Series No. SSG-18, Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations [21];
- IAEA Safety Standards Series No. NS-G-3.1, External Human Induced Events in Site Evaluation for Nuclear Power Plants [22];
- IAEA Safety Standards Series No. NS-G-3.2, Dispersion of Radioactive Material in Air and Water and Consideration of Population Distribution in Site Evaluation for Nuclear Power Plants [23];
- IAEA Safety Standards Series No. SSR-6 (Rev. 1), Regulations for the Safe

Transport of Radioactive Material — 2018 Edition [24];

— IAEA Safety Standards Series No. WS-G-2.3, Regulatory Control of Radioactive Discharges to the Environment [25];

— IAEA Nuclear Energy Series No. NW-T-1.24, Options for Management of Spent Fuel and Radioactive Waste for Countries Developing New Nuclear Power Programmes [26].

Safety considerations are overarching across the nuclear power impact areas that are outlined in Section 3.2. It is important to emphasize that the SEA is not meant to replace the nuclear safety assessment, which is conducted as part of the nuclear power programme, nor does it replace any national nuclear safety regulations. Rather, the SEA aims to assess related issues and aspects for each of the nuclear power impact areas with regard to their environmental and related sustainability implications.

3.2. Nuclear power impact areas

In the context of these guidelines, nuclear power impact areas refer to the technical and organizational areas within which environmental impact themes (see Section 3.3.) and related sustainability objectives need to be considered. They are approached here in terms of seven areas that relate to the infrastructure issues in the development of nuclear power (introduced in Table 1), as follows:[15]

(1) Main siting and technological considerations;

(2) Power plant construction, operation and decommissioning;

(3) Nuclear fuel cycle;

(4) Spent fuel management strategy/radioactive waste storage and disposal;

(5) Physical protection and security;

(6) Emergency preparedness and response;

(7) Wider physical infrastructure requirements.

When considering these impact areas, it is always important to consider the transport of nuclear material, especially across all steps of the nuclear fuel cycle. This can be a sensitive issue, in particular in those cases in which there are security concerns and when the public is critical of nuclear power.

For each impact area, a number of considerations are outlined. It is at the scoping stage (see Section 4.3) that decisions will need to be made about which of these nuclear power impact areas require consideration and at what level of detail. Some issues may also be marked for more detailed consideration later in a site specific EIA. Furthermore, the structure of the impact areas suggested in this section will need to be adjusted to best address the given circumstances of the nuclear power programme under consideration.

It is not envisaged that SEA outlines the strategies to address these categories in detail. For example, a strategy for physical protection and security is unlikely to be the result of SEA. However, as pointed out in Section 4, it is assumed that the SEA is conducted as a proactive tool in parallel with the process of designing a nuclear power programme, thereby engaging with this process at regular intervals.

3.2.1. Main siting and technological considerations

While the subsequent nuclear power impact areas investigate specific aspects and implications of siting and technological considerations in more detail, this first impact

[15] It should be noted that impact areas 2–6 are all closely connected to area 1.

area addresses the main guiding considerations, such as proximity to cities or to the ocean, or reactor design. It may, thus, help narrow down possible sites or types of technology requiring further investigation (e.g. as part of an EIA). The following considerations are important with regard to identifying suitable sites for nuclear facilities, as well as suitable technological options:

- Sites registering low seismic activity are essential, considering environmental and related sustainability impacts.
- A balance needs to be struck between sites that reduce transmission losses (i.e. those in proximity to the users of the electricity generated) and those that minimize risk if there were to be an accident (i.e. those distant from population centres), taking into account their environmental and related sustainability impacts.
- Sites in areas in which populations are, potentially, more amenable to the environmental and related sustainability implications of nuclear energy tend to be more suitable.
- Generally, sites more suitable for development are those which have, comparatively, low environmental sensitivity with regard to their potential for significant adverse environmental impacts.
- Sites that have an existing infrastructure in place that results in, comparatively, fewer negative environmental impacts with regard to the need for additional supporting facilities (e.g. roads, access to the electrical grid, supply of raw materials and disposal) may be favourable. However, existing infrastructure should not be the sole reason for justifying any particular option.
- Furthermore, access to cooling water and related technology choices require consideration.

A nuclear power programme will need to consider various technology choices across all nuclear power impact areas. Technology considerations include, in particular, the reactor design, for which the technical and economic benefits of various design options need to be assessed. These include evolutionary designs that represent minor modifications to operational reactors, or innovative designs such as Generation IV reactors that may become commercially available options in the future [27].

The environmental implications of these technology choices should be reviewed and assessed within the SEA. The choices considered should build on the nuclear power programme development process. In this way, they would not need to assess reactor types that were, for good reason, already excluded. However, the SEA should also not limit itself to prescribed technology choices if technically feasible alternatives would better fulfil environmental objectives. In situations where technology choices have not yet been made, the SEA can support this process by proposing criteria for evaluating and choosing technology types. Close interaction between the nuclear power programme development and SEA processes is essential in this context (see Section 4.1).

3.2.2. Power plant construction, operation and decommissioning

Besides considering physical aspects (buildings and infrastructure) and the relevant steps of the nuclear fuel cycle, construction activities may cover substantial geographical areas and may extend over several years. It is, therefore, important to consider potential effects at the programme level, as follows:[16]

- The source of building materials and possible associated environmental impacts of their production and

[16] It should be noted that similar considerations would be addressed at the project level for an EIA, although the level of detail would be different.

transport may be important, in particular if materials have to be transported over long distances.

— Emissions generated during construction (including noise, vibration and dust) may be harmful and significantly impact human health and the wider environment, which may influence the choice of site.

— Construction waste will need to be managed, including its disposal. Some sites may place substantially higher demands on waste management.

— The power plant design, construction methods and schedules may directly affect building material needs, emissions, the amount of waste produced and other environmental impacts.

— The potential for impacts on wildlife population and diversity and ensuing habitat loss through construction activities will need to be considered and avoided or, at least, mitigated.

Power plant operation is going to be a central aspect of SEA, as operation is expected to last for several decades. The following aspects (among others), thus, need to be considered:

— Safety, emergency and contingency considerations are of relevance when considering possible sites and technologies. For example, sites near settlements with only one access road may be unsuitable.

— Water consumption and discharges.

— Emissions (radiological and non-radiological) and associated activities.

— Waste management.

Power plant decommissioning is likely to require the development of specific policies, plans and programmes with their associated SEA.[17] Possible decommissioning aspects to be mentioned in a general nuclear power programme SEA (anticipating future dedicated decommissioning SEAs) include firm commitments to:

— Keep environmental impacts of decommissioning (including those on people's health) to a minimum;

— Ensure socioeconomic impacts are considered well before decommissioning starts;

— Work on a management strategy for storage or disposal of any radioactive material well before decommissioning starts;

— Develop a strategy for ensuring that funds will be available for safe decommissioning.

3.2.3. Nuclear fuel cycle

Consideration of the steps of the nuclear fuel cycle and developing an understanding of their potential environmental and related sustainability implications are at the heart of identifying what an SEA needs to focus on. An SEA needs to consider the relevance of all of the steps in the nuclear fuel cycle for a particular nuclear power programme (see Fig. 7). This potentially spans front end activities (e.g. mining, conversion, enrichment and fuel fabrication) to back end activities (e.g. spent fuel management and disposal), along with other relevant action, such as associated infrastructure requirements.

Several of the front end steps can be outsourced and contracted from the nuclear technology supplier, thereby reducing associated national infrastructure requirements. This is less common for back end services, which are usually dealt with nationally. Only those steps of the fuel cycle that will be dealt with nationally are fully relevant for an SEA. However, responsible nuclear management requires that the environmental sustainability of those steps

[17] If decommissioning of one single power plant is considered, this may also be an EIA.

that are outsourced to other countries also receive some attention (e.g. mining and milling practices). Ensuring that the entire fuel cycle is considered will be important for choosing the preferred (technological) options.

Production facilities representing various steps of the fuel cycle will normally be placed at different locations. Potential negative environmental (including health) impacts should be taken into account at all of these locations. In this context, transport between sites, representing different steps of the fuel cycle, will also need to be addressed.

All steps of the fuel cycle are described in Ref. [28]. For a more in-depth discussion, the reader is referred to Ref. [29]. Furthermore, infrastructure issue 16 of Ref. [14] (see also Table 1) explicitly focuses on the nuclear fuel cycle and, thus, it is advisable that the SEA closely interact with this component of nuclear power programme development.

3.2.4. Spent fuel management strategy/radioactive waste storage and disposal

Radioactive waste is waste that contains, or is contaminated with, radionuclides at concentrations or activities greater than clearance levels as established by the regulatory body. Radioactive waste refers to any such material which is not intended to be used in the future. As such, spent fuel may either be considered waste if it is to be disposed of, or it may potentially be considered a secondary raw material if stored in interim storage facilities for possible future reprocessing and fuel use. Spent fuel and radioactive waste management requires the preparation of a strategy addressing low, intermediate and high level wastes. Part of the SEA will need to focus on these types of waste and consider technical approaches to waste management, dependent on the radiological level. Spent fuel and radioactive waste management ranges from on-site interim storage to (possibly) permanent geological disposal. Associated transport will need to be considered for any of the assessed options.

Infrastructure issue 17 of Ref. [14] (see also Table 1) explicitly addresses radioactive waste management. Other considerations of the fuel cycle, which include spent fuel storage and potential reprocessing, also have direct implications on the spent fuel and radioactive waste management strategy (see Section 3.2.3). It is, therefore, recommended that the SEA and its evaluation of related environmental implications closely interact with the development of the nuclear power programme in these areas.

The IAEA maintains a radioactive waste and spent fuel management programme for establishing a proper safety framework, including a range of waste related safety standards. Reference [26] provides more detailed information on related options for countries developing new nuclear power programmes.

FIG. 7. The nuclear fuel cycle [28].

3.2.5. Physical protection and security

Physical protection refers to various measures aimed at protecting nuclear material and facilities. Security is a key element in managing nuclear power and associated facilities and activities during construction, operation and decommissioning. This also includes the treatment, storage and transport of nuclear material. Specific national guidelines for physical protection and security need to be developed and embedded within the corresponding legislative and regulatory framework.

The SEA may critically highlight the need for considering the environmental implications of the manifold security issues that vary according to the type of material[18] and which may relate to:

[18] As outlined, for example, for the transport of nuclear material in annex 1 of the Convention on the Physical Protection of Nuclear Material [30].

- Prevention of theft, including measures to locate and, where appropriate, recover nuclear material;
- Prevention of sabotage, terrorism and non-authorized access, and mitigating or minimizing the consequences of any such act of sabotage or terrorism;
- Prevention of illegal transfers or other malicious acts involving nuclear material or facilities.

Security also includes the response to any incidents that have occurred. While in-depth assessments of physical protection and security will be out of the scope of an SEA, different siting criteria may have different implications for the level of protection required and for the related supportive measures.

Infrastructure issue 15 (nuclear security) of Ref. [14] (see also Table 1) specifically requires the preparation of recommendations for nuclear security as part of the process of making a knowledgeable commitment to a nuclear power programme. The related environmental (including health) implications need to be considered in the SEA. A detailed discussion of the necessary measures to ensure this protection at nuclear facilities is provided in Ref. [31].

3.2.6. Emergency preparedness and response

Emergency preparedness targets the available capabilities to ensure an effective response to a nuclear emergency. These capabilities relate to, inter alia, involved institutions and their human capacities, and to related plans, tools, equipment and facilities. Emergency response aims at regaining control, mitigating any consequences and informing the public in the case of an emergency. This is outlined in more depth in Ref. [32].

The greatest risks of an emergency arising from nuclear reactors come from potential accidents, which can be due to:

- Technical and human error;
- Natural or environmental disasters affecting the nuclear power plant and its support structures.

Both need to be key considerations when choosing sites and technologies for nuclear facilities. Furthermore, environmental degradation may increase the impact of unusual natural events and should be taken into account. For example, deforestation may lead to instability of soils and slopes, and may worsen the impacts of flood events by facilitating mudslides. Figure 8 shows potential linkages between development, the environment and the manner in which a disaster event may unfold.

Similar to the previous impact area (physical protection and security), infrastructure issue 14 (emergency planning) of Ref. [14] (see also Table 1) requires an evaluation of a country's emergency preparedness and response, leading to the establishment of regulations governing all requirements to have emergency response plans. The SEA may feed into and support this process by considering the related environmental implications. An estimation of risks may be attempted when considering:

- Minor problems or breakdowns at one or various steps of the nuclear fuel cycle;
- Any potential major accidents.

In this context, emergency preparedness is usually adjusted based on the probability and severity of the associated impacts of an emergency.

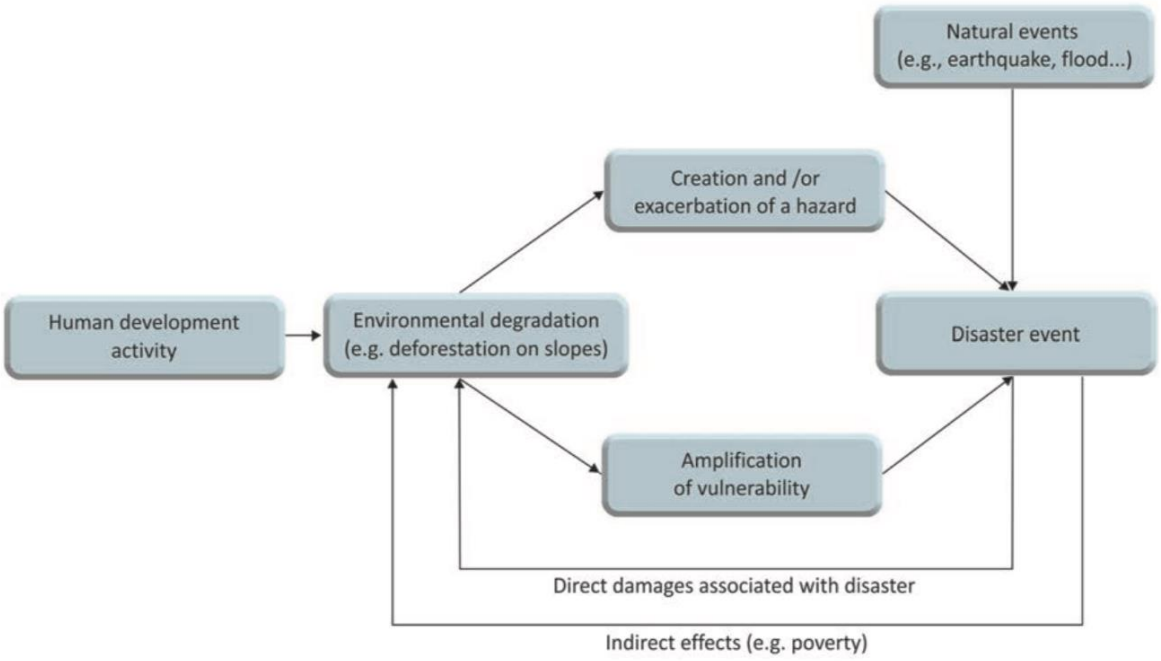


FIG. 8. Linkages between development, the environment and disaster (adapted from Ref. [33]).

3.2.7. Wider physical infrastructure requirements

Developing nuclear energy requires careful consideration of the suitability of the wider infrastructure. In this context, it is important that the SEA evaluate the significance of enhanced infrastructure requirements in the nuclear power programme. One possible approach includes:

(a) Supporting the assessment of the best sites for the development of nuclear energy from a grid point of view and assessing possible impacts when there is a need to adapt the existing electrical grid to accommodate nuclear power;
(b) Identifying, on the basis of this assessment, the preferred sites from a grid point of view;
(c) Comparing these preferred sites with those sites identified in Section 3.2.1.

In addition to the grid, other infrastructure may be directly affected and, therefore, needs to be assessed, following an approach similar to that outlined for the electrical grid. This may include, for example, accessibility through roads, railways or waterways, or housing for the local population and workers at a nuclear power plant, including provision of water and gas supply and sewage.

3.3. Environmental impact themes

For the purpose of these guidelines, eight environmental impact themes were chosen for consideration in an SEA for nuclear power programmes. These themes are based on current global practice in general (non-nuclear) SEA. This especially includes the environmental issues introduced in annex I of the EU SEA Directive [4], as this directive has been one of the main reference points for many SEA systems globally. Many of these themes are connected and also overlap, to some extent, but provide a different angle, from more infrastructure related environmental effects (regarding recipients and entities responsible for emissions) to wider impacts of the programme on society and external impacts on the programme. The eight themes are:

(1) Air, water, soil;

(2) Emissions (radiological and non-radiological), noise and vibration;

(3) Land, landscape, cultural heritage;

(4) Ecosystems;

(5) Climate change;

(6) Public health, well-being and safety;

(7) Economy (in connection with environmental implications) and society;

(8) Natural hazards.

It is important for any specific nuclear power programme that a customized approach be used and that any of these themes be adapted to the specific context and application.

These environmental impact themes are linked to impacts in various ways through activities associated with nuclear power programmes. In this instance, impact does not only mean 'impact on', but can also mean 'impact from' the environmental themes. The latter may include, for example, seismic activities. Another example is climate change, which can be an important consideration when designing reactors. For example, very hot weather periods (and associated warming of cooling water) can reduce the efficiency of the cooling process and, thereby, electricity generation. Impacts from the environmental themes on the nuclear power programme are usually analysed in detailed safety assessments, which evaluate potential radiological releases. An SEA may integrate the results of such assessments.

An important question arising when compiling the baseline of these environmental impact themes concerns the nature of information that may be readily available in a particular context and what information may have to be produced specifically for the purpose of the nuclear power programme. Furthermore, when dealing with actual impacts, it is important to consider both negative as well as positive impacts.

Key points for assessment in an SEA are potential environmental risks (both in terms of 'impacts on' and 'impacts from'), as well as public acceptance issues and safety. In this regard, a stakeholder analysis establishing the specific interests of stakeholders is also of relevance in SEAs (see also Section 5). In the following sections, the eight environmental impact themes are discussed in more detail.

3.3.1. Air, water, soil

With regard to potential impacts from nuclear energy activities on air, water and soil, potential exposure of human beings or wildlife may be considered in particular. Water, especially, has a number of aspects that may be of relevance for an SEA, including temperature, usage and wastewater. Also, there may be competition for water resources for, for example, hydropower, navigation, irrigation or household water supply. The impacts of related policies, plans and programmes will need to be assessed on a cumulative basis (i.e. by looking at the combined proposed measures).

3.3.2. Emissions (radiological and non-radiological), noise and vibration

Radiological emissions consist of electromagnetic radiation as well as particle radiation. In line with safety principles (see Section 3.1), nuclear power plants and associated activities are designed and operated to keep radioactive releases as low as reasonably achievable. To limit the risk of exposure to radiation, measures need to be taken to ensure that the risk of an accident with serious radiological consequences remains extremely low and that any radiological consequences are mitigated to the fullest extent practicable [34].

The need to consider conventional (non-radiological) emissions that may potentially affect air, water and soil has already been discussed. Noise and vibration may potentially affect human beings, as well as wildlife. As regards nuclear energy, emissions, noise and vibrations are most likely to be associated with mining activities and the construction of facilities (e.g. nuclear power plants). Furthermore, associated transport will lead to noise and other emissions.

3.3.3. Land, landscape, cultural heritage

There is a range of potential impacts on land use associated with nuclear power programmes. The site of a nuclear reactor alone can cover an area of about 20 ha. Nuclear facilities can, therefore, require significant amounts of land and, as a consequence, can have more or less significant ecological and landscape impacts, depending on where they are located and how they are designed. However, the greatest potential impact is usually associated with mining and with the associated dumping of mill tailings. Other land use and landscape impacts are caused by the associated infrastructure (e.g. the electrical grid supply and its pylons). However, the latter are not specific to nuclear energy, but are associated with all forms of electricity generation. Furthermore, cultural heritage may be considered in any SEA undertaken for a nuclear power programme. In this context, it may be investigated whether important sites of archaeological interest, for example, can be avoided. The rights of minorities in this context are also to be considered.

3.3.4. Ecosystems

Ecosystems encompass the flora and fauna, and their interactions with each other and with the environment. In this context, the SEA needs to take account of the potential radiological and non-radiological impacts on the composition and functioning of ecosystems, including their biodiversity as well as the services they provide to humans. This also requires consideration of the potential for loss of habitat.

Other impacts on ecosystems are associated with mining and the infrastructure needed for nuclear energy, including buildings and transmission lines. The SEA may explain where impacts from these activities are assessed and consider them when analysing options. The reader is referred to Ref. [35] for approaches to identifying, measuring and communicating the value of ecosystem services in an SEA.

3.3.5. Climate change

With reference to climate change mitigation, nuclear energy is considered to be an important potential low carbon energy option that can help to reduce greenhouse gas emissions. In this context, it is important that the SEA not only focus on potential negative implications, but also take positive impacts into account. However, while running a nuclear power plant produces near zero greenhouse gas emissions, the mining and transport of materials, as well as the construction of infrastructure are examples of activities that release carbon emissions. Generally, it is advisable to apply a life cycle perspective.

The consideration of climate change adaptation (i.e. impacts from climate change) requires evaluation of the options to create a resilient infrastructure. In this context, potential impacts, such as heat waves or flooding at nuclear facilities, are to be taken into account, as well as indirect impacts of climate change on nuclear power plant operations (e.g. water availability). The reader is referred to Ref. [36] for a detailed discussion of climate change and nuclear power, and to Ref. [37] for approaches to address climate change adaptation in SEA.

3.3.6. Public health, well-being and safety

Public health, well-being and safety are key aspects for consideration in SEA for nuclear power programmes. With regard to physical determinants of health, radiological aspects are of particular importance. With its Simplified Approach for Estimating Impacts of Electricity Generation (SIMPACTS)[19], the IAEA provides a tool to assess the geographical distribution of public health implications during standard operations of a nuclear power plant. With regard to non-standard operations and for avoiding incidents and accidents, safety considerations in the development of

[19] https://www.iaea.org/topics/energy-planning/energy-modelling-tools

nuclear energy require careful attention. Other aspects that may have an impact on physical health determinants include noise and emissions associated with mining, construction of facilities and transport.

When considering health in SEA, it is not only the physical determinants that require attention but also various social aspects. In this context, the 'health determinants' approach promoted by the World Health Organization can be applied (see annex A1.1 of Ref. [38]). As regards the development of nuclear energy, other health aspects that may need to be taken into account include mental health, as perceptions of threats posed by nuclear energy may have a very real impact on the health of local or regional populations. Existing epidemiological studies may provide a baseline in this case.

3.3.7. Economy (in connection with environmental implications) and society

In SEA, the economic effects of options and mitigation measures on society (rather than just on individuals or companies) may be considered to avoid recommending options with a very limited environmental benefit, but which have significantly higher costs. This may also enable a comparison of the indicative costs of an option and its wider economic impacts at local or regional levels. Further, economic and social effects of a nuclear power programme could also give rise to indirect environmental impacts.

Overall, however, the SEA needs to be guided by environmental considerations, and complementary economic assessments may be performed outside of the SEA process. In line with this, assessments of larger macroeconomic impacts, such as job creation, are usually associated with the policy level and are, thus, outside the scope of these guidelines (see Section 1.3).

The attitudes of society towards the environmental implications of nuclear power can play an important role when developing a nuclear power programme. Public concerns regarding nuclear energy need to be addressed early on in the process. Otherwise, the benefits for the economy and society may be outweighed by the associated challenges of addressing public concerns at a later stage.

While public concerns are a key issue to be considered in SEA for nuclear power programmes, its focus is not on whether nuclear energy is to be developed, but rather on the 'how' and 'where'. However, if that debate did not take place when looking at nuclear power at the policy level, there would be a need to consider this later, including at the nuclear power programme level.

The source of the nuclear material will also be a consideration when devising nuclear power programmes. In this context, the rights of minorities, such as indigenous peoples, should be taken into account, as well as the impact different activities may have on them and their environment (e.g. mining).

3.3.8. Natural hazards

The consideration of natural hazards is of key importance in SEA for nuclear power programmes, in particular with regard to the impacts from these hazards. Aspects to be considered may include the potential for seismic activity/earthquakes, hurricanes, tsunamis, landslides and/or mudslides and floods, including, for example, flooding of river basins or surface flooding.

3.3.9. Guiding questions

Table 3 identifies questions arising in SEAs for nuclear power programmes that may be relevant to the environmental impact themes introduced above. These may guide, in particular, the scoping exercise in the SEA.

4. METHODOLOGY, PART 1: SEA PROCESS

This section explains the components of the SEA process, after outlining process management requirements. Furthermore, aspects of quality assurance are introduced in the final part of this section.

4.1. Process management

The SEA needs to be conducted in parallel with the process of designing a nuclear power programme and needs to engage with it at regular intervals, in line with the approach presented in Fig. 9. Full integration of both processes may be possible, depending on the importance given to SEA. If SEA has a weak status, then it is advisable to avoid full integration, as other issues are then likely to subsume the SEA and a lack of transparency is likely to result. The process of preparing a nuclear power programme will normally take at least six months, but more likely several years, and will differ depending on the country and system in which it is applied.

While external experts may be engaged in the development of an SEA, it is essential that the process be led by a responsible and competent authority. The type of authority in charge will vary between different countries and could, for example, be an energy or environmental authority. However, in any case, it is recommended that an environmental authority play an important role in the SEA process, in particular in the SEA review and evaluation (see Section 4.8). Coordinating the parties involved will require effective process management. While it is advisable to assign a dedicated person (supported by others) to be responsible for the management of the process overall, an SEA process committee may fulfil an auditing function. Furthermore, it will be important to ensure that the processes and their interrelations are clearly understood by those involved. A process management checklist developed during scoping (see Section 4.3) will be a useful first step in this direction.

In this context, the team in charge of conducting the SEA will need to liaise closely with the team preparing the nuclear power programme. Both teams would ideally start preparation processes at the same time and run both processes in parallel. This means that any documentation prepared at the different decision stages could be released in combination and the parts may clearly refer to each other. For example, the screening decision may be published together with the decision to prepare a nuclear power programme. Furthermore, an SEA scoping report should be published alongside any nuclear power programme discussion papers. It is common practice for authorities to seek the views of the public and other stakeholders prior to the preparation of a draft programme. The SEA can contribute to this stage through the scoping report, which can also serve as a formal record of this stage of the nuclear power programme. The same applies to any documentation prepared at subsequent stages of the SEA process.

It is important that a timeline be agreed on by both SEA and nuclear power programme preparation teams, and that this is released upfront. In this way, awareness of the essential role of both processes can be developed, in particular among stakeholders and, also, among the decision makers themselves. This is important as the attitudes of those involved have a great influence on the effectiveness of SEA overall. Briefing notes may be prepared to facilitate communication between those involved in the process (see Ref. [39]).

TABLE 3. SELECTED QUESTIONS FOR SEA FOR NUCLEAR POWER PROGRAMMES

Environmental impact theme	Questions arising in the SEA
Air, water, soil	— Is any potential air, water/groundwater and soil contamination taken into account through, for example, construction or other associated activities? — Will any activities associated with the development of nuclear energy potentially impact: • Air quality? • Groundwater and surface water levels? • High quality soil (e.g. through removal or compaction)? — Is any relevant exposure of human communities, flora and fauna to potentially contaminated air, water and soil taken into account? — Are any possible positive effects on air, water and soil described (e.g. through substitution of other potentially more harmful energy options)? — Are any potential impacts from dust considered? — Will the nuclear power programme affect water availability or temperature? Will this affect the local climate or microclimate? — Are unusual weather events a key consideration?
Emissions (radiological and non-radiological), noise and vibration	— Are potentially radioactive emissions/discharges during routine operation considered? — Are non-radiological emissions during routine operations considered? — Are emergency and recovery plans in the case of non-routine discharge adequate? — Are emissions, noise and vibration considered for all relevant steps of the nuclear fuel cycle and associated action? — Are emissions, noise and vibrations considered from construction, operation and decommissioning of nuclear facilities? — Are emissions, noise and vibrations from other necessary constructions considered, including for roads, railways, water corridors or the electricity grid?
Land, landscape, cultural heritage	— Are land use, landscape and cultural heritage taken into account at every step of the nuclear cycle (including historic landscapes and buildings)? — Are any potentially significant negative impacts of mines, buildings and other infrastructure facilities on land use, landscape, seascape or cultural heritage (including tourism) considered? — Will access to open or other important spaces and areas be restricted or will their quality or quantity be affected? — Are any positive impacts considered, for example, by avoiding other more harmful energy options or by encouraging the conservation of historic buildings?
Ecosystems	— Will the nuclear power programme have any effects on: • Flora and fauna, including on any protected species, both terrestrial and marine? • Any designated sites or non-designated sites that are important for the protection and development of flora and fauna, both terrestrial and marine? • Services provided by ecosystems, such as providing food or water, regulating climate or natural hazards or providing habitats or cultural value? — Will any areas of biodiversity be affected?

TABLE 3. SELECTED QUESTIONS FOR SEA FOR NUCLEAR POWER PROGRAMMES (cont.)

Environmental impact theme	Questions arising in the SEA
Climate change	— Will the nuclear power programme lead to any changes in carbon dioxide emissions or other greenhouse gas emissions (both direct and indirect) with regard to alternative electricity supply options and is this considered in the SEA? — Does the SEA take adaptation to expected climate change and its risks into account and assess nuclear power programme options in the light of these, including, for example, changes regarding (the occurrence and magnitude of): • Heat waves? • Flooding? • Coastal or other erosion? • Water availability and temperature?
Public health, well-being and safety	— Are health and safety issues considered for all steps of the nuclear fuel cycle in the SEA? In this context, are there any existing baseline epidemiological studies that can be used? — Are all determinants of health considered, including those that are of a physical (environmental) nature, as well as those that are economic and social (e.g. behavioural and mental)? — Are health and safety aspects considered for the construction, operation and decommissioning stages of nuclear facilities?
Economy (in connection with environmental implications) and society	— Does the SEA take attitudes of local, regional and national and international communities to nuclear energy into account? — Does the SEA consider potential economic benefits and costs to society? — Does the SEA allow stakeholders and the general public to contribute to the process and does it provide feedback on how their concerns and questions have been addressed? — Are the rights of minorities (e.g. indigenous peoples) considered? — Are any positive or negative impacts on communities or minorities and indigenous peoples considered in the SEA?
Natural hazards	— Have potential seismic activities been considered? — Has the potential for flooding (river, sea, surface water) been considered? — Has the potential for landslides been considered? — Has the likelihood of extreme storms been considered (e.g. hurricanes, typhoons, cyclones)?
Cutting across all themes	— Are any potentially significant effects avoided, reduced, minimized or mitigated? — Have alternatives from all identified significant impacts been taken into account? — Are there any interactions of different environmental impact themes?

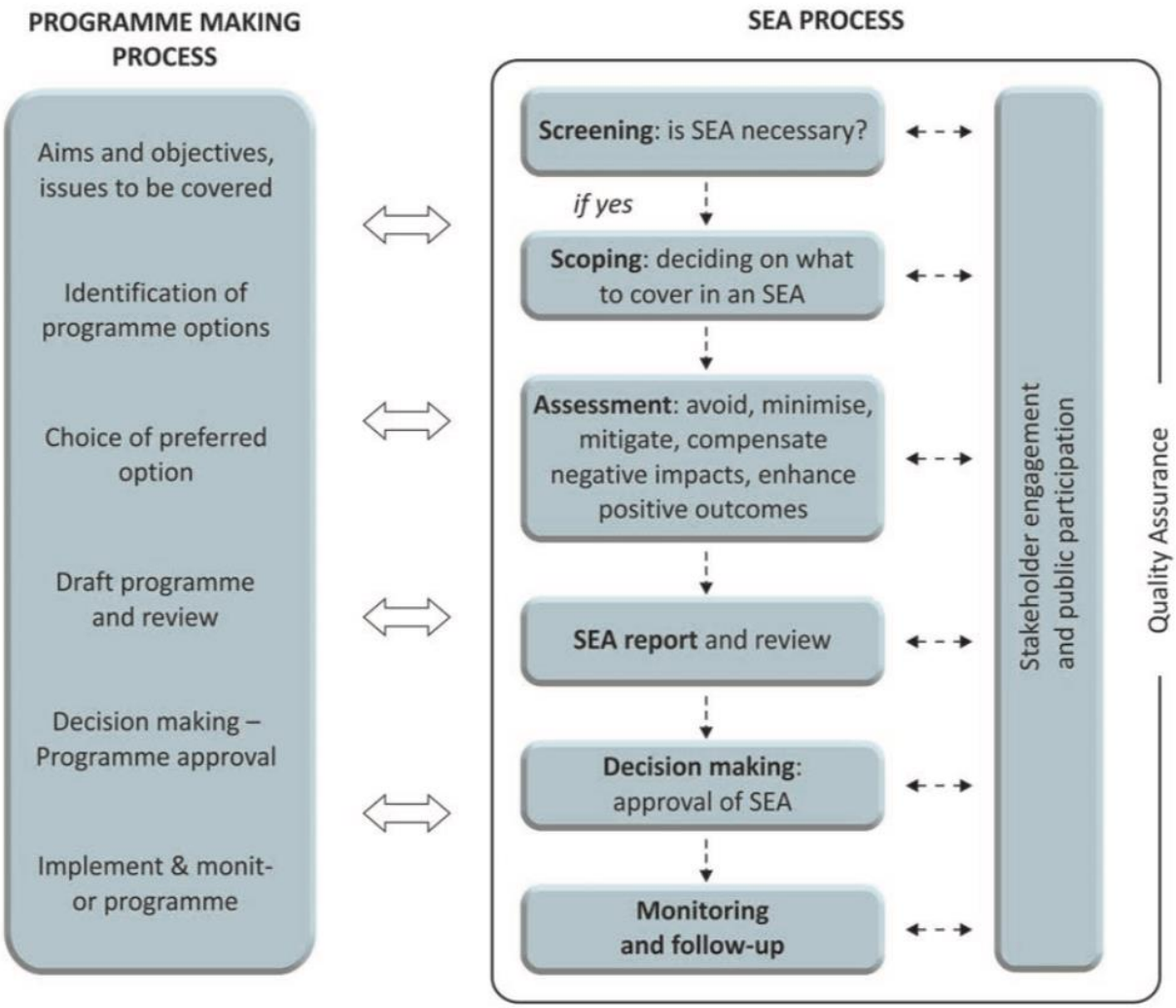


FIG. 9. SEA process and integration with nuclear power programme preparation.

4.2. Screening

Screening is the initial action taken when considering whether or not to conduct an SEA for a nuclear power programme. It results in a decision that is based on likely significant impacts. Two main types of screening are differentiated and these may be used in combination:

(1) Screening based on inclusion or exclusion checklists/criteria;

(2) Case by case screening.

Inclusion or exclusion checklists/criteria may be based either on the specific types of programme requiring an SEA (such as a nuclear power programme for building a power plant, extending its lifetime or developing a strategy for radioactive waste management) or on environmental conditions when an SEA is necessary (i.e. in the case of an area with a specific protection status being affected). Checklists may be provided by legislative requirements. Inclusion checklists would identify policies, plans and programmes that require SEA, whereas exclusion checklists would identify those that do not.

If an SEA for a nuclear power programme (or a subcomponent thereof) is a legal requirement, no further screening is necessary. For an example of such an inclusion checklist, the reader is referred to article 4.2 and annexes I and II of the UNECE Protocol on SEA for a list of

projects that may require SEA, and annex III for screening criteria [5].

If case by case screening is required, owing to the programme focusing only on some minor changes to existing nuclear infrastructure, this would require further information about the proposed nuclear power programme along with the potentially affected environment. In case by case screening, it is recommended to produce a short screening report, justifying whether or not to go ahead with the SEA. The responsibility for case by case screening would ideally be with an authority different to the one in charge of the nuclear power programme to avoid accusations of partiality in what is considered, in many countries, a sensitive issue. Screening needs to be conducted as early as possible and will profit from consultations with interested stakeholders.

Screening can have different outcomes, depending on the country in which it is conducted. In addition to 'no SEA' or 'full SEA', a decision may be made that further study is necessary to determine the level of SEA required or whether a more limited SEA is to be prepared, focusing on a number of selected issues only. Screening should result in a statement on the anticipated significant effects.

4.3. Scoping

Scoping is the stage at which issues, impacts and options are determined which potentially will need to be considered at subsequent stages. It is a systematic exercise that establishes the boundaries and terms of reference for the SEA. There are legal requirements in most countries on what aspects must be considered and formally scoped in or out, including issues, options and impacts that require further study. With regard to nuclear power programmes, key options are likely to revolve around technical and site options. Importantly, there needs to be some flexibility in the SEA process to allow for issues to be scoped in or out, even after the scoping stage, if this turns out to be beneficial.

Scoping includes elements of both identification and prioritization (evaluation) of aspects to be included in the SEA. The latter facilitates a targeted use of resources for collecting the information necessary for decision making. As scoping places limits on the information to be gathered and analysed in SEA, it helps to focus the approach to be taken. The purpose of scoping can, therefore, be summarized as follows:

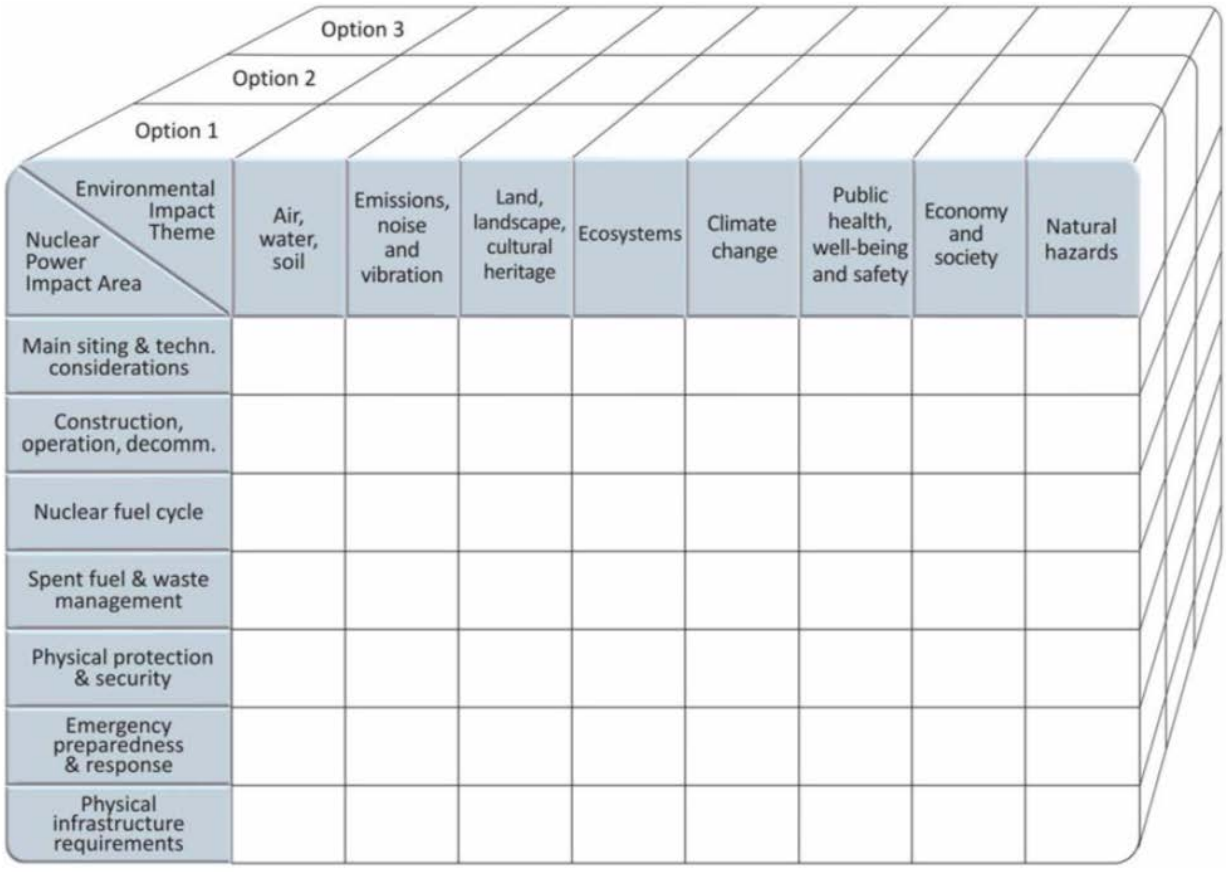
- To identify the important issues to be considered (including environmental baseline and assessment options);
- To determine appropriate time and space boundaries;
- To establish the information necessary for decision making;
- To anticipate the significant effects and factors to be studied in detail.

Section 3 defines nuclear power impact areas and introduces environmental impact themes that may be affected by these impact areas. At the scoping stage, all of these themes and areas should be covered in order to decide on their exclusion or inclusion and prioritization. While the nuclear power impact areas were singled out as key areas to be considered in nuclear power programmes, all infrastructure issues in Ref. [14] should be checked for relevance, as they may directly or indirectly affect the SEA process (see also Table 1). For example, procurement rules may indirectly have an environmental impact, as they could affect the environmental footprint of procured goods as well as safety standards. The same is true for funding and financing, as lending institutions may impose certain requirements regarding the SEA process.

Figure 10 introduces a scoping matrix, revolving around the eight environmental impact themes and seven nuclear power impact areas to be addressed in SEA (following on from Section 3). Such a matrix may be used during scoping to assign weights of importance to its elements (such as ++, +, o, –) and to support the prioritization process.

Scoping should take account of the nature of the programme together with specific national circumstances and requirements. Issues may be excluded because they have been or will be dealt with at other decision tiers, ranging from earlier policies, plans and programmes and their associated SEAs, to later projects and their associated EIAs. The scoping stage is, therefore, framed within the sequence of decision tiers between the conceptual and implementation stages (see Section 2.3).

A good balance needs to be achieved between issues that are to be considered and those that are not. Scoping in too many issues is problematic as this will make the SEA overly complicated and may, ultimately, confuse the issues involved. However, scoping out issues that may be relevant means that the SEA will fail to adequately address potentially significant impacts. In this context, the determination of what is likely to be 'significant' in be defined and what it comprises, possibly expressed through suitable environmental and sustainability indicators.



Note: Options are likely to mean different locations and type/technology of a nuclear power plant.

FIG. 10. Scoping matrix.

Achieving the right focus is of key importance and associated decisions need to be taken at the outset of an SEA considering all stakeholders involved (including environmental and health authorities as well as the general public). The public and other stakeholders usually decide on what they consider to be significant not only based on pure evidence, but also their perception of impacts. In the context of SEA, dealing with public perceptions is, therefore, as important as generating scientific evidence. Stakeholder and public involvement in scoping will add credibility and help justify why elements that some may consider important were excluded. It will facilitate a constructive and inclusive

debate on what the key public and institutional concerns are.

It is very much in the interest of the body performing an SEA to engage key stakeholders (and potentially the general public) at an early stage to avoid later delays, criticism or misunderstanding in the engagement process as a result of different views regarding the focus of SEA, for example.

Important aspects to be considered in the scoping consultations are presented below (adapted from Ref. [40]):

- Identifying a list of main stakeholders and updating it during the process of developing the nuclear power programme and the associated SEA.
- Inviting stakeholders and the general public to contribute to scoping.
- Sending out information on the programme and the associated SEA; in this context, providing contact details for information and comment.
- Making information on the nuclear power programme and the associated SEA widely available, using a wide range of media.
- Collating and analysing responses, and taking them into account in planning the SEA.
- Writing back to each respondent thanking them for their input and explaining how their comments have been addressed.
- If appropriate, arranging meetings to discuss the issues raised.
- If there is considerable local interest in areas where potentially suitable sites have been identified, consideration should be given to holding a public exhibition or a community meeting during which the project is presented and expert staff are on hand to answer questions.
- If there are several groups with a common interest, consideration should be given to setting up a special forum to meet at regular intervals.
- Considering issuing regular newsletters to keep stakeholders up to date with events.
- Always recording the views expressed in consultations.

In addition to the identification and prioritization of aspects to be included in the SEA, a process management checklist should be prepared at the scoping stage to ensure the quality of the SEA process (see Table 7). This checklist should outline issues and tasks to be addressed during the subsequent stages of SEA, along with an allocation of tasks and responsibilities, and an indication of the likely time requirements and timeline.

Scoping is complete when all required work and studies to be included in the SEA have been specified (e.g. when a scoping report and the terms of reference for the SEA have been prepared; see Ref. [41]). A scoping report of good quality reduces both the risk of including inappropriate issues and aspects, and the risk of excluding those issues that should be addressed. It should be customized to meet the following objectives:

- To inform the public about a planned nuclear power programme;
- To identify the main concerns and societal values;
- To define reasonable and practical site and technology options to be addressed;
- To explain how the steps of the nuclear fuel cycle are relevant and will be considered;
- To focus on the important issues and significant impacts to be addressed;

- To define boundaries of the SEA in terms of time, space and subjects covered;
- To set requirements for the collection of baseline and other information;
- To point towards applicable indicators, target values and methods for assessing significant impacts (see Section 6);
- To establish the terms of reference for the SEA and to document them;
- To prepare an information package or circular explaining the proposal and the process, and to specify the role and contribution of stakeholders and the general public;
- To respond to new information and further issues raised by stakeholders and the general public during the scoping exercise.

Such a scoping report can then serve as the starting point for the subsequent assessment stage.

4.4. Assessment

The assessment stage should start with a description and an explanation of the proposed nuclear power programme, focusing on the information that is important for an SEA. This may be done through a draft SEA report (see Section 7). This description needs to clearly state the underlying objectives and the options considered within SEA, which may be different from those considered in the nuclear power programme.

4.4.1. Baseline environment

An assessment needs to start with a qualitative and quantitative description and analysis of the baseline environment, as well as of any other issues identified as being important during scoping, building on available data and assessments. In addition to biophysical aspects, this needs to include people and their socioeconomic environment, as well as their public health, well-being and safety. The specific aspects to be considered in this context depend on legal and other formal requirements, as well as on informal practices. Current and expected future environmental characteristics require evaluation, establishing their overall value as well as their sensitivity to potential impacts.

For an SEA, existing data from environmental databases, land registers and other environmental management and planning instruments will usually be the starting point. Other important sources are existing policies, plans and programmes, including spatial plans and other sectoral and development plans. When reviewing associated documents, it is important to check whether they are current.

The description of the baseline environment should emphasize existing environmental problems and constraints, and needs to pinpoint ecologically important and sensitive areas. It requires a prioritization of what is necessary to be able to judge the environmental implications of a nuclear power programme. Furthermore, any data issues that may affect the assessments need to be recorded, from unreliable data to assumptions used to fill data gaps (see Section 6.2).

4.4.2. Options and impacts

After having developed a basic understanding of the baseline environment, preliminary options to be considered in the assessment need to be described and explained. These options should be closely aligned with, but not limited to, what is considered in the parallel development of the nuclear power programme (see Fig. 9).

The SEA should aim to identify environmentally friendly options and clearly explain how these were chosen. Furthermore, one of the options to be included should be the zero option, representing the evolution of the environment without the implementation of the nuclear power programme. In this context, if considering alternative power system developments, the assumption (as presented in Section 1.3) is that the country has

determined that nuclear power could play a role in meeting future energy demand, which was supported by a thorough energy systems analysis. The main options of the programme would, thus, revolve around the siting of nuclear facilities and technology choices. As such, the zero option would draw on, reference and summarize related preceding studies, and would only add a concise assessment of the environmental implications, as necessary.

Importantly, options should not be made up in order to support the development and selection of a preconceived winning option. In this context, stakeholder engagement and public participation should be used to decide upon viable options. Terms of reference for performing the SEA should ensure that there is sufficient room, both financially and temporally, to genuinely investigate these options.

The assessment of options includes the evaluation of their impact significance. This requires taking into account the value and the expected sensitivity of the potentially affected environment and the expected magnitude of the likely change due to the nuclear power programme. In order to evaluate impact significance, an appropriate methodology needs to be chosen. In this context, applying a predefined methodology makes the SEA more transparent, reproducible and comparable (see Section 6). Figure 11 provides an overview of how the potential significance of environmental impacts is a combination of the sensitivity of the environmental receptor and the magnitude of change. It may be applied to the elements presented within the scoping matrix shown in Fig. 10.

	Environmental Receptor Sensitivity			
Impact Magnitude	Negligible	Low	Moderate	High
Negligible	Not significant	Not significant	Low	Low
Low	Not significant	Low	Low to Moderate	Moderate
Moderate	Low	Low to Moderate	Moderate	High
High	Low	Moderate	High	High

FIG. 11. Evaluating potential impact significance.

The evaluation of impact significance is usually associated with environmental development and protection objectives. These can be based on regulations, guidelines or expert/public opinion. To be able to reach decisions on options and mitigation, knowledge of the significance of impacts is essential.

Results need to be presented for both positive and negative environmental impacts. In this context, different types of anticipated impact need to be taken into account, such as direct and indirect, cumulative, short term to long term, synergistic, local, regional and global (including transboundary), as well as residual impacts:

- Direct impacts: Impacts of a nuclear power programme that occur in the same space and time as the programme itself. They are also referred to as primary impacts.
- Indirect impacts: Impacts of a chain of activities that are associated with, or induced by, the nuclear power

programme that may occur later in time or are affecting a broader area than that directly covered by the programme.

— Cumulative impacts: Resulting from the incremental effects of a nuclear power programme when added to other past, present or planned (future) actions. While these actions may have minor impacts when considered individually, they may be of significance once assessed in combination.

— Short term to long term impacts: Short term impacts are those that have a clear end and may be of significance for a few days, weeks or months only (e.g. construction of a nuclear power plant). Long term impacts are those associated with the long term operation of a nuclear power programme (e.g. the infrastructure and associated transport activities, or waste management).

— Synergistic impacts: Impacts that result from the interaction of different impacts of a nuclear power programme, or from the interactions of impacts of several policies, plans, programmes or projects within the same area, and that may turn out to be greater than their sum.

— Local, regional and global impacts: Impacts associated with a nuclear power programme that are of a local nature, such as noise and landscape impacts, and impacts that are of a regional nature, such as those that are transport related, and impacts that are potentially of a global scale, including the effects of a nuclear power programme on carbon emissions.

— Residual impacts: Those impacts that remain, together with all associated mitigation and other environmental management measures (e.g. permanent waste storage sites).

Impacts can be determined qualitatively and, whenever possible, quantitatively. Certain impacts may be calculated and modelled while others may be estimated. Appropriate methods will need to be identified at the scoping stage and might have to be reassessed later on in the SEA process. Environmental impacts may affect various media owing to the complexity of causal chains. Monocausal relationships will be the exception rather than the rule and the chosen methodologies will need to reflect this. It is important that environmental impacts depend on the characteristics of the receiving environment as well as on the type of action giving rise to impacts. Examples of potential options and mitigation measures are provided in Table 4.

4.4.3. Mitigation measures

After describing the options available, identifying mitigation measures is another key stage in SEA to ensure the nuclear power programme is best aligned with the environment and related sustainability objectives. Mitigation in SEA seeks to prevent any significant negative impacts from occurring and to enhance positive outcomes. Its aims are, therefore:

— To support the development of measures for avoiding, or at the very least reducing, significant adverse impacts on the environment and society;

— To enhance beneficial effects, lowering costs for environmental protection and conserving natural resources;

— To create better opportunities for economic development through generating positive outcomes for environmental conservation, sustainable livelihoods and personal well-being.

Mitigation is, therefore, intended to improve protection of environmental assets, to encourage more prudent use of natural resources and ecosystems, and to avoid costly

environmental damage. Mitigation can be depicted as a desirability hierarchy of aspects to be considered, with enhancement of positive outcomes, as well as avoidance of negative impacts, being accorded the highest priority. These objectives are followed by minimization and rectification of, and compensation for, negative impacts, as summarized in Fig. 12.

Enhancing positive outcomes and avoiding or minimizing impacts at the source are most desirable. This is the starting point for an SEA, which attempts to find the best possible siting and technology options. Rectification and compensation are viable mitigation measures at the EIA and project level. Table 4 provides examples of potential mitigation measures and Table 5 demonstrates how mitigation could be reported in an SEA report.

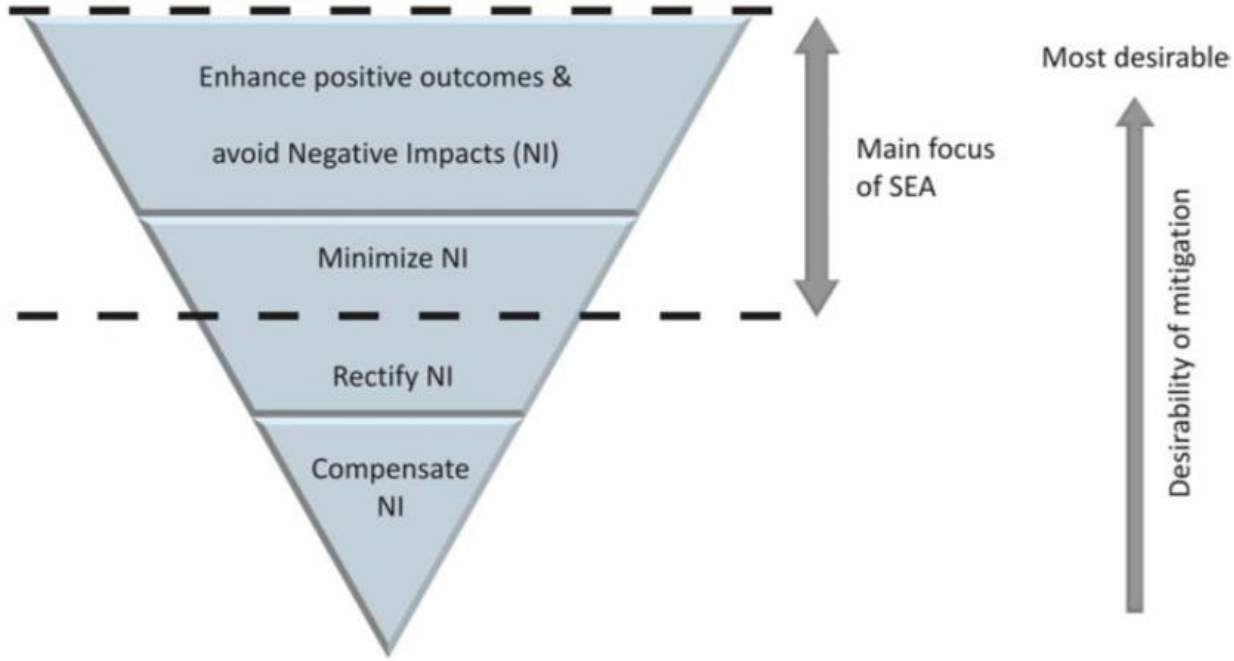


FIG. 12. Desirability of different types of mitigation measure in SEA.

TABLE 4. EXAMPLES OF POTENTIAL OPTIONS AND MITIGATION MEASURES

Nuclear power impact areas	Options	Mitigation measures
Main siting and technological considerations	— Different siting criteria; — Different reactor types.	— Considering a different site or different types of site; — Changing construction and design at the same site; — Considering a different reactor type.
Power plant construction, operation and decommissioning	— Different construction materials; — Different designs (e.g. wet or dry cooling tower, hybrid cooling tower without plume); — Different transport options (modes and routes); — Different decommissioning options (e.g. future use of site for similar or other purposes).	— Considering less environmentally harmful construction materials; — Considering more environmentally sustainable transport options and routes; — Considering more environmentally sustainable decommissioning options.
Nuclear fuel cycle	— Import fuel; — Extract uranium from domestic mines; — Fuel leasing; — Reprocess uranium.	— Considering more environmentally sustainable fuel options and sources; — Choosing most knowledgeable companies.
Spent fuel management strategy or radioactive waste storage and disposal	— Store both low and high level wastes together in a deep geological repository; — Store low level waste in a landfill site; — Fuel leasing; — Agreement with foreign country to combine storage efforts.	— Considering decay storage to reduce radioactivity in low level waste; — Considering measures to reduce the amount of waste to be stored.
Physical protection and security	— Consider site options based on their implications for physical protection and security; — Consider different options of physical protection and security measures.	— Enabling design which can be better physically protected and secured.
Emergency preparedness and response	— Consider sites and operations (including transport) at which emergency preparedness and response is, comparatively, more secure.	— Reducing risk of accidents by learning from past experiences and adjusting the design accordingly; — Preparing emergency and response plans; — Undertaking a thorough risk assessment.
Wider physical infrastructure requirements	— Consider the physical infrastructure requirements for different sites.	— Looking at environmentally sustainable physical infrastructure options.

TABLE 5. EXAMPLE TABLE FOR SUMMARIZING MITIGATION OUTCOMES

Option	Type of potential impact	Magnitude of potential impacts	Significance of potential impact (i.e. sensitivity of environment)	Anticipated costs of option and possible mitigation, and potential responsibilities for implementation
1				
2				
3				

4.5. The SEA report

The SEA report is the main written output of the assessment. Its structure is explained in more detail in Section 7. Generally, the act of reporting does not only include the preparation of a written report, but needs to include meetings and other events to publicize

and explain its content, results and recommendations, and to engage in a process of consultation. The latter is of particular importance, as an SEA does not take decisions, but rather supports decision makers in making good decisions as regards environmentally sustainable development. This needs to be taken into account in any stakeholder and public involvement strategy, which is further explained in Section 5. Work on the SEA report starts once a decision to conduct SEA for a nuclear power programme has been taken, for example, on the basis of legal requirements or case by case screening. The scoping report is the first stage of reporting and the main SEA report should either incorporate the scoping report or present a summary of it. The SEA report will advance the objectives, options and issues to be considered and indicators identified during scoping, and explain whether and how they have changed.

The preparation of a sound SEA report is likely to take a minimum of 6 months and more likely one or more years. This time develops along the lines of the SEA process, starting with work on the scoping report and ending with a positive quality review. In this context, it is important that this does not mean that the SEA is delaying the process of developing and implementing the nuclear power programme. Rather, it is prepared in parallel to it, covering environmental issues in a participatory process, which would need to be carried out in any case. The part of the process requiring the longest period of time is stakeholder and wider public participation.

The SEA report should be reviewed and approved by the responsible environment authority, and should involve feedback and comments from a range of authorities and bodies. Reviewing and approving the SEA report should, therefore, not be the sole responsibility of the authority responsible for the preparation of the nuclear power programme SEA. Quality review of an SEA report is explained further in Section 4.8.

4.6. Decision making

The main aim of SEA is to effectively incorporate environmental and sustainability considerations into the nuclear power programme's decision making processes and, ultimately, to support decisions that result in more environmentally sustainable development. Thus, the SEA needs to consider how decision making can be influenced. This requires that the SEA be conducted in parallel with the nuclear power programme preparation process, but converging with it at various points along the preparation process (see Fig. 9).

In this context, the design of the SEA should be sensitive to the real characteristics of decision making, as real decision processes frequently divert from what has been planned upfront or what is set out in formal requirements. The SEA also needs to be flexible in order to be able to react to any changes or unforeseen developments. Furthermore, it should be understood that it is a support tool for a more effective decision framework (see Figs 2–5). Any oral or written explanations by decision makers on the decisions taken during the process should clearly state how the SEA was taken into account. In this context, as an important support document, the SEA report should be explicitly referred to in any decisions taken and in the documentation prepared to justify them.

While an effective SEA always requires its results to be considered in any decision making, there may also be legal or other formal requirements for justifying decisions, in the light of what the SEA is reporting. Here, it is important to closely follow those requirements when justifying decisions taken.

Furthermore, there is a need to effectively engage with stakeholders and the general public (see Section 5). Results, along with recommendations emerging from the SEA, need to be explained to decision makers and to other stakeholders in meetings, workshops and through other means. It is not adequate to simply submit a report; it is necessary to welcome feedback and to be open to

amendments of the nuclear power programme. In this context, it is important that there be an engagement and communications strategy.

Finally, there should be a written justification of the programme decision taken (i.e. adoption of the programme). This should explain how the SEA was considered and what information needs to be provided after adoption.

4.7. Monitoring and wider follow-up

Monitoring consists of two main aspects: (i) monitoring compliance with what is set out in the SEA and in the nuclear power programme; and (ii) monitoring whether the actual impacts are in line with what was envisaged. In this context, the use of indicators is particularly useful.

Monitoring and wider follow-up mark a key stage in the SEA process, one which is frequently neglected or at times even ignored altogether. It is important that the implementation of the conditions agreed upon (and recorded in reports) during the nuclear power programme and the SEA preparation processes be monitored. This will ensure that the subsequent design and implementation of a nuclear power project with its EIA happens in line with the SEA.

Furthermore, there is a need to verify whether proposed mitigation measures are integrated into subsequent planning processes and that they result in the desired outcomes. Monitoring is also required to confirm whether future impacts are expected to be in line with initial estimates during an SEA. In this context, determining indicators, objectives, targets and methods will facilitate the measuring, monitoring and evaluation of the main actions to take in order to prevent, mitigate or compensate for the impacts resulting from the nuclear power programme.

If necessary, remedial action may be required, especially if actual developments differ from those predicted or planned. In SEAs, associated activities are frequently referred to as follow-up. In this sense, follow-up should allow for at least some adaptive management in the development of nuclear energy. This is supposed to help manage environmental risks and to support learning in the SEA process, along with learning from past experiences. Essential components of effective SEA follow-up are listed below:

- Follow-up needs to check conformance with terms and conditions laid out in the SEA.
- Follow-up needs to check the satisfactory environmental performance of nuclear power programme implementation, comparing and evaluating predicted with actual impacts.
- Follow-up needs to manage actual impacts that may be different from those that were predicted. This acknowledges uncertainties and a lack of full knowledge of environmental processes, and addressing this requires some flexibility.
- Follow-up needs to include dissemination of what is learned from following up the SEA.

Overall, the rationale for monitoring and wider follow-up is connected with the level of uncertainty inherent to the SEA. This is why monitoring and follow-up are an integral part of the SEA. In this context, feedback from follow-up should enable conscious learning from experience. The objectives of SEA monitoring and wider follow-up with regard to three key issues, controlling, learning and communicating, are listed below:

- *Controlling*: checking and adjusting the nuclear power programme for the purpose of controlling (environmental) risk.
- *Learning*: providing feedback to the SEA framework, process, predictions and actual effects.

— *Communicating*: about the environmental performance of the nuclear power programme.

Monitoring and wider follow-up are the main link between pre- and post-decision stages of various interdependent SEA processes. It is important that follow-up not just focus on one specific SEA for the nuclear power programme, but that the full decision framework is taken into account (see Figs 2–5). While the former can be referred to as micro-level follow-up, the latter would be viewed as macro-level follow-up.

The related activities have financial and human resource implications. It is, therefore, important that SEA monitoring and wider follow-up be integrated with other (possibly already existing) monitoring and auditing activities. Generally, the proponent of an SEA would be considered responsible for performing most activities involved in follow-up. Furthermore, the competent environmental authority should be involved, possibly as an auditor of associated activities. Finally, the general public (including affected and interested communities, and non-governmental organizations (NGOs)) should also be able to contribute.

Monitoring and follow-up activities can be organized in different ways. For example, there may be formal command and control requirements in place with the possibility of pursuing any breaches of what is expected from a legal perspective. Furthermore, there may be self-regulation by those responsible for a nuclear power programme, which, however, would have to be monitored by an independent body. Finally, public pressure may be a powerful driver in ensuring follow-up is being carried out.

Any activities associated with monitoring and follow-up should involve the preparation of a (post-decision) management plan with clearly defined actions, responsibilities, timelines and reporting requirements. The specific requirements should be set out in the main SEA report, which may also define indicators, targets and methods for monitoring and follow-up (see Section 6). In this context, transboundary aspects will also need to be considered.

Ideally, monitoring and follow-up activities proposed in the SEA will be integrated into the nuclear power programme and subsequent EIAs. The results of monitoring and follow-up should be made available to environmental, health and other authorities, as well as to the public, at defined intervals.

4.8. Quality assurance

The quality of SEA is determined through a number of aspects. A high quality decision making framework in which the SEA is applied, and which it tries to influence, is essential to ensure effective and efficient SEA. Furthermore, a high quality SEA process itself is vital. In order to ensure high quality, the proficiency of those involved in conducting the SEA process and in preparing the SEA report (which should also be of high quality) is important. SEA is supposed to increase transparency in decision making. Thus, the quality of SEA as a platform for open and fair debates is another aspect. Finally, SEA is only effective if it is able to influence decisions, and this is another quality aspect.

As SEA aims to effectively influence decisions, creating the correct context for achieving effectiveness is important. For this purpose, the following actions should be undertaken to ensure that SEA can be developed into an effective decision support tool:

— Conducting a preliminary audit on the adequacy of institutional arrangements for the preparation of the nuclear power programme and associated SEA;

— Conducting a preliminary audit on the capacity of both public and private sectors to prepare a nuclear power programme and associated SEA, and implement it;

— Verifying whether adequate resources (financial, temporal and human) are

available to conduct a nuclear power programme SEA;

- Ascertaining whether there is sufficient political will to conduct a nuclear power programme SEA which can be used effectively in decision making;
- Ensuring that an effective communication and consultation strategy is in place for the SEA (in addition to the one for the nuclear power programme itself);
- Ensuring that decisions agreed on during SEA are binding with respect to ensuing decision making processes and implementation;
- Ensuring state of the art knowledge, methods and techniques are applied throughout the process;
- Ensuring that those preparing the nuclear power programme and the associated SEA are accountable;
- Ensuring that the SEA process is stakeholder driven, focused, iterative, flexible and adaptable;
- Ensuring the cost and time efficient generation of sufficient, reliable and usable information.

The main responsibility for ensuring the high quality of the SEA lies with those experts that are conducting it. Ultimately, the responsibility for ensuring the high quality of the SEA will, however, rest with the authority in charge of managing the SEA process. An external review can further contribute to achieving a high quality standard and also strengthen the credibility of the SEA with the stakeholders involved.

Table 6 summarizes specific components of SEA quality review, in addition to the overall criteria listed above, which are then explained in more detail in the following paragraphs. In order for quality assurance to work effectively, responsibilities need to be clearly defined. Thus, Table 6 also includes suggestions for quality review responsibilities. These need to be adjusted to individual national institutional frameworks.

Quality is closely associated with the focus and context of a nuclear power programme and the tiered decision making framework in which it is applied. This framework comprises interlinked levels, from the policy level down to the project level, and across policy areas to extend beyond energy (see Figs 2–5). In this context, clarity is required as to when and where different issues of nuclear energy development are to be addressed and how these refer to each other. This closely relates to the quality of the existing regulatory and institutional frameworks, and, within those, the roles that different administrations play. It further relates to the specific assessment tasks and types of impact to be considered at the levels of policies, plans and programmes, and at the project level [42].

TABLE 6. COMPONENTS OF SEA QUALITY REVIEW

Specific components of SEA quality review	Coverage and suggested responsibilities
Quality of the tiered decision making framework within which an SEA is applied and which it attempts to influence (see Fig. 5).	Coverage of 'why', 'what', 'how' and 'where' questions (e.g. the legislator may define what questions need to be answered at which administrative level).
Quality of the SEA process (see Table 7).	Coverage/comprehensiveness of all procedural stages (responsibility could lie with an authority in charge of programme approval/licensing).
Expertise and experience of those involved in conducting the SEA process and preparing the SEA report.	Qualification and ability should be explained in the main report (responsibility could lie with an environment ministry or agency).
Quality in the context of an SEA being a platform for open and fair debates (see also Table 12).	Debates conducted during the SEA process and reaction to these debates should be described in the main report (responsibility could lie with an authority in charge of programme approval/licensing).
Quality of the main SEA report (see Table 16).	Coverage/comprehensiveness with regard to legal and other requirements and comprehensible style (responsibility could lie with an environment authority).
Quality with regard to an ability to influence decisions (see Table 8).	Should be described in the main report (responsibility could lie with environment authorities and an authority in charge of programme approval/licensing).

At the level of energy and nuclear policies, questions on the design of the future energy system and its generation mix should be addressed. These will be inherently interdisciplinary, which means a large number of administrations will need to be involved. At the level of plans and programmes, the focus is on specific infrastructure requirements, based on the policy decisions taken. In this context, nuclear power programme SEAs mainly focus on the national and regional impacts of siting and technology issues. Objectives for the programme should be formulated accordingly and ensure sufficient space for the identification of alternatives (see Section 2.3.2). At the project level, EIA will assess impacts associated with a particular nuclear facility. The main focus, in this context, should be on local impacts. The legislator is likely to play a key role in the allocation of assessment tasks to these different levels (i.e. policies, plans, programmes and projects).

An important task is to verify whether all relevant issues and tasks are adequately addressed. Table 7 provides an overview of important components to be considered in the quality review of the SEA process. This review is likely to be the responsibility of the environmental authority or any other body which is specifically in charge of SEA process quality assurance.

High quality is also essential when setting up the team of experts actively involved throughout the SEA process. This includes both those who conduct the SEA as well as any external assessors. By its very nature, SEA is an interdisciplinary task. This needs to be taken into account when setting up the teams involved, which should include experts from different disciplines and institutions. It is important that the key person in charge of this process be able to act as a moderator in the process and support an unbiased approach to SEA. This also includes ensuring that the SEA process is not dominated by a specific disciplinary approach. The expertise of those involved may be evaluated on the basis of criteria such as professional education and continuing professional development, but, most importantly, by their track record,

demonstrating their practical experience with such interdisciplinary functions.

A checklist for the quality of SEA with regard to being a platform for open and fair debates is presented in Section 5 when discussing stakeholder engagement. Furthermore, a checklist for evaluating the nuclear power programme SEA report is presented in Section 7. With regard to SEA being able to influence decisions, Table 8 lists a number of quality elements.

5. METHODOLOGY, PART 2: STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION

This section starts by focusing on the functions and effects of what will, subsequently, be termed 'adequate stakeholder engagement and public participation'. Thereafter, associated principles are explained (Section 5.2) before introducing associated methodologies and methods (Section 5.3). The section concludes by briefly outlining stakeholder and public grievance management frameworks and mechanisms (Section 5.4), and discusses the quality criteria for adequate and fair stakeholder engagement and public participation (Section 5.5).

5.1. Functions and effects of adequate stakeholder engagement and public participation

Benefits accruing from adequate stakeholder engagement and public participation in SEAs for nuclear power programmes are based on an enhanced quality of the decision making process. The main elements of adequate stakeholder engagement and public participation are:

- Developing a common understanding: To reach political decisions with all parties involved by being able to develop a common understanding of the matter. Authorities should understand social fears and concerns, and should aim to clarify complex technical questions and issues.
- Developing mutual trust: To build trust in public authorities by providing a forum in which any negative perceptions and emotions can be expressed and discussed.
- Developing enhanced acceptance: To enhance acceptance of public decisions and to allow development of an understanding for the reasons behind decisions.
- Strengthening civil society: To support the building of a civil society as well as to foster mutual respect between parties involved in the programming process.
- Reconciling diverging views: To aim at reconciling divergent viewpoints at an early stage while avoiding related delays at later stages in the implementation of the nuclear power programme.
- Preparing a stakeholder engagement and public participation report: To create transparency and to show how engagement influenced the programme making process and the associated SEA.

TABLE 7. QUALITY OF THE SEA PROCESS

SEA stage	Important quality components
Screening	— Has screening been conducted according to specific national legal or other formal requirements and in reference to: • Inclusion and exclusion checklists? • Case specific considerations, based on the magnitude of the expected impact and sensitivity of the receiving environment? — Has case specific screening been conducted by a responsible environmental authority, with input from other key/interested stakeholders, if appropriate? — In case specific screening, has a short screening report been produced? — Has a clear screening decision been made by the responsible (environmental) authority, explaining that decision in the light of the available evidence?
Scoping	— Has scoping been formally conducted by the responsible (environmental) authority? In this context: • Have all relevant issues (i.e. the likely significant issues, impacts, technical and site options to be studied in detail — in line with the objectives of the programme) been scoped in? • Have all irrelevant issues been scoped out? • Have the appropriate temporal and spatial boundaries of the SEA been established? • Have the main stakeholders and their concerns and values been identified? — Has information necessary for the subsequent assessment been clearly established? — Has there been full stakeholder engagement and public participation during scoping and has this been clearly reported? — Has a scoping report been prepared, describing the results of scoping (e.g. using a scoping matrix), outlining the further stages of the SEA (including data requirements) and explaining how comments received were addressed?
Assessment	— Has the relevant baseline environment (i.e. those issues that were scoped in, including environmental problems and constraints) been described and has the information provided been used in the assessment? Or is an environmental baseline only presented without subsequently making any meaningful links with the actual assessment of impacts? — Have all relevant and realistic technical and site options (with respect to the predefined objective of the programme) and impacts been assessed with regard to their impact significance? — Have all relevant types of impact been considered in the SEA (direct, indirect, cumulative, short term and long term, synergistic, local, regional, global as well as residual)? — Have mitigation measures been clearly outlined? — Has an environmentally friendly and sustainable option been identified?
SEA report	— See Section 7.
Decision making	— Have the results of the SEA, as established in the SEA report, been explicitly considered in decision making? — Is the decision explained in the light of the findings of the SEA report? — Is the decision explained in the light of the comments from stakeholders and the general public?
Monitoring and wider follow-up	— Is there a published monitoring/follow-up action plan in place? — Are provisions formulated for compliance monitoring (i.e. with the consent decision)? — Are provisions formulated for conformance monitoring (i.e. whether actual impacts are in line with predictions)? — Are provisions formulated for performance management (i.e. is a plan for corrective action in place in the case that environmental impacts are significantly worse than predicted)? — Are mitigation measures considered in subsequent planning processes, such as EIA and project designs?

TABLE 8. QUALITY WITH REGARD TO BEING ABLE TO INFLUENCE DECISIONS

Influencing decision elements	Important quality components
Consideration of SEA results	Have decision makers justified their decisions in the light of the results of the SEA?
When, where and how has the SEA exerted influence	Has clear reference been made in the nuclear power programme to the SEA and have explanations been provided as to when, where and how it influenced it?
Post-decision management	Is there an obligation for establishing a (post-decision) management plan, following up on impacts and agreed actions?
Learning through SEA	In respect of the points made above, an important objective is to establish an SEA system which allows for knowledge acquisition through the SEA, the adjustment of the programme through the SEA and, potentially, also a change of behaviour. Has this been considered?

Adequate stakeholder engagement and public participation is critical for the successful implementation of nuclear power programmes because, if this is done well, it can help allay associated public concerns. Its key role is to facilitate interactions between nuclear power developers and various stakeholders during the SEA process and the development of the nuclear power programme. Engagement should allow all of the interested parties to disclose their expectations and fears, including their environmental worries and concerns for public health and safety, protection of valued environmental heritage and transboundary impacts. The specific aims of stakeholder engagement and public participation include:

- Informing stakeholders and the general public about a proposed nuclear power programme and its SEA in order to raise public awareness on suggested objectives and interventions, and to encourage suggestions;
- Empowering stakeholders and the public by enabling them to actively engage in the processes of developing a nuclear power programme and associated SEA;
- Consulting stakeholders and the public, and gathering vital information on views, opinions and expertise regarding a proposed nuclear power programme and associated SEA;
- Attempting to build consensus with various stakeholder groups by ensuring that the public's aspirations, concerns and grievances are clearly understood and considered in the nuclear power programme and associated SEA processes;
- Negotiating and ensuring sustainable collaboration and partnership with relevant stakeholders in all aspects of the proposed nuclear power programme and associated SEA processes, including during the identification of alternatives and environmental mitigation options;
- Providing the public with an opportunity to contribute local knowledge.

Using suitable methods for engaging stakeholders and the public, and developing a clear understanding of their roles is, therefore, crucial. This includes individuals and governmental and non-governmental organizations, as well as private sector entities. In an SEA process, assessors may assume the role of moderators between different interests and act as facilitators of agreed objectives. In addition, those being consulted and invited to engage with the process need to be given sufficient time to read and comprehend all of the necessary documentation and to formulate responses.

Adequate stakeholder engagement and public participation may help resolve conflicts of interest by establishing the values of stakeholders and by taking them into account when evaluating options in the SEA. Ultimately, adequate engagement may engender an increase in public support for decisions made that are aligned with stakeholder and public expectations, preferences and knowledge. It can, thereby, reduce costs (not just to the environment but also to society and to developers) by leading to publicly acceptable solutions that help to avoid associated programming delays.

5.2. Principles of adequate stakeholder engagement and public participation

Adequate stakeholder engagement and public participation in SEAs should respect a number of good governance principles. Besides an overall right to participate, this includes transparency and accountability of the programming process. The principles are detailed below:

- Clear rules: The nuclear power programme cannot be adopted before the SEA is concluded and the SEA cannot close before engagement is complete. The adopted SEA report should list the results of the engagement and explain how the points raised were addressed. Prior to any engagement, the rights of stakeholders and the public need to be clearly explained.

- Early engagement and continuity of the engagement process: Engagement should start early and be a planned and continuous process to ensure social acceptance. Those taking part in the engagement process have a right to receive a response to their concerns, both during the debate and in the form of documentation.

- Comprehensiveness and inclusiveness: Stakeholder engagement and public participation in SEAs need to address international, national, regional and local audiences. Engagement methods need to be adapted to reach representatives at each of these different levels; this includes, for example, the choice of language(s). Transparency is key and the conclusions collected at different levels and through different methods should be brought together in order to allow for a comprehensive assessment. All individuals wishing to take part in the stakeholder engagement should be allowed to do so and this process should embrace all interested groups of stakeholders and the public. In this context, efforts to engage groups perceived as disadvantaged or excluded are necessary.

- Respect for the common good and interest: Public interest in the environment, as well as in health, safety and overall values and beliefs should be fully respected. In this context, stakeholder engagement and public participation should take the interests of all into account, including those who have concerns as well as those who have positive attitudes towards nuclear power.

- Integrity, openness and responsiveness: Public authorities need to demonstrate integrity and should strive to ensure that the information presented to the stakeholders is true and that nothing has been kept hidden. This includes safety issues and risks, as well as uncertainties. Responsiveness and openness to concerns by stakeholders is a key ingredient of adequate stakeholder engagement and public participation.

The information presented in the SEA report needs to be reliable and should be prepared with due diligence. With this end in view, a quality review system for stakeholder engagement and public participation should be established. This may involve public review

and should consider three principles: (i) the principle of documentation, (ii) the principle of third authority and (iii) the principle of optimization. These quality review principles are detailed below:

- The principle of documentation: It is important to document all phases of stakeholder engagement and public participation and to make this documentation publicly accessible. Methods for collecting and sharing documentation (e.g. public domains and printed reports) depend on the level of information and communication technology development in a country. Furthermore, the risk of information exclusion needs to be factored in.

- The principle of third authority: Even the best engagement process may not meet expectations if there is a lack of citizens' trust in the authorities preparing and implementing the nuclear power programme. It is, therefore, advisable to include collective entities as stakeholders, for example, NGOs as opinion leaders. An engagement group of opinion leaders may be established to voice opinions.

- The principle of optimization: The channels of communication employed in the engagement process should be adapted to the capabilities of the stakeholders and the public. Poorly chosen engagement channels can be equated to a lack of transparency in the process.

5.3. Stakeholder engagement and public participation planning and associated methods

Stakeholder engagement and public participation as an open platform for debate and information exchange is an advanced method of communication between authorities responsible for preparing programmes and others. When conducting an SEA, authorities should have a clear understanding of what they require from the engagement process. Stakeholder engagement and public participation should allow for any problems, weaknesses and threats, as well as opportunities and benefits, to be identified. Furthermore, it should also establish an indication of the proportion of stakeholders and the general public that think about the identified issues in a certain way.

Stakeholder mapping can be a particularly useful tool, and involves the identification of stakeholders based on their potential influence, attitude, position, background knowledge and interest in contributing to the SEA process. On the basis of such stakeholder mapping, the engagement methods and type of communication will need to be chosen to best engage with the various stakeholder groups (Table 9).

Table 10 provides practical examples for different stakeholder groups.

TABLE 9. CATEGORIES OF POSSIBLE ENGAGEMENT METHODS

Category	Engagement method
1	*Information:* Passive communication involving the sharing of information with stakeholders and the public (e.g. through mass media).
2	*Consultation:* Collection of feedback from stakeholders and the public on the nuclear power programme.
3	*Engagement:* Direct dialogue with stakeholders and the public, aimed at gathering opinions, observations and comments. This should involve a transparent communication of action that authorities intend to take in response.
4	*Cooperation:* Top level of participation, resulting in co-creation of the nuclear power programme report and the SEA.

TABLE 10. POSSIBLE ENGAGEMENT METHODS FOR DIFFERENT STAKEHOLDER GROUPS

Stakeholder group	Engagement method
The public, in general, and, specifically, local communities, including vulnerable groups and indigenous peoples	Print, mass and social media, including newspapers, radio broadcasts and Internet web site, SMS, emails, voice messages, public and focus group meetings, information centres
Institutional stakeholders (e.g. environmental and health authorities)	One on one interviews, dialogue meetings
Environmental groups	Dialogue workshop, focus group meetings, Internet web site, emails
Private sector and business community	Dialogue workshop, focus group meetings, emails
Transboundary stakeholders	Internet web site, emails, one on one interviews, transboundary public hearings

To ensure that stakeholder engagement and public participation is both adequate and effective, an engagement plan and communication strategy should be developed. This should include the following:

- Clear objectives for the engagement process;
- A comprehensive and transparent package of nuclear power programme information to be used during the engagement process;
- A comprehensive stakeholder analysis and mapping strategy for identification and clustering of various stakeholder groups, for example, as primary or directly affected stakeholders, secondary or indirectly affected stakeholders, elected representatives, institutional stakeholders, vulnerable groups, environmental groups, civil society and transboundary stakeholders;
- A description of engagement activities (e.g. house to house surveys, one on one interviews, public meetings, focus groups, dialogue workshops, referendums) and communication tools (e.g. leaflets, questionnaires);
- An outline of engagement venues, other related requirements and a timetable.

Effectiveness of engagement is determined by the selection of suitable methods and channels. These need to be adjusted to the

subject of consultation (i.e. what is being addressed in the SEA) and to the various stakeholders, including who they are as well as their position and interests.

Table 11 introduces guidelines for choosing the category of engagement method for different levels of engagement and stakeholder groups. In Table 11, these groups are divided according to three main geographical levels: international, national and regional/local. If need be, additional sectoral and regional levels can be established, depending on the specific planning traditions in a particular country. For additional guidance regarding transboundary consultation processes, article 10 of the UNECE Protocol on SEA [5] should be referred to.

Although this publication contains overall guidelines for stakeholder engagement and public participation, any specific SEA situation requires the design of a custom made engagement approach.

For further guidance, reference should be made to the *Good Practice Recommendations on Public Participation in Strategic Environmental Assessment* [43] and the *Maastricht Recommendations on Promoting Effective Public Participation in Decision-making in Environmental Matters* [44]. These were prepared under the UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (also known as the Aarhus Convention) [45].

5.4 Grievance management

Stakeholder engagement and public participation should be positioned within existing frameworks for related grievance management. The framework should describe the process by which people affected by the nuclear power programme can convey their grievances for consideration and possible redress. This should include: (i) information on the procedures to follow to lodge a grievance, ideally published on information boards and on the web sites of local authorities, and (ii) grievance resolution protocols and time frames. The framework should cover both the development phase of the nuclear power programme with its SEA and the subsequent implementation phase of the programme. Furthermore, a mechanism should be in place to ensure responsiveness to any concerns and complaints, particularly from affected stakeholders and communities. The SEA should verify that such a grievance management framework is in place, ascertain that it is functional and initiate improvements, as necessary.

5.5. Quality criteria for SEA being a platform of open and fair debates

Table 12 introduces elements of open and fair debates, and associated criteria. These can be used when evaluating the quality of an SEA with regard to this specific component of the SEA application.

TABLE 11. METHODS FOR STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION IN DIFFERENT SITUATIONS

Description (in practice, this requires case specific stakeholder mapping)	Possible interest[a]	Possible impact[a]	Possible communication methods and action examples[b]
International level			
Authorities of other potentially affected countries: this includes any (direct or indirect) neighbouring countries and associated SEAs (both for land and maritime borders).	?	?	1–4: Bilateral meetings, documentation exchange
International institutions: bodies that issue opinions on compliance with existing international instruments (for European Union Member States, for example, this would include European Union bodies and institutions).	?	?	1 and 2: Meetings, documentation exchange, official notifications if required
Multilateral organizations such as the IAEA: this includes organizations with an advisory capacity in the implementation of the nuclear power programme and which provide guidance on regulations and safety standards.	?	?	1 and 2: Meetings, documentation exchange, requests for opinions
Foreign or international environmental organizations: this includes numerous political advocacy organizations and associations, representing the interest of the general public and activists that defend the rights of third parties, protect the environment and others.	?	?	1–3: Meetings, press releases, media appearances, submitting documentation
Mass media: this includes, for example, journalists whose media activity may have an impact on the image of the nuclear power programme and the SEA internationally, representing foreign or international newspapers and magazines covering economic or nuclear power issues.	?	?	1 and 2: Submitting briefs and data, information exchange, popular science publications, interviews with experts
Potential suppliers of equipment and services: this includes advanced technology developers and suppliers of the most important equipment, for example nuclear reactors (these may be chiefly foreign).	?	?	1–4: Technical talks, meetings
Potential investors, shareholders, financing institutions: institutions that may be interested in funding the nuclear power programme.	?	?	1–4: Technical talks, meetings
Society at the international level.	?	?	1 and 2: Information sharing through mass media and engagement with non-governmental organizations, preparation of information in a format typical of popular science

TABLE 11. METHODS FOR STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION IN DIFFERENT SITUATIONS (cont.)

Description (in practice, this requires case specific stakeholder mapping)	Possible interest[a]	Possible impact[a]	Possible communication methods and action examples[b]
National level			
Government and administrative bodies of the country concerned.	?	?	1–4: Press conferences, bilateral and multilateral meetings, including representatives at regional/local level
Environmental organizations: this includes numerous political advocacy organizations and associations representing the interests of citizens and/or activists defending the rights of third parties, protecting the environment, etc.	?	?	1–4: Meetings, press releases, media appearances, submitting documentation, public hearings
Research, scientific and educational institutions: this includes institutions that provide research and education services in the area of nuclear power.	?	?	1 and 2: Information exchange, public requests for submitting opinion (written or electronic consultation forms, polls, surveys)
Mass media: these can influence the programme by communicating information about it as well as on the attitude of the public, threats and opportunities.	?	?	1 and 2: Submitting briefs and data, information exchange, popular science publications, interviews with experts
Society at the national level: individuals or informal associations.	?	?	1–3: Information sharing through mass media and engagement with non-governmental organizations, preparation of information in a format typical of popular science, inviting them to comment on the formal SEA procedure, quantitative surveys, full surveys (e.g. a referendum)

TABLE 11. METHODS FOR STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION IN DIFFERENT SITUATIONS (cont.)

Description (in practice, this requires case specific stakeholder mapping)	Possible interest[a]	Possible impact[a]	Possible communication methods and action examples[b]
Regional/local level, addressed when dealing with specific siting options			
Local authorities: operating in the area where the project can be carried out or its effects can occur.	?	?	1–4: Bilateral/multilateral meetings, cooperation with experts, inclusion in focus groups, expert and popular science information, collective projects (civic workshops, conferences)
Local environmental organizations: including non-governmental organizations operating at the local/ regional level; their likely involvement in the SEA will result from their desire to protect the environment or from their opposition to nuclear power. Also included are associations representing the interest of citizens, environmentalists, or activists defending the rights of third parties, protecting the environment, etc.	?	?	1–4: Meetings, press releases, media appearances, submitting documentation, projects (civic workshops and conferences)
Mass media: can influence the SEA by communicating information about it as well as on the attitude of the public, threats and opportunities.	?	?	1 and 2: Submitting briefs and data, information exchange, popular science publications, interviews with experts, collective projects (civic workshops, conferences)
Social, cultural and educational institutions: this includes entities distinct from environmental non-governmental organizations, including institutions that operate in the area of the project's location and which may have an impact on it through influencing public opinion.	?	?	1–3: Meetings, press releases, media appearances, submitting documentation, collective projects (civic workshops, conferences)
Religious groups: separate legal entities classified as stakeholders because of their capacity to influence public opinion and which, thus, may have an impact on the nuclear power programme.	?	?	1–3: Meetings, press releases, media appearances, submitting documentation
Local community: this consists of local residents and, if applicable, minorities or indigenous communities. It combines persons of different professions, qualification and level of skill/ competence who are influenced (directly or indirectly) by the nuclear power programme and adopt different positions on it. They can become associated and voice their opposition in a non-formal manner (protest committees, demonstrations, pickets and others).	?	?	1–3: Meetings, conferences, press releases, media appearances, submitting documentation

[a] Expressed as 'high', 'moderate' or 'low', depending on the outcome of the stakeholder analysis.
[b] Numbers refer to the categories of engagement listed in Table 9.

TABLE 12. QUALITY OF SEA AS A PLATFORM FOR OPEN AND FAIR DEBATES

Element	Associated evaluation criteria
To achieve a high level of awareness of a nuclear power programme preparation process and SEA	— Information on intentions and plans is published widely in a range of different media, including written and broadcast media at different levels (e.g. national, regional, local), and dedicated spaces on the Internet.
To provide for adequate opportunities for open and fair debates at key stages of the process	— Physical meetings (which may be streamed on-line) and virtual meetings are held, at least at the scoping and reporting stages of the SEA.
To ensure accessible locations of venues for (public) debates and public hearings	— Those wanting to participate are able to reach the location, not just by private transport, but also by public transport, at a reasonable cost and within a reasonable amount of time.
To secure moderation	— Unbiased and skilled moderators are employed in debates and act according to strict rules for open and fair debates.
To set clear rules for debates	— Debates are first contextualized, resolving any unclear points; — The moderated debates are based on objective and unbiased arguments, not intimidation; — Arguments are checked for validity and truthfulness.
To engage in conflict reduction strategies	— Areas of conflict are identified in an unbiased manner; — Open and fair discussion on areas of conflict is encouraged and all those interested and potentially affected are given the opportunity to actively engage in these discussions.
To create an environment of trust	— Transparency is ensured throughout all stages of the nuclear power programme and associated SEA processes; — Integrity is established and maintained; — Visions, aims and objectives are clearly communicated, as well as underlying values; — All those contributing to debates are given equal status; — The focus is on shared, not personal issues; — Information is not withheld; — A consistent argument and approach is pursued.
To ensure the safety of those gathering and contributing to debates	— An environment is created in which people feel free to speak their mind without fear of intimidation or harassment; — Adequate security measures are in place at meetings; — Strict moderation rules are applied on any dedicated social media discussion groups.
To ensure transparency	— Written records of all engagement activities are provided; — A stakeholder engagement report is prepared.

6. METHODOLOGY, PART 3: ASSESSMENT METHODS AND DATA REQUIREMENTS

There are a number of methods that will be useful for supporting the assessment work performed during an SEA. While the use of specific methods in SEAs is often left to the discretion of practitioners, at times they are prescribed in regulation or suggested by guidelines (see, for example, Refs [40, 46–48]). When choosing methods, it is important to select those that are suitable for a specific situation and for which the necessary data are available. Furthermore, those methods that are chosen should allow for a logical organization of information in the SEA and enhance understanding of the issues at stake. In this context, simple and transparent methods (e.g. checklists) facilitate wider communication. A combination of methods should be used to highlight different issues from various perspectives. The outcome of one particular method should never be seen as the outcome of an SEA overall. Methods are applied to inform the SEA process, not to replace it. In this section, an outline of selected methods (Section 6.1) as well as associated challenges (Section 6.2) are presented, before

a discussion on the applicability of these methods at different procedural stages of the SEA (Section 6.3).

6.1. Outline of selected methods

A selection of 11 methods that may be useful for SEAs of nuclear power programmes are listed below:

(1) Literature and document reviews and analogues;

(2) Checklists;

(3) Indicators;

(4) Matrices;

(5) Networks;

(6) Multi-criteria analysis;

(7) Environmental cost–benefit analysis;

(8) Risk assessment;

(9) Overlay mapping;

(10) Expert opinion;

(11) Modelling and scenario analysis.

Although a comprehensive description of each of these methods is beyond the scope of these guidelines, outlines for them are provided. It is acknowledged that these methods are also common for EIAs. However, when used for SEA at the programme making level, they will be applied more strategically, which is likely to mean information provided will be less detailed and uncertainty will be higher.

6.1.1. Literature and document reviews and analogues

Literature review is concerned with the collection of information on specific types of action and their impacts, and is usually a starting point for identifying subsequent assessment needs and applicable methods. It may include reviews of the professional literature and of documents previously prepared in similar situations. It provides an overview of experience gained elsewhere from similar actions (including those from other jurisdictions, countries or regions). It is also frequently referred to as 'analogues' or 'precedents'.

Analogues can be used in SEAs at different procedural stages, for example during impact identification (i.e. in screening and scoping), as well as for impact prediction and assessment (i.e. during the main assessment stage). Literature reviews may be particularly useful in identifying linkages between different aspects of the nuclear power programme and their environmental impacts. Observed impacts are taken as the basis for making judgements in a particular SEA. In this context, when referring to other practice cases, actual monitoring data should be the basis for providing a sound analogy to the possible impacts of a proposed development.

6.1.2. Checklists

Within SEA checklists, lists of environmental parameters are often used to check for possible impacts of proposed developments. The potential benefits of using checklists include:

— Applying a simple method for identifying relevant environmental issues for consideration in the SEA;

— Encouraging discussions on environmental issues to be considered in SEAs at an early stage;

— Representing the collective knowledge and judgement of those developing and completing the lists of environmental issues.

A simple method, such as a checklist, has limitations on what it can deliver. For example, checklists are not able to discover interdependencies or synergies between interacting environmental issues. In addition, they are not able to describe variations in environmental conditions. Finally, they do not

readily provide information on specific data needs.

6.1.3. Indicators

Indicators comprise selected features or parameters of environmental issues, representing a broader measure of their quality or quantity. They may specifically refer to either numerical or categorized information which can be used to describe the behaviour of the baseline parameters and for predicting and assessing the environmental impacts. When used in an SEA for a nuclear power programme, indicators should represent the environmental impact themes introduced earlier in these guidelines (see Section 3.3). Only a limited number of indicators should be used (ideally below ten) and indicators should combine certain important issues in a meaningful way. For example, all climate change related emissions and actions should be combined in one 'climate change' indicator.

6.1.4. Matrices

A matrix may take the form of a two dimensional table for cross-referencing a list of actions with environmental impact parameters. Activities associated with different phases of nuclear power development can be listed along one axis (e.g. nuclear power programme impact areas), with environmental components listed along the other axis. Inputs into a matrix can either be qualitative or quantitative. Matrices may simply state the occurrence of an impact or focus on impact magnitude and significance. Quantitative estimates can be weighted, leading to overall 'impact scores'. Matrices allow for a visual description of the relationship between different proposals being assessed, as well as for an identification of the impacts of different phases of a project. Figure 13 shows a simple impact matrix that can be used in SEAs for nuclear power programmes.

6.1.5. Networks

Networks are used to identify the structure, key elements and interactions in a given system by using aids, such as decision flow charts and loop analysis. A network diagram visually describes cause–effect chains (see Fig. 14). In this context, different levels of information can be displayed. The relative dependence of one factor on the condition of another may be indicated by various arrow widths and heights. Negative and positive feedback loops can also be identified, if the nature of the interrelationship is indicated.

6.1.6. Multi-criteria analysis

Multi-criteria analysis, or multi-criteria decision analysis, is used to select the best option for achieving set targets or goals for a number of environmental (and potentially other) criteria. It is based on identifying positive or negative weights for criteria used for selecting between different options. Figure 15 shows the principle of multi-criteria analysis for SEAs for nuclear power programmes.

	Different categories of sites				
Environmental impact themes	A	B	C	D	E
Ground, air, water, soil	+	+/-	...	...	...
Natural hazards	+/-	-	...	...	...
Land use, landscape, cultural heritage	++	-	...	...	...
Radiological emissions	+	+	...	...	...
Non-radio. emissions, noise, vibration	-	--	...	...	...
Ecosystems	+	-	...	...	...
Climate change	+	+	...	...	...
Economy	-	++	...	...	...
Health and safety	+	-	...	...	...

++ = impact positive; + = no conflict; +/- = could go either way; - = conflict / negative impact;
-- = significant negative impact of a high magnitude

FIG. 13. Simple impact matrix.

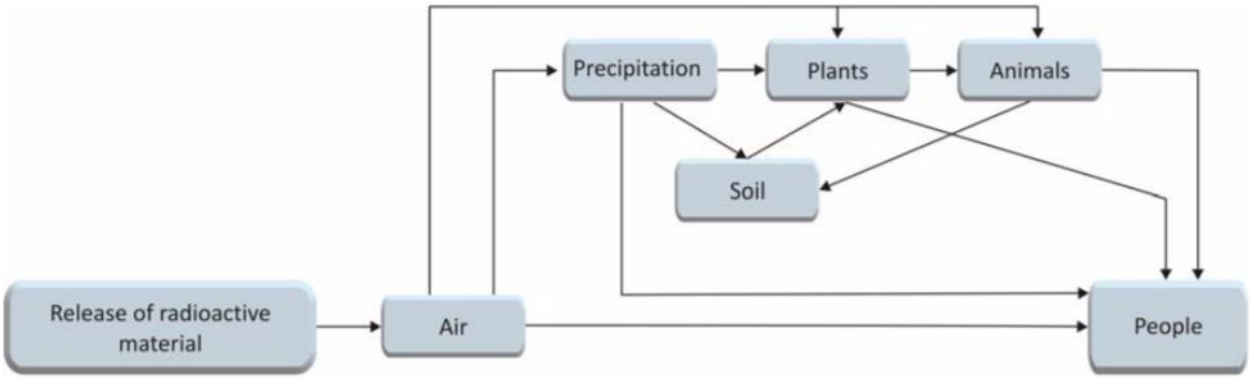
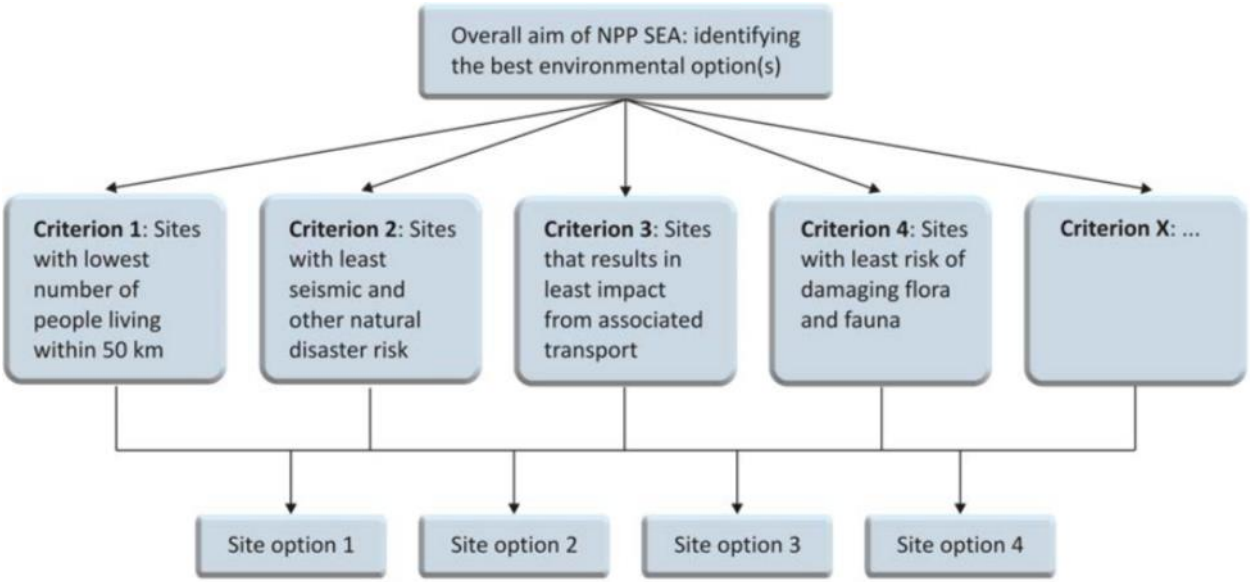


FIG. 14. Network showing potential paths following the release of radioactive material.



Note: Weights will usually be allocated to criteria depending on priorities (e.g. criterion 1 = 0.5; criterion 2 = 0.2, etc.); this will follow on from national policy and needs to be done in a transparent manner.

FIG. 15. Principle of multi-criteria analysis for SEAs for nuclear power programmes.

6.1.7. Environmental cost–benefit analysis

Environmental cost–benefit analysis aims at comparing the expected benefits of a nuclear power programme in monetary terms with the costs associated with its development. Cost–benefit analysis is commonly demanded in any investment decision making. Therefore, addressing cost aspects within the SEA has the advantage of being able to ensure a balanced approach by adequately addressing environmental aspects that may otherwise be omitted. Cost–benefit analysis works similarly to multi-criteria analysis, with the main difference being that results are expressed in monetary values rather than numbers. As with multi-criteria analysis, cost–benefit analysis is best used when comparing options with a number of environmental (and potentially other) criteria that are expressed in monetary terms or in terms of quantifiable indicators. This is difficult, as it is often not straightforward to clearly quantify

environmental damage, such as that due to emissions or noise, and its impact on humans and wildlife. Problems in this context are similar to those associated with establishing ecosystem services.

6.1.8. Risk assessment

Risk assessment evaluates the potential risks of proposed actions. In the context of an SEA for a nuclear power programme, a risk assessment focuses on assessing the strategic risks of different site and associated technology options. Development trends that may undermine the objectives and quality standards of a nuclear power programme, thus generating potentially relevant damage and attendant costs, need to be included (e.g. a change in the political landscape or climate change). A risk assessment, in its simplest form, consists of a number of simple procedural steps, as follows:

- To identify risk factors (threats, vulnerability);
- To identify who or what could be harmed;
- To evaluate risks;
- To record risks and to devise risk management processes;
- To make a decision;
- To monitor and review.

A central element of a risk assessment can be an assessment matrix in which the severity of a risk (ranging from negligible to catastrophic) is compared with its probability (ranging from improbable to very high). A very high risk paired with potentially catastrophic outcomes would be something to be avoided, while negligible improbable risk outcomes would be sought. A risk assessment should result in a risk management process for the chosen SEA option.

6.1.9. Overlay mapping

Overlay mapping (through a geographic information system) is normally used to identify areas that are compatible with a proposed action. This technique is based on sets of maps of the affected area depicting environmental characteristics or themes (biophysical, social, aesthetic, or institutional performance indices such as level of corruption or budget execution) together with the effects of a nuclear power programme. When they are overlayed, the resulting maps provide for a composite characterization of impacts on a regional or local environment, based on map algebra. Impacts can be identified by noting the affected environmental characteristics within the boundary area of a nuclear power programme.

There are some limitations to using this method, including a tendency of maps to oversimplify issues. Furthermore, interrelationships between different environmental issues are not necessarily readily obtainable using traditional map overlays, which also cannot effectively describe changing dynamics (e.g. from ecosystems) over time. However, when used to compare different options on the basis of a defined set of environmental components, overlay maps can produce useful results. Figure 16 shows a simple overlay mapping example. Here, a corridor that would be assigned the lowest possible environmental impact is identified on the basis of a simple overlay of habitats, water bodies and areas of cultural interest. This could be useful, for example, when investigating suitable areas for new electricity transmission lines.

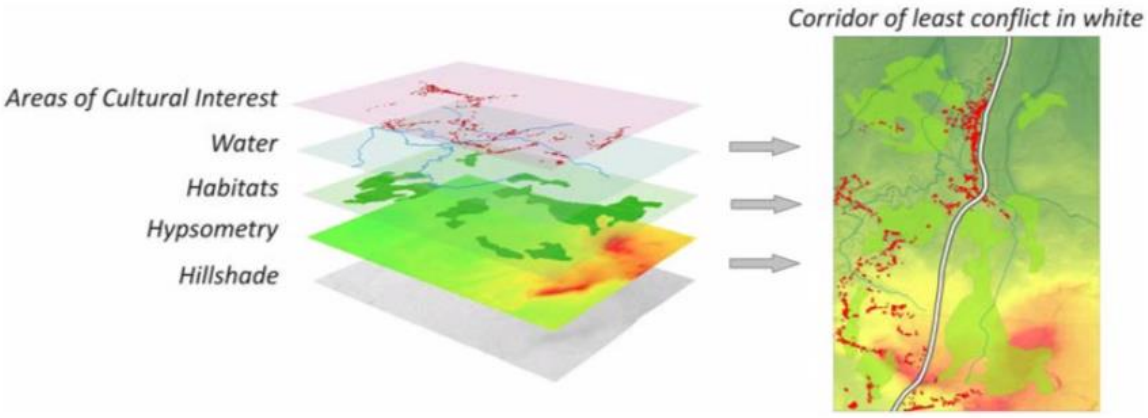


FIG. 16. Example of overlay mapping.

6.1.10. Expert opinion

Opinions and perspectives from recognized experts in relevant fields are often used in an attempt to resolve complex situations within relatively short time periods. In this context, consultations or workshops may be used. Consultations are frequently conducted with the help of questionnaires or guided interviews. Workshops may include structured meetings, for example, with a focus on problem solving and identifying alternatives or mitigation options, as well as prioritization exercises through Delphi exercises (i.e. facilitated, iterative rounds of expert discussions).

6.1.11. Modelling and scenario analysis

Both qualitative and quantitative modelling are commonly applied in SEA. The former refers to descriptive methods used to assess changes to the environmental components considered in SEA. It is a method usually based on expert opinion (i.e. professional judgement which is derived from experience). For example, an ecologist may reliably predict the impacts of infrastructure on a biotope, based on observation from other similar cases.

Quantitative modelling is based on the use of mathematical models that are applied for assessing expected changes to environmental components. They range from simple to very complex models (e.g. three dimensional computer based models) that may require extensive data input. In most cases, models are used for the description or prediction of changes in properties of the system over a time period. Quantitative modelling is most effective when environmental factors are easily quantifiable and can, thus, be easily integrated.

Examples of quantitative IAEA models[20] include the Model for Energy Supply Strategy Alternatives and their General Environmental Impacts (MESSAGE) and the Wien Automatic System Planning Package (WASP), both of which are used to assess energy and power system developments and aggregated emissions. SIMPACTS is used for assessing the geographical dispersion of emissions from a single (nuclear power) plant as well as the associated health implications.

These models are usually used for scenario analysis, which allows dealing with the numerous uncertainties involved when investigating potential environmental impacts decades into the future. Scenarios are usually set up to test hypotheses regarding socioeconomic, environmental and technological pathways. For example, they may include assumptions regarding the development of public acceptance towards nuclear energy, prices of alternative fuels and electricity market prices, climate change and

[20] https://www.iaea.org/topics/energy-planning/energy-modelling-tools

operational requirements (e.g. owing to the variability introduced by increasing shares of renewables), together with shorter term assumptions regarding investment costs and construction time. Scenarios serve to combine these assumptions within a consistent framework. They are also sometimes referred to as 'what if' analysis (i.e. what would happen if a certain future scenario were to evolve). Usually, a number of scenarios are set up to best cover the range of uncertainties involved.

6.2. Challenges of SEA methods and data requirements

While all methods introduced in this section can be useful in an SEA for nuclear power programmes, all have certain drawbacks in their application, as summarized in Table 13.

The more in-depth methods, in particular, are usually data intensive, and data gaps often constitute a limit to their applicability and, therefore, their robustness for decision making. In this context, methods and data may mutually influence each other. Sometimes, the absence of key data will result in the omission of a certain method; sometimes the benefits of a certain method will result in efforts to fill data gaps in one way or another. In addition to data gaps, the quality, reliability or accessibility of data may also be of concern.

As data gaps often occur, strategies to deal with them need to be formulated. In this context, it is important to identify the significance of data for the actual purpose of the assessment and to aim at addressing the identified gap accordingly. This may range from changing the method to delaying its application until data become available, from literature reviews and analogues to expert judgement (e.g. based on a stakeholder engagement process (see Section 5)), as well as additional analysis to generate data of a sufficiently high quality. The collection of primary data is likely to be out of the scope of most SEAs.

Whatever strategy is chosen, for the sake of transparency, it is important to record any data issues, such as unreliable data or assumptions used to fill data gaps, and to note their implications for the SEA in the SEA report (see Section 7). This may also include recommendations on how to proceed once currently missing data become available.

6.3. Use of methods at different procedural stages of SEA

While methods introduced in this section can be applied at different stages of an SEA process, certain methods are particularly useful for certain stages. What is important when choosing methods in any particular situation is to have a clear understanding of what the method is supposed to achieve (i.e. of its underlying dynamics and objectives) and also its data requirements. Another criterion for selecting a method is its suitability for the type of stakeholder that it should inform. Overly complicated or overly simplistic methods and associated results may unduly influence and, in a worst case scenario, manipulate those using the outcomes.

It is important to consider that no method is perfect and that data availability may also be an issue. The choice of methods should, therefore, be approached with regard to what is the most reasonable option. Furthermore, SEAs should never rely on one method only but should highlight issues and problems from various angles, using a range of methods. Useful methods in SEAs should lead to transparency and should not obscure the issues under consideration. Table 14 provides a simple overview of the stages at which methods are normally used and those for which they are particularly useful.

TABLE 13. DRAWBACKS OF SEA METHODS FOR NUCLEAR POWER PROGRAMMES

Method	Challenges
Literature and document reviews and analogues	— While different contexts may appear superficially similar and comparable, they may actually be quite different in reality; — What is presented in the older literature may be outdated; — Application may result in a simplistic approach that is not adjusted to the actual circumstances.
Checklists	— Certain issues and components may be difficult to put into a checklist; — Spatial information may not be integrated well; — Strategic issues may come with a considerable degree of uncertainty and more flexibility may be required than checklists can provide.
Indicators	— Depending on how indicators are designed, positives and negatives may cancel each other out; — Too many indicators may confuse rather than facilitate understanding; — Too few indicators may lead to an overly simplistic approach; — Unreliable or missing data may lead to misleading indicators.
Matrices	— Can lead to overly simplistic conclusions; — Can be repetitive and time consuming; — Different issues covered in matrices can come with very different units, data requirements and reliability.
Networks	— Can be inflexible when presenting problems; — Can be insufficiently multi-dimensional.
Multi-criteria analysis	— Can lead to an overly simplistic result (e.g. to one number); — Should only be used in comparative ways (e.g. when assessing different options) but never in absolute terms.
Environmental cost–benefit analysis	— Can lead to an overly simplistic result (e.g. to one monetary value); — Should only be used in comparative ways (e.g. when assessing different options); — Difficulties in allocating monetary values to environmental impacts, such as on ecosystem services.
Risk assessment	— Can be resource consuming and time consuming; — Can be overly mathematical.
Overlay mapping	— Often requires a large amount of spatial data that may not be available; — Only allows for spatial problems to be assessed; — Requires up to date and reliable data.
Expert opinion	— Experts may draw conclusions from past experience that do not apply to actual circumstances; — People may mistrust experts; — Experts may not have a specific or broad enough expertise to reliably judge a situation.
Modelling and scenario analysis	— Can be a 'black box' that is difficult to judge, even by external experts; — Is usually based on numerous assumptions, giving the modeller considerable control over the actual results of the model; — Can lead to overly simplistic results; — Can be incomprehensible to the general public; — One 'wrong' parameter can lead to a 'wrong' result.

TABLE 14. USE OF METHODS AT DIFFERENT PROCEDURAL STAGES OF THE SEA

	Screening	Scoping	Assessment	SEA report	Decision making	Monitoring and wider follow-up
Analogues	✓	✓	✓	✓		
Checklists	✓	✓	✓	✓	✓	✓
Indicators	✓	✓	✓		✓	✓
Matrices	✓	✓	✓		✓	
Networks	✓	✓	✓			
Multi-criteria analysis			✓		✓	
Cost–benefit analysis			✓		✓	
Risk assessment			✓			
Overlay mapping			✓			
Expert opinion	✓	✓	✓	✓	✓	✓
Modelling			✓			

7. SEA REPORT

The main purpose of the SEA report for a nuclear power programme is to illustrate the main aspects considered during the assessment process and to summarize and communicate the agreements reached, concerns raised, outcomes obtained and recommendations given. As a rule, the report should be written in simple and comprehensible language, so that both experts and lay people can understand it. This is of key importance, as transparency is a rationale for conducting the SEA in the first place.

Furthermore, it is important that the different sections of the report have the appropriate length and that no section is either over emphasized or overlooked. For example, the general characteristics of nuclear power technologies should only be covered to the extent to which this is meaningful for an SEA. Otherwise, attention may be drawn away from the environmental and related sustainability issues. However, to ensure clarity about the assumptions made for assessing environmental impacts, further technical detail should be accessible and referred to, for example, in an annex to the SEA report, or in the document proposing the nuclear power programme.

On the basis of best practice, an SEA report dealing with such a complex matter as a nuclear power programme should be comprehensive and have no more than 500 pages, excluding any annexes, with an additional non-technical summary of no more than 10 pages.

The report should be prepared without bias, given the various and often divergent views of stakeholders. In this context, it is important to note that it should not be written in a defensive style, for example, when reacting to stakeholder criticism, as this may lead to the impression that the authors of the report were not entirely open to external suggestions.

With regard to a balanced report, Fig. 17 provides an indicative overview of the emphasis of each of its parts. The actual shares

will need to be adjusted to best address the given circumstances.

This section first presents the main parts and the overall structure of an SEA report before providing guidance regarding its quality review in Section 7.2.

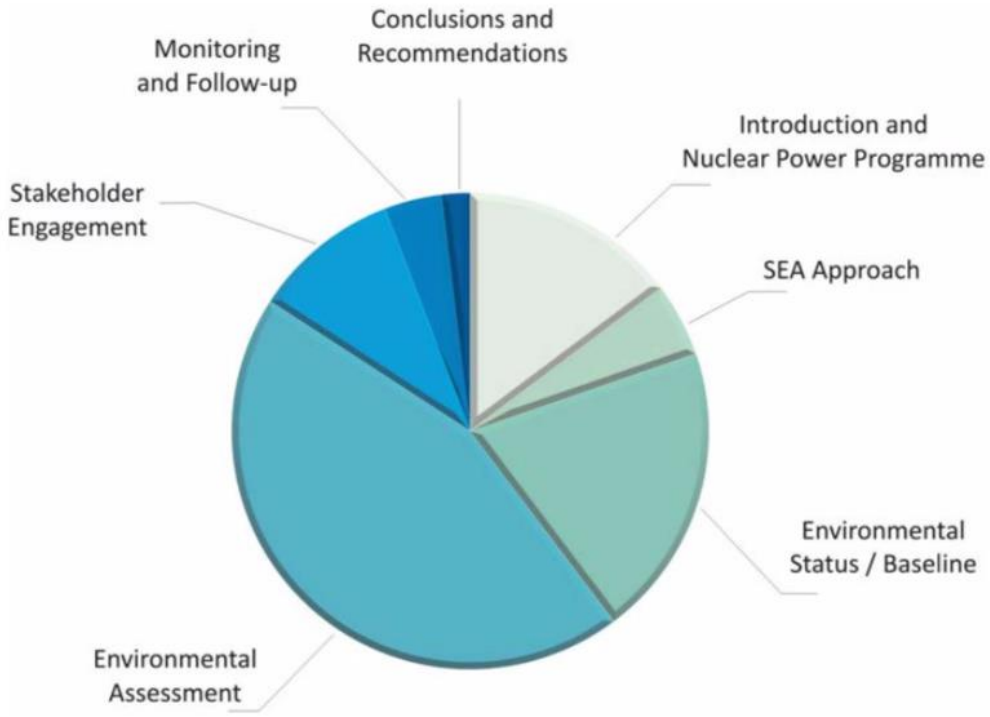


FIG. 17. Suggested approximate composition of an SEA report (excluding annexes).

7.1. Main sections of the SEA report

The SEA report is the main document used by all stakeholders regarding the environmental impacts of a nuclear power programme. It is also the main basis for keeping track of the measures agreed upon during implementation of the nuclear power programme, as well as during monitoring and follow-up. The different sections of an SEA report are introduced in this section, including the non-technical summary; introduction and background; nuclear power programme; SEA approach; environmental status/baseline; environmental assessment; stakeholder engagement and public participation; monitoring, evaluation and follow-up recommendations; as well as conclusions and recommendations, including next steps. Reflecting these constituent parts, an overview of the structure of an SEA report is provided in Box 3.

7.1.1. Non-technical summary

The SEA report should start with a non-technical summary of the main aspects resulting from the SEA process. This should highlight the most relevant environmental and social considerations, and impacts identified during the consultation process. It should explain the resulting adjustments and mitigation measures for the preferred option arising from the SEA process and how SEA considerations have been reflected in the nuclear power programme. The main features of the nuclear power programme and the findings of the SEA process should also be presented. These include the objectives of the nuclear power programme and the main

criteria used during the screening and scoping phases to decide on why it should be subject to an SEA. The summary should also explain the benefits of an SEA, the requirements to undertake it in terms of legal frameworks, and the role of institutions, as well as the boundaries of the assessment itself.

The status of the environment and its development without the nuclear power programme (baseline) will be summarized with respect to environmental aspects having a significant potential to be affected, followed by the key findings of the assessment. Special consideration should be given to the main points raised during consultation. The summary should make reference to any quality review processes used during the SEA process (see Section 7.2). Furthermore, it should contain the main recommendations for monitoring, follow-up and the evaluation of the implementation of the key measures identified during the SEA process.

7.1.2. Introduction and background

This section lists and summarizes the energy policy and planning documents relevant to the nuclear power programme that were considered and analysed in the assessment. It positions the programme within this space, including relevant higher level decisions made previously. This section should also include reference to other, non-nuclear, yet relevant policies, plans and programmes, and associated SEAs (see Figs 2–5). This should include overall energy sector policies, in which nuclear energy has been identified as one of the preferred options. The SEA for the nuclear power programme either needs to be in line with the findings of such documents, such as the energy sector SEA, or, if it deviates from them, it should explain what has changed and the reason why.

7.1.3. Nuclear power programme

The SEA report needs to include a description of the nuclear power programme, its objectives and how it is meant contribute to the country's overall sustainable development objectives. This includes environmental objectives to ensure coherence with the country's environmental policies, regulations and multilateral agreements.

Furthermore, the report should describe the main aspects of the programme and the options considered when devising it, and what role the SEA played in this context, including issues such as potentially suitable sites and technologies. The implementation plans should also be explained. A very important part of this section is a brief explanation of how and why the selected nuclear power programme options were chosen. In this context, it is assumed that detailed information on technical aspects of the options assessed is provided in an annex or in the document proposing the nuclear power programme.

7.1.4. SEA approach

The SEA report should present a summary of the objectives of the SEA, including those of international and national legal and regulatory frameworks affecting the SEA for the nuclear power programme, and how these relate to the environmental and social priorities of other policies, plans, programmes and projects. The report should also describe how the processes used in developing the SEA, the nuclear power programme and any related decision making were linked and coordinated.

The SEA approach should describe the scope of the work and its boundaries, and introduce the methodology used (i.e. the assessment process followed and the methods applied) in undertaking the SEA as well as the options identified and analysed. Describing the scope of the work and its boundaries is especially important to clearly point out what was subject to this SEA and what was not. To support the related decisions taken, the SEA report should contain the scoping report (see Section 4.3) in an annex, signed by the relevant stakeholders that participated in the SEA process. This is important, as a scoping report will contain the endorsement, with respect to the coverage (scope) of the SEA, of the representatives of the public and of the main stakeholders.

Furthermore, when describing the SEA approach, the quality review process of the SEA should also be explained. Quality review tables should be attached in an annex.

7.1.5. Environmental status/baseline

The SEA report should summarize the current status of those environmental aspects that could potentially be affected in a significant manner by the activities of the nuclear power programme and their likely evolution without it. Among these aspects, the report should present the environmental characteristics of areas likely to be affected, existing problems within these areas and the environmental protection objectives assigned to them. Special attention should be given to the environmental transboundary implications of the nuclear power programme.

7.1.6. Environmental assessment

In addition to the description of the environmental status, the report also needs to explain how the various environmental aspects will be impacted by the nuclear power programme. In this context, the report should cover the main topics identified during the assessment exercise, including all relevant effects (e.g. direct, indirect and cumulative). It is also important to establish which aspects are considered elsewhere in the energy and nuclear planning decision framework (see Figs 2–5).

The SEA report should also describe the (state of the art) methods with which effects were identified, prioritized and assessed. It is suggested that the assessment follow the structure across those nuclear power impact areas that were scoped in, as outlined in Section 3, addressing the relevant environmental impact themes for each of them. It should investigate: (i) baseline, (ii) impacts, (iii) options within the nuclear power sector and (iv) mitigation measures. In this context, it should also explain the reasons for selecting these options. This section of the SEA report should indicate the positive and negative aspects and impacts of each option, and provide recommendations. Throughout the assessment, this section should highlight any difficulties or uncertainties faced which may influence the assessment and its recommendations. This may include issues such as data quality or any constraints put on effective assessments by the existing decision framework. This section should pay special attention to transboundary issues.

7.1.7. Stakeholder engagement and public participation

The SEA report should summarize the engagement and participation process, including its objectives, main aspects, findings and consequences. This should include the results of initial stakeholder mapping (with regard to their influence, attitude/positioning and interests) and present the outreach strategy chosen to engage with each of the identified stakeholder groups. In this context, reference should be made to transboundary engagement processes. It should also include the issues raised and outcomes of the stakeholder engagement during the scoping, the assessment and the SEA report (see Section 5).

Once a decision on the nuclear power programme has been made, the SEA report should be accompanied by a post-decision statement which explains the reasons for adopting the programme in its final form in the light of other reasonable options. It should summarize where and how the recommendations of the SEA process were taken into account. This is one of the most important aspects of SEA, since it will only have been effective if it is able to influence the nuclear power programme. This includes an effective consideration of the main concerns of key stakeholders.

7.1.8. Monitoring, evaluation and follow-up recommendations

The SEA report should point out the main processes and approaches for future monitoring, evaluation and follow-up. This should include clearly specified actions, responsibilities and timelines. In this context, it should cover both conformance and

performance monitoring (see Section 4.7). In the case of performance monitoring, a description of the indicators, targets and methods is useful to measure, monitor and evaluate whether predictions are in line with actual impacts. The report should also look into already existing monitoring arrangements and evaluate whether and how they may be used in the context of the nuclear power programme, in order to avoid a duplication of effort.

7.1.9. Conclusions and recommendations, including next steps

In the conclusions, the SEA report should summarize its key findings and recommendations. It should outline the next steps, with regard to: (i) the overall SEA process, (ii) the future use of the SEA report and (iii) the potential need to update the report or its recommendations (e.g. upon availability of new or more accurate data, analyses or experience).

Box 3 provides an overview of the structure of an SEA report and the issues covered, following on from the previously introduced content of the SEA report. An SEA report that covers these issues and prioritizes relevant aspects of the nuclear power programme is likely to be a valuable tool for summarizing and communicating the agreements reached on how to deal with the concerns raised during the SEA process.

BOX 3. STRUCTURE OF SEA REPORT

Non-technical summary:

— Summarizing the key issues of the SEA.

Introduction and background:

— Mapping of energy policy and planning framework;

— Positioning of the nuclear power programme within this framework.

Nuclear power programme:

— Objectives of the nuclear power programme and description;

— Contribution towards sustainable development goals;

— Considerations within the nuclear power programme (e.g. site, technology).

SEA approach:

— Objectives of SEA;

— Environmental protection objectives;

— National and international legal and regulatory frameworks;

— Relationship to other relevant policies, plans, programmes and projects;

— Scope, boundaries and methodology of the SEA and options to be assessed;

— Quality review process;

— Coordination of the SEA and the development of the nuclear power programme.

Environmental status/baseline:

— Current state of those environmental aspects that are potentially significantly affected and their likely evolution without the programme;

— Existing problems within areas likely to be affected;

— Transboundary issues.

Environmental assessment:

— Scope of assessment, based on scoping report.

— Impacts on environmental issues and their significance, assessing: (i) main siting and technological options considered; (ii) power plant construction, operation and decommissioning; (iii) nuclear fuel cycle; (iv) spent fuel management strategy/radioactive

waste storage and disposal; (v) physical protection and security; (vi) emergency preparedness and response; (vii) wider physical infrastructure requirements.

Stakeholder engagement and public participation:

— Objectives;

— Stakeholder mapping;

— Outreach strategy;

— Key issues raised during scoping, the assessments and on the draft report;

— Adjustments to the SEA process and the nuclear power programme.

— Monitoring, evaluation and follow-up recommendations:

— Process and approaches for conformance and performance monitoring.

Conclusions and recommendations, including next steps

The SEA report is an important input to be considered when preparing and adopting the nuclear power programme. It should have a strong position in the mind of decision makers as it contains the agreements reached between stakeholders. It should be permanently consulted to ensure that the actions contained are implemented, evaluated and monitored, in order to take corrective actions if necessary. Ensuring the high quality of the report and its underlying processes is, therefore, of importance, as outlined in the following section.

7.2. SEA report quality review

As introduced in Section 4.8, an SEA report needs to fulfil a number of quality criteria. These relate to: its content and technical integrity; compliance with the scoping stage and legal and other regulatory requirements (including other relevant SEAs); the prediction of impacts (including the application of accepted/good practice methods); and how the SEA content is communicated to the stakeholders. A quality review needs to evaluate these criteria.

In this section, a review table is introduced which helps to assess the quality of an SEA report, and the information it provides and impacts it analyses. The main purpose of the quality review table is to allow evaluation of the report in a simple, effective and efficient way.

Quality review can be performed using a set of hierarchically arranged review topics. An overall report quality mark is assigned on the basis of the individual marks given to the nine suggested review areas. To facilitate the evaluation of these review areas, a set of quality criteria are provided for each of them. It is not advisable to assign marks using a mathematical approach (e.g. with weighting factors), as the omission of one important aspect alone could lead to an unsatisfactory SEA report. However, in this case, it may not be difficult to address this omission and, consequently, improve the quality of the report to an acceptable standard.

With regard to marking questions and review areas, quality grades need to be assigned. These could, for example, range from A (best possible grade) to F (worst possible grade), as presented in Table 15. Ideally, quality reviews are done by more than one reviewer and marks are subsequently compared. The reviewers would then confer and discuss their respective marks, with the aim of allocating agreed marks to review areas and to the overall quality of the report.

The review table that follows (Table 16) presents nine main review categories comprising some forty questions. These questions are, in part, derived from the EU SEA Directive [4] (see Annex). The review table can be adapted to any specific situation of application by changing the questions and review categories.

TABLE 15. SUGGESTED SEA REPORT QUALITY REVIEW SCORING SYSTEM

Grade	Description of grade
A	The work has generally been well performed with no important omissions
B	The work has been performed satisfactorily, with only minor omissions or inadequacies
C	The work is regarded as just satisfactory, despite some omissions or inadequacies
D	The work is regarded as well attempted but, on the whole, is unsatisfactory because of omissions or inadequacies
E	The work is unsatisfactory, revealing major omissions or inadequacies
F	The task was not attempted at all
n.a.	Not applicable

TABLE 16. SEA REPORT QUALITY REVIEW TABLE

Name of reviewer:
Name of SEA:

(1) Non-technical summary	Grade	Comments
The SEA report:		
Includes a non-technical summary which reports, in simple and clearly comprehensible language, the results of the SEA as portrayed in the SEA report, including options considered, impacts identified and mitigation measures introduced for the preferred option.		
Evaluation of section (1)		

(2) Introduction and background	Grade	Comments
The SEA report:		
Clearly maps out the energy policy and planning framework in the country in which the programme is prepared.		
Clearly positions the programme within the underlying energy policy and planning framework.		
States which other policies, plans, programmes and projects are relevant and their relationship to the programme.		
Evaluation of section (2)		

(3) Nuclear power programme	Grade	Comments
The SEA report:		
Clearly describes and explains the objectives of the programme.		
Explains how the programme contributes towards environmental and sustainable development objectives.		
Explains the scope of the programme (i.e. what categories of sites and technology are covered).		
Evaluation of section (3)		

(4) SEA approach	Grade	Comments
The SEA report:		
Clearly describes and explains the objectives of the SEA (e.g. environmental protection objectives).		
Clearly explains the national and international legal and regulatory frameworks governing the SEA.		
Explains the scope, boundaries and methodology of the SEA, along with the options that were assessed.		
Describes how the SEA and the nuclear power programme processes were coordinated (it is recommended that the SEA take place during the preparation of the programme and be conducted in parallel with it, converging at regular intervals).		
Outlines all important issues (e.g. the IAEA's 19 nuclear infrastructure issues [14]) that are addressed elsewhere.		
Evaluation of section (4)		

TABLE 16. SEA REPORT QUALITY REVIEW TABLE (cont.)

Name of reviewer:
Name of SEA:

(5) Environmental status/baseline	Grade	Comments
The SEA report:		
Provides relevant information on the present status of those environmental, economic and social issues that are expected to be significantly affected, and how they would develop in the absence of the nuclear power programme. Data gaps are also described.		
Provides information on any current environmental concerns, especially those affecting areas of environmental importance.		
Carefully considers and explains what issues of the environmental status in other countries need to be taken into account (transboundary issues).		
Evaluation of section (5)		

(6) Environmental assessment	Grade	Comments
The SEA report:		
Is in line with what was agreed in the scoping report. Deviations thereof are clearly explained and it is clear that stakeholders were aware of these deviations.		
Describes how reasonable mitigation and alternative technological and siting options were identified, considering the objectives and the geographical scope of the nuclear power programme.		
Provides information on the likely significant environmental impacts (magnitude of impact versus sensitivity of environment) of different options for each of the scoped in nuclear power impact areas, and for all relevant types of impact (see the points listed in Section 4.4.2) for each of the relevant environmental impact themes (see Section 3.3), and the interrelations between them. The impact areas may include:		
— Main siting and technological considerations;		
— Power plant construction, operation and decommissioning;		
— Nuclear fuel cycle strategies;		
— Spent fuel management strategies/radioactive waste storage and disposal;		
— Physical protection and security;		
— Emergency preparedness and response;		
— Wider physical infrastructure requirements.		
Provides information on the foreseen measures to avoid, reduce or otherwise mitigate any expected significant negative environmental impacts and related sustainability issues.		
Explains what residual impacts will remain after mitigation.		
Shows how state of the art knowledge and assessment methods were used.		
Evaluation of section (6)		

TABLE 16. SEA REPORT QUALITY REVIEW TABLE (cont.)

Name of reviewer:
Name of SEA:

(7) Stakeholder engagement and public participation	Grade	Comments
The SEA report:		
Describes how (and which) authorities and stakeholders and the public were consulted and explains the results of stakeholder mapping.		
Describes the outreach strategy and explains how the draft SEA report was made available to authorities and those members of the public likely to be affected or to have an interest in the programme.		
Confirms that these communication channels were adjusted to the stakeholder groups and enabled them to participate in the engagement process. Confirms that they were allowed to express their opinions within an appropriate time frame.		
Confirms that results of the consultation on the SEA were considered in decision making and what adjustments were made.		
Evaluation of section (7)		

(8) Monitoring and evaluation of follow-up recommendations	Grade	Comments
The SEA report:		
Describes the foreseen measures regarding both conformance and performance monitoring to ensure that the implementation of the nuclear power programme is in line with the SEA recommendations. Specifies what will be monitored by whom, how and when.		
In this context, investigates the possibility to use or adjust existing monitoring mechanisms to avoid duplication.		
Evaluation of section (8)		

(9) Presentation of information and results	Grade	Comments
The SEA report:		
Is included as a clearly distinguishable SEA section in the nuclear power programme or as a separate SEA report.		
Is well written and in language facilitating the engagement of relevant stakeholders.		
Provides information on any complications (such as technical issues, unreliable data or lack of know-how) and uncertainties faced when collecting and processing data and information.		
Once a decision on the nuclear power programme has been made, provides a statement summarizing how environmental considerations were taken into account in the programme, based on the SEA report and stakeholder consultations. Explains the programme in its final form with regard to the excluded alternative options that were assessed.		
Evaluation of section (9)		

Overall grade for SEA report		
Any additional notes		

8. CONCLUDING REMARKS

These guidelines offer a menu of options and methods for conducting customized SEA for nuclear power programmes. In this context, SEA is understood to be a decision support tool applied in assisting the preparation of a specific programme by ensuring its environmental sustainability. Based on an analysis of the context within which SEA is applied, it is also a tool to position a nuclear power programme within the wider energy decision framework, which usually consists of a range of associated policies, plans, programmes and projects.

An important underlying assumption of these guidelines is that nuclear energy was identified as an option in prior energy policy making, informed by an energy policy SEA. The main focus of a nuclear power programme SEA is, therefore, not on why nuclear energy is used, but rather on its implementation, based on programme specific aspects such as siting criteria and technologies. In this context, it aims to avoid or mitigate any expected significant negative environmental impacts and, importantly, to enhance positive environmental and related sustainability outcomes. It does so by assessing various implementation options and their implications across the entire nuclear fuel cycle, including the construction, operational and decommissioning stages of nuclear power generation. By identifying and removing those options that are unsustainable at a point in time at which only limited resources have been spent on their development, SEA helps save time and money.

When assessing the identified options, numerous methods can be applied. Choosing the right one will involve matching the complexity of the method with the specific situation to which it is applied. For example, simpler methods may be more transparent and, thus, facilitate wider communication. On the other hand, more advanced methods may allow analysis of more complex relationships, but their application and the interpretation of results may be limited to experts. When data availability is a concern, methods will have to be chosen accordingly. To ensure transparency and allow for later improvements, it is important to record in the SEA report any data gaps or situations in which unreliable data were used, and also the potential implications for the assessment. Whatever data and methods are used, they will just be one element of several supporting and informing the SEA process, such as a continuous stakeholder dialogue.

Through consideration and discussion of opinions proposed by stakeholders, such as authorities and the general public, early on in the process, SEA increases the overall transparency of decision making and helps decision makers to engender public trust. This reduces the risk of deadlock during decision making on individual subsequent projects, owing for example to local opposition. To achieve these benefits, SEA for nuclear power programmes has to provide a platform for informed and fair public debates. Considering the challenges associated with public debates, it is advisable to follow clear and strict rules with regard to the requirement to validate claims. A skilled SEA moderator is, therefore, key for achieving an effective SEA that can help reconcile conflicting objectives pursued by different administrations and sectors.

The main document referred to by all stakeholders is the SEA report. It is, therefore, important that it be accessible, both physically and with regard to the language used. This requires keeping its audience in mind, which comprises both lay people as well as experts. It is recommended that technical detail be provided only to the extent required for the reader to understand the environmental implications of the assessed options. Furthermore, the sections of the SEA report should be balanced and refer to each other. For example, the part describing the environmental baseline should not dominate others simply because related information was widely available. Instead, the focus should be on those environmental aspects that are expected to be significantly affected by the nuclear power programme.

SEA will only be effective if it is proactive, driving ideas for options and issues to be considered in a nuclear power programme. Thus, an SEA does not end once the SEA report is written. Rather, it needs to be demonstrated that SEA results fed into the decisions taken and that subsequent developments are in line with those decisions and the underlying SEA. This requires establishing an appropriate monitoring process that verifies the conformity of these subsequent developments with the SEA and checks whether future impacts are in line with what was foreseen in the SEA. The responsibility for overseeing the entire SEA process will vary between different countries and administrative levels. It can lie with, for example, an energy or an environmental authority. In any event, it is advisable that an environmental authority play a key role in conducting an SEA, in particular, in the associated SEA quality review and evaluation.

Quality assurance is a comprehensive exercise comprising multiple aspects, from the quality of the decision making framework and its institutions, to the quality of the process itself, including stakeholder engagement and public participation, as well as the SEA report. Quality assurance further encompasses ensuring the expertise of those conducting the SEA as well as its ability to influence decisions and the subsequent project design. Quality assurance will be significantly more effective if it involves an external review by an unbiased body. This will also add to the credibility of the SEA process. The main responsibility for the quality of the SEA will, however, rest with those driving the process, comprising both the experts conducting it and the authority in charge of steering it.

In order to capitalize on its anticipated benefits, SEA needs to be applied as early as possible in the nuclear power programme development process and accompany that process in all stages of its preparation. It is important to note that the results of an SEA will not remain valid indefinitely, and that there may be a need to revisit and revise an SEA in the case of, for example, major policy or other changes.

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Annex

REQUIREMENTS FOR SEA AND COUNTRY EXPERIENCES

A–1. EU SEA directive and UNECE protocol on SEA

Given their similarities, this section combines and compares selected requirements for strategic environmental assessment (SEA) based on both European Union (EU) Directive 2001/42/EC on Assessment of the Effects of Certain Plans and Programmes on the Environment (EU SEA Directive) [A–1], and the United Nations Economic Commission for Europe (UNECE) Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a Transboundary Context (UNECE Protocol on SEA) [A–2]. In addition, text in this section is taken from EU Directive 2011/92/EU [A–3], as amended by EU Directive 2014/52/EU [A–4], on environmental impact assessment (EIA), and from EU Directive 92/43/EEC (Habitat Directive) [A–5], to which the EU SEA Directive refers.

The EU SEA Directive [A–1], as any other EU Directive, is binding with regard to the results to be achieved, but leaves the choice of form and methods to Member States. It is required to be transposed into national legislation of EU Member States. Signing United Nations conventions and protocols to conventions demonstrates the support of a party to later ratify it, and only at this point do they become legally binding.

For both the EU SEA Directive [A–1] and the UNECE Protocol on SEA [A–2], SEA shall be carried out for plans and programmes which are likely to have significant environmental effects. According to the UNECE Protocol on SEA [A–2], this also explicitly includes health effects. Further, it also provides a non-mandatory framework for application of SEA to policies and legislation.

For both the EU SEA Directive [A–1] and the UNECE Protocol on SEA [A–2], SEA shall address plans and programmes which set the framework for future development consent for, for example, energy or waste management projects, such as:

— “Thermal power stations and other combustion installations with a heat output of 300 megawatts or more and nuclear power stations and other nuclear reactors (except research installations for the production and conversion of fissionable and fertile materials, whose maximum power

does not exceed 1 kilowatt continuous thermal load)" [A–2];

- "Waste-disposal installations for the incineration, chemical treatment or landfill of toxic and dangerous wastes" [A–2];

- "Installations solely designed for the production or enrichment of nuclear fuels, for the reprocessing of irradiated nuclear fuels or for the storage, disposal and processing of radioactive waste" [A–2].

Further, both the EU SEA Directive [A–1] and the UNECE Protocol on SEA [A–2] refer to the following point, which in the latter is, however, limited to plans and programmes which set the framework for future development consent for projects that require an EIA under national legislation:

- "Deep drillings (in particular geothermal drilling, drilling for the storage of nuclear waste material, drilling for water supplies), with the exception of drillings for investigating the stability of the soil" [A–2].

The UNECE Protocol on SEA [A–2] further explicitly mentions:

- "Construction of overhead electrical power lines with a voltage of 220 kilovolts or more and a length of 15 kilometres or more and other projects for the transmission of electrical energy by overhead cables."

In this context, the EU SEA Directive [A–1] more generally refers to industrial installations for carrying gas, steam and hot water; transmission of electrical energy by overhead cables.

The UNECE Protocol on SEA [A–2] further explicitly refers to:

- "the dismantling or decommissioning of...[nuclear] power stations or reactors (except research installations for the production and conversion of fissionable and fertile materials whose maximum power does not exceed 1 kilowatt continuous thermal load)".

The EU SEA Directive [A–1] refers to the Habitat Directive [A–5], which — as it is an EU regulation — is not mentioned in the UNECE Protocol on SEA [A–2]. The Habitat Directive [A–5] aims to promote biodiversity and to ensure the conservation of a wide range of rare, threatened or endemic animal and plant species. It establishes the Natura 2000 networks of nature protection areas. The EU SEA Directive [A–1] requires SEA to be performed for plans and programmes which, in view of the likely significant effect on sites, have been determined to require an assessment pursuant to the Habitat Directive [A–5].

The following are common to both the EU SEA Directive [A–1] and the UNECE Protocol on SEA [A–2]:

- SEA is required for any other plans and programmes which Member States/Parties determine are likely to have significant environmental effects (including health for the UNECE Protocol on SEA [A–2]). This shall be determined either through case by case examination or by specifying types of plans and programmes or by combining both approaches (considering the criteria determining the likely significance of effects as listed in the EU SEA Directive [A–1]). The related conclusion of Member States/Parties, including reasons for not requiring an environmental assessment, shall be made available to the public.

- Plans and programmes which determine the use of small areas at local level and minor modifications to plans and programmes shall require an environmental assessment only where the Member States/Parties determine that they are likely to have significant environmental effects. Excluded are

plans and programmes the sole purpose of which is to serve national defence or civil emergency, and financial or budget plans and programmes.

A–2. Selected examples of national regulations and practices

A–2.1. National Environmental Policy Act, United States of America

The National Environmental Policy Act of the United States of America of 1969 (amended 2000) points to the continuing responsibility of the Federal Government to use all practicable means to improve and coordinate Federal plans, functions, programmes and resources to fulfil the responsibilities of each generation as trustee of the environment for succeeding generations. The act requires that all agencies of the Federal Government utilize a systematic, interdisciplinary approach drawing on natural and social sciences and environmental design arts in cases when planning and decision making may have an impact on the environment. Further, they shall ensure that presently unquantified environmental values are given appropriate consideration in decision making along with economic and technical considerations.

Whenever proposed legislation and other major Federal actions significantly affect the quality of the human environment, a detailed statement is required describing: the environmental impact, any unavoidable adverse environmental effects, alternatives to the proposed action, the relationship between local environmental short term uses and long term productivity, and any irreversible and irretrievable commitments of resources. The act further refers to support for related international cooperation, information sharing, the use of ecological information when planning and developing resource oriented projects, and the identification of alternatives for unresolved conflicting resource uses.

A–2.2. Environment Protection and Biodiversity Conservation Act, Australia

Australia's Environment Protection and Biodiversity Conservation Act of 1999 prohibits action that has, or is likely to have, a significant impact on the environment, unless the minister gives approval or decides that approval is not needed. The minister may further agree that an assessment of the impacts of actions resulting under a policy, plan or programme is required. This refers to action affecting a declared World Heritage property, a national heritage place, a declared Ramsar wetland, listed threatened and migratory species, or the marine environment. It specifically points to the protection of the environment from nuclear actions, which refer to: (i) establishing or significantly modifying a nuclear facility (including research reactors and production of nuclear materials for industrial or medical use); (ii) transport of spent nuclear fuel or radioactive waste products arising from reprocessing; (iii) establishing or significantly modifying a facility for storing radioactive waste products arising from reprocessing; (iv) mining or milling uranium ore; (v) establishing or significantly modifying a large scale disposal facility for radioactive waste; or (vi) decommissioning or rehabilitating any nuclear facility.

A–2.3. Law of the People's Republic of China on Evaluation of Environmental Effects

Evaluation of environmental effects as referred to in the Law of the People's Republic of China on Evaluation of Environmental Effects of 2002 consists of: the analysis, prediction and assessment of possible environmental effects after implementation of plans and construction projects; ways put forth and measures for preventing or mitigating the adverse effects on the environment; and the methods and systems applied for follow-up monitoring. When making arrangements for formulating plans for the utilization of land, the environmental effects need to be evaluated in this process and an explanation of the effects needs to be given in the plan.

A–2.4. SEA practice in Kenya

SEA was first introduced through the Environmental (Impact Assessment and Audit) Regulations of 2003. These regulations required that it be determined which proposals for public policies, plans and programmes were the most environmentally friendly and cost effective when implemented individually or in combination with others. However, initially related efforts focused on EIAs and environmental audits that were also introduced with this regulation, and the first SEA was performed in 2005.

In 2014, the National Environment Management Authority launched the National Guidelines for Strategic Environmental Assessment in Kenya to give direction on how SEA is to be conducted in practice in Kenya. In the section on screening, in addition to significant environmental effects, a range of other criteria are highlighted, such as: health, safety and politically contentious issues; cumulative and transboundary effects; uncertainty in predictions; or indirect effects through affecting the behaviour of third parties.

In 2015, Kenya amended its Environmental Management and Co-ordination Act of 1999 with Section 57A to specifically require SEA for all polices, plans and programmes that are determined to be likely to have significant effects on the environment. Aligned with this amended act, the draft Environmental (Strategic Assessment, Integrated Impact Assessment and Audit) Regulations, 2017 will repeal the Environmental (Impact Assessment and Audit) Regulations, 2003 once enacted.

As of 2016, close to 50 SEAs have been, or are being conducted, including the SEA for Kenya's Nuclear Power Programme which was initiated by the Kenya Nuclear Electricity Board in May 2016.

A–2.5. The Khyber Pakhtunkhwa Environmental Protection Act, Pakistan

With the Khyber Pakhtunkhwa Environmental Protection Act of 2014, the Khyber Pakhtunkhwa province of Pakistan established a legal foundation for SEA. It empowers the Government to ask for SEA to be carried out for any plan or policy likely to have an adverse impact on the environment. It specifically points to issues such as land use and water use management, transport and infrastructure, waste and, more generally, socioeconomic development. It further states that Government agencies and local authorities may be asked to conduct SEA and submit a related statement to the Khyber Pakhtunkhwa Environmental Protection Agency. This agency will then be in charge of a stakeholder engagement process, reviewing received comments and advising Government agencies and local authorities on any required modifications of the plan or policy. Further, this agency is supposed to maintain publicly accessible registers for SEA reports and the related decisions taken.

A–2.6. Law No. 32/2009 on Environmental Protection and Management, Indonesia

Law No. 32/2009 on Environmental Protection and Management of Indonesia lists SEA as one of several instruments to prevent environmental pollution and/or damage, together with, for example, EIA, quality standards or related legislation. Articles 15–18 oblige the Government and regional governments to apply SEA and its results to ensure the principles of sustainable development form the basis for the development of policies, plans and programmes in a region. The law explicitly refers to spatial planning and mid-term to long term development planning, but also, more generally, to all decision making processes with the potential to cause environmental impacts or risks. An SEA shall assess, among other things, environmental impacts, risks and resilience, ecosystem services, biodiversity, the efficiency of natural resource utilization, and the vulnerability to climate change and related adaptation potential. SEA needs to formulate alternatives and recommend possibilities for improvements. The law further explicitly refers to the need for involving communities and stakeholders. An example for SEA in Indonesia includes the Masterplan for

Acceleration and Expansion of Indonesia's Economic Development (SEA MP3EI), which also implicitly assesses energy related aspects.

A–2.7. Law for the Protection and Development of the Environment, United Arab Emirates

Federal Law No. 24 of the United Arab Emirates of 1999 aims at protecting and conserving the quality and natural balance of the environment. Further, it aims at controlling and avoiding harmful effects from economic, agricultural, industrial, development or other programmes aiming to improve life standards. It refers to the consideration of present and future generations when developing natural resources and conserving biological diversity. While this law does not specifically refer to SEA, it is in line with the established standards of conduct for the promotion of environmentally sound management practices for the development of infrastructure projects of the Environment Agency — Abu Dhabi. In this context, it details that the Environment Agency may require SEA when the development of the design for the proposed project is not yet finalized or when environmental baseline data are not yet available. While the SEA precedes the EIA, there is no specific reference to SEA for policy, plans and programmes.

References to Annex

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MILESTONES IN THE DEVELOPMENT OF A NATIONAL INFRASTRUCTURE FOR NUCLEAR POWER ("IAEA MILESTONES APPROACH")

IAEA Nuclear Energy Series No. NG-G-3.1 (Rev. 1)

1. INTRODUCTION

1.1. Background

A nuclear power programme is a major undertaking requiring careful planning, preparation and investment in time, institutions and human resources. While nuclear power is not alone in this respect, it is different because of the safety, security and safeguards requirements associated with using nuclear material.

A decision to start a nuclear power programme should be based on a commitment to use nuclear power safely, securely and peacefully. This commitment requires establishing a sustainable national infrastructure that provides governmental, legal, regulatory, managerial, technological, human resource, industrial and stakeholder support for the nuclear power programme throughout its life cycle. The demonstration of compliance with international legal instruments, internationally accepted nuclear safety standards, nuclear security guidelines and safeguards requirements is essential in establishing a responsible nuclear power programme.

The required infrastructure includes not only facilities and equipment, but also the human and financial resources and the legal and regulatory framework within which the programme will be carried out. Essentially, the same infrastructure is needed whether the programme is planned for the production of electricity, for seawater desalination or for any other peaceful purpose.

It is the responsibility of the country introducing nuclear power to establish the necessary infrastructure. Those supplying equipment to a new nuclear power programme will expect progress on a schedule that will ensure that their products are used safely, securely and sustainably.

This publication is intended to provide guidance for the benefit of those starting such programmes, based on relevant international legal instruments, IAEA safety standards and guidance publications and documents, as well as the experience and good practices of countries that have nuclear power plants in operation. Experience has shown that early attention to the 19 infrastructure issues presented here will facilitate a successful nuclear power programme. Insufficient attention to any of them may compromise safety or lead to costly delays or even project failure. This publication assumes that a country contemplating the introduction of nuclear power has a stable political, economic and social environment.

Timescales for nuclear power are long. Each nuclear power plant involves a commitment in the order of 100 years, through construction, operation, decommissioning and waste disposal. Experience suggests that the time from the initial consideration of the nuclear power option by a country to the operation of its first nuclear power plant is about 10–15 years. This may vary depending on the resources devoted to the programme. Depending on the circumstances in the country and the resources available, implementation could take longer.

The use of nuclear material requires constant strict attention to nuclear safety, nuclear security and safeguards. This is a responsibility not only to a country's own citizens but also to the international community. It is embodied in

both national and international legal instruments.

Regarding nuclear safety, the fundamental safety objective is to protect people and the environment from the harmful effects of ionizing radiation. A comprehensive safety framework needs to be developed that permeates all 19 infrastructure issues described in this publication. The IAEA safety standards provide a system of Safety Fundamentals, Safety Requirements and Safety Guides for ensuring safety, reflecting an international consensus on what constitutes a high level of safety. Safety Standards Series publications also include a roadmap for safety infrastructure development for their use by countries contemplating the introduction of nuclear power. It will be incumbent on the government, the owner/operator[21] and the regulatory body to develop awareness of safety issues and maintain a safety culture throughout the entire programme.

Regarding nuclear security, the fundamental security objective is to protect persons, property, society and the environment from the harmful effects of a nuclear security event. As with safety, a comprehensive nuclear security regime needs to be developed and sustained to prevent, detect and respond to nuclear security events.

Regarding safeguards, a country must ensure that there is no risk of proliferation of nuclear weapons and that all nuclear material is adequately accounted for and protected. This also requires the development of the appropriate culture, systems and practices to ensure that all staff are aware of their responsibilities and the importance of their actions.

1.2. Objective

This publication defines milestones in the development of the infrastructure necessary for introducing nuclear power, and provides guidance on the activities that need to be carried out before each milestone. A country can use it to ensure that:

(1) It has recognized the commitments and obligations associated with the introduction of nuclear power.

(2) It has adequately prepared the entire national infrastructure for building a nuclear power plant.

(3) It has developed all the capabilities needed to regulate and operate a nuclear power plant safely, securely and cost sustainably and to manage the resulting radioactive waste.

1.3. Scope

This publication covers both the 'hard' infrastructure (i.e. electrical grid and sites, etc.) and 'soft' infrastructure (i.e. nuclear law, regulations, training, etc.) needed for a nuclear power programme.

Infrastructure needs are discussed from the time a country first considers the nuclear power option, through decision making, planning, procurement, construction and preparations for commissioning. Subsequent steps — operation, decommissioning, spent fuel and radioactive waste management — are addressed only to the degree necessary for planning purposes prior to commissioning. They are included because all stages, including operation and decommissioning, as well as spent fuel and radioactive waste management, should be considered when the decision is made to proceed with nuclear power and because planning for these stages should be in progress by the time specifications for the plant are set. By the time the country is ready to commission a nuclear power plant, it should be ready to manage the longer term commitments associated with operation, spent fuel and radioactive waste management, and decommissioning.

[21] The owner and the operator may be two separate entities. This is discussed further in Section 3.3, on management. This publication will distinguish between the owner and operator when it is important to do so and will use the combined term 'owner/operator' when the distinction is less important.

1.4. Users

This publication is principally for decision makers, advisers and senior managers in government, industry and regulatory bodies in a country interested in introducing nuclear power.

It may also help international organizations to assess a country's progress in developing the infrastructure necessary for nuclear power and to provide timely and meaningful assistance.

Other organizations, such as suppliers, nuclear energy agencies and operator organizations, may use this publication to increase confidence that a country has the infrastructure necessary for nuclear power or to identify areas for potential assistance.

Countries interested in expanding existing nuclear power programmes may also find the publication helpful, particularly if it has been a long time since they last built a nuclear power plant.

1.5. Structure

This publication has two sections in addition to this introduction. Section 2 presents the three major infrastructure milestones in the development of a nuclear power programme. Section 3 presents 19 infrastructure issues and, for each issue, the main activities to be carried out in order to reach each milestone.

1.6. Using this publication

This publication is intended to help a country to plan the steps necessary to develop a national infrastructure for nuclear power and to assess its progress towards that goal. It is not a comprehensive guide on how to create the entire infrastructure needed for a nuclear power programme, but rather presents the elements of infrastructure that should exist at significant points in the development process. More detailed information and guidance on each of the 19 infrastructure issues is available in the IAEA publications listed in the regularly updated bibliography at:

http://www.iaea.org/NuclearPower/Infrastructure/Bibliography/index.html

2. THE PROGRAMME TO DEVELOP INFRASTRUCTURE

2.1. Infrastructure milestones

The activities needed to prepare the infrastructure for nuclear power can be split into three phases, with the duration of each dependent on the degree of commitment and resources applied in the country. The term 'infrastructure milestone' is used to identify the point at which the activities required in that phase of development have been successfully completed. Each 'infrastructure milestone' therefore corresponds to the completion of a set of activities, with no implications about the speed with which it is reached.

The three phases in developing the infrastructure necessary to support a nuclear power programme are:

— Phase 1: Considerations before a decision to launch a nuclear power programme is taken;

— Phase 2: Preparatory work for the contracting and construction of a nuclear power plant after a policy decision has been taken;

— Phase 3: Activities to implement the first nuclear power plant.

The completion of each phase is marked by a specific milestone at which the progress of the development effort can be assessed and a decision can be made to move on to the next phase. These milestones are:

— Milestone 1: Ready to make a knowledgeable commitment to a nuclear power programme;

— Milestone 2: Ready to invite bids/negotiate a contract for the first nuclear power plant;

— Milestone 3: Ready to commission and operate the first nuclear power plant.

Figure 1 is a schematic representation of the phases and milestones.

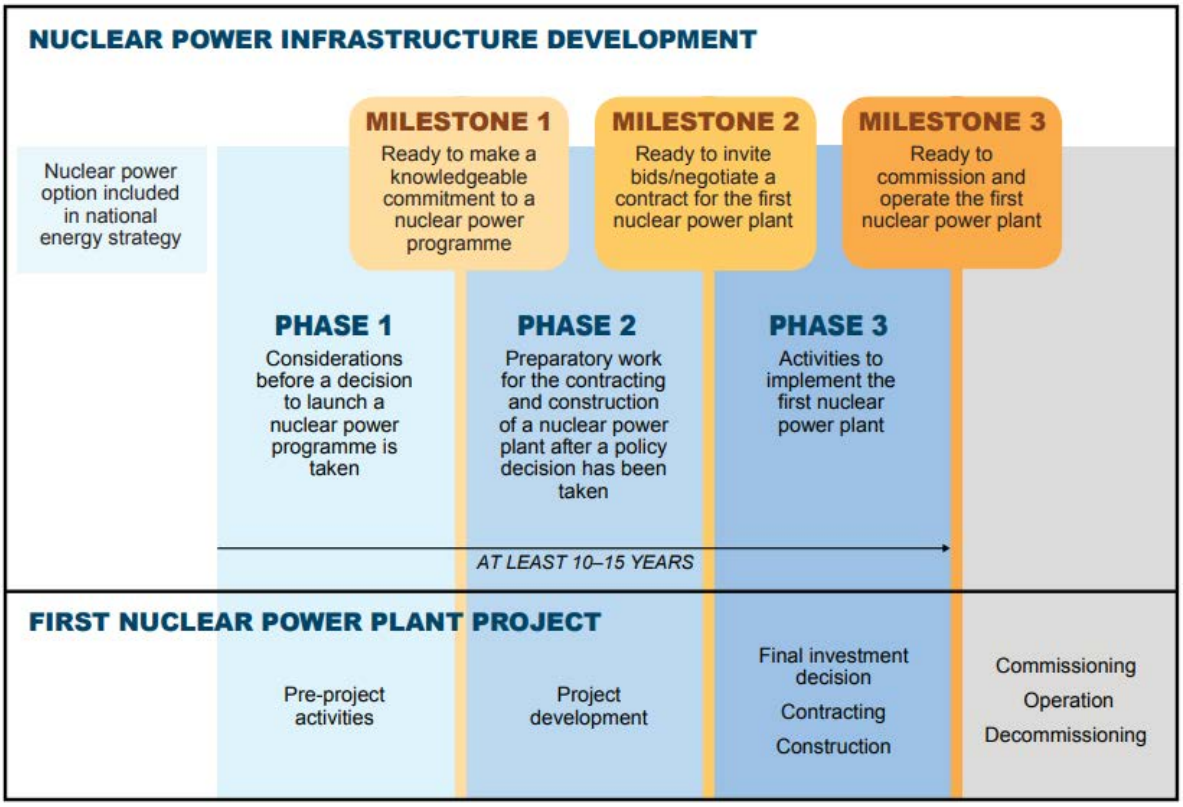

FIG. 1. Development of the infrastructure for a national nuclear power programme.

The three phases and three milestones refer to developing the national infrastructure to support a nuclear power programme. The programme includes one or more nuclear power plants, possible related projects, such as uranium exploration and fuel fabrication, and the supporting infrastructure. As the programme develops, many specific activities will be undertaken to implement the first nuclear power plant *project*, and it is important that the distinction be clear. Projects are temporary undertakings to develop and construct nuclear power plants. The infrastructure provides the processes and capabilities to enable the project activities and the subsequent operation of the nuclear power plant to be implemented safely, securely and sustainably.

In the development of the nuclear infrastructure, three key organizations are involved: the government, the owner/operator of the nuclear power plant and the regulatory body[22]. Each has a specific role to play, with responsibilities changing as the programme advances. The owner/operator may be State owned or private, be part of a domestic or international utility or be another commercial entity. The development of the regulatory body should

[22] There may be more than one regulatory body. For example, there may be one for nuclear safety and another for nuclear security. Thus, statements in this publication about 'the regulatory body' should generally be read as 'the regulatory body or bodies'.

ensure growing independence so that in Phase 2 it is effectively independent in its regulatory decision making. It will not be entirely separate from other governmental bodies, but must have sufficient authority, staffing and financial resources to be able to make independent regulatory decisions, free from any undue influences, such as pressures associated with changing political circumstances or economic conditions, or pressures from government departments or other organizations.

In this publication, it is assumed that the government will create a mechanism (which may involve high level and working level committees) to coordinate the work of these and other organizations involved in infrastructure development. In this publication, this mechanism is called the nuclear energy programme implementing organization (NEPIO). It should be noted that this designation is used here for illustrative purposes only. The country may organize the activity in a manner most appropriate to its own customs and needs.

Table 1 shows the 19 infrastructure issues that need to be considered for each milestone. The order does not indicate relative importance. Each issue is important and requires careful consideration. Different organizations will need to consider which issues relate most to them and to plan their work and resources accordingly. The three key organizations — that is, the government, the owner/operator and the regulatory body — need to ensure awareness of all issues.

TABLE 1. INFRASTRUCTURE ISSUES

The 19 infrastructure issues	
National position	Stakeholder involvement
Nuclear safety	Site and supporting facilities
Management	Environmental protection
Funding and financing	Emergency planning
Legal framework	Nuclear security
Safeguards	Nuclear fuel cycle
Regulatory framework	Radioactive waste management
Radiation protection	Industrial involvement
Electrical grid	Procurement
Human resource development	

2.2. Milestone 1: Ready to make a knowledgeable commitment to a nuclear power programme

At the beginning of Phase 1, it is assumed that a country has determined that it needs additional energy and has considered nuclear power as a possible option to meet some of these needs. During Phase 1, the country will analyse all issues that would be involved in introducing nuclear power, so at the end of Phase 1, it is in a position to make a knowledgeable decision on whether or not to introduce nuclear power.

In Phase 1, it is essential that the country acquire a comprehensive understanding of the obligations and commitments involved, and what would be required to fulfil them, before any decision on implementation be taken. It is important that the country have a clear understanding of its energy needs and the potential role of nuclear power within its long term energy and economic development plans.

A country considering nuclear power would probably already have infrastructure for nuclear security, radiation safety and emergency preparedness covering its current

facilities and activities. Building on the existing infrastructure and associated experience should greatly assist the country in establishing the necessary infrastructure for a nuclear power programme.

In Phase 1, the NEPIO should ensure overall coordination, ensure the engagement of all important parties, compile the information and studies necessary for a knowledgeable policy decision on whether to proceed with nuclear power and, at the end of Phase 1, provide a comprehensive report that, should it recommend a positive national decision, defines and justifies a national strategy for nuclear power. Any pre-feasibility study done during Phase 1 can be a significant input to the comprehensive report, although it is important that the report fully address all 19 infrastructure issues described in Section 3.

2.3. Milestone 2: Ready to invite bids/ negotiate a contract for the first nuclear power plant

Following the policy decision to proceed with the development of a nuclear power programme, substantive work for achieving the necessary level of technical and institutional competence should be undertaken. This phase requires a significant, continuing commitment from the government, and the responsibility should be clearly assigned to an appropriate governmental ministry. It is also important that the work of all organizations continue to be well coordinated and driven through the NEPIO. The key NEPIO functions include:

— Maintaining momentum and providing a continuing forum for communication and cooperation among the organizations described throughout Section 3 (e.g. the owner/operator, the grid operator, the regulatory body, relevant government agencies, legislators and other decision makers);

— Ensuring that the roles of the key organizations (i.e. the government, the regulatory body and the owner/operator) are well defined and understood by all stakeholders;

— Ensuring that the key organizations develop in line with the project schedule;

— Ensuring that the rationale for the national decision to introduce nuclear power is well understood by all stakeholders;

— Ensuring that the contracting approach and technical specifications remain consistent with the country's nuclear power development strategy.

During Phase 2, the country will carry out the work required to prepare for the contracting, financing and construction of a nuclear power plant. It should develop the necessary infrastructure (covering all 19 infrastructure issues) to the point of complete readiness to invite bids/negotiate a commercial contract between the owner[23] and the supplier. An effectively independent regulatory body should be developed to a level at which it can fulfil all of its authorization and inspection duties.

The owner/operator has a key role at this time to ensure that by the end of Phase 2, it has developed the competence to manage a nuclear power project, meet regulatory requirements and be a knowledgeable customer in Phase 3. The owner/operator should also have, by the end of Phase 2, clear plans to develop or acquire during Phase 3 the capability to safely operate the plant.

2.4. Milestone 3: Ready to commission and operate the first nuclear power plant

For countries using competitive bidding, Phase 3 starts with the bidding and subsequent negotiation of the contract for the design, construction and commissioning of the nuclear power plant. For other countries, Phase 3

[23] The reference here to just the owner, rather than the owner/operator, reflects the possibility that a country may prefer that a sole supplier or strategic partner offer operating services as part of its proposals. In those cases, the 'operator' would only be established with the conclusion of the contract negotiations at the beginning of Phase 3.

starts directly with the negotiation of the contract. Much of the work on infrastructure development will be well advanced by the beginning of Phase 3, but the greatest capital expenditure for the nuclear power plant will occur during Phase 3. Depending on the specific agreements between the owner/operator and the contractor(s), the contract may involve different phases of work (e.g. detailed design and construction) with different price agreements (e.g. fixed price or cost plus). After agreement on the contract, the final investment decision by investors may wait for final project cost and schedule agreements and other financial arrangements. Whatever the detailed contract arrangements are, the final investment decision is a pivotal step.

The initial work will be to develop the site specific design, produce the preliminary safety analysis report and achieve all the required licensing and planning approvals. At this stage, the project costs and schedule can be finalized. Subsequent work will then include all procurement and construction activities, under appropriate management arrangements, and will involve regulatory oversight and approvals throughout the phase.

Milestone 3 is reached when the entire infrastructure is in place to start the stages of nuclear power plant commissioning that involve nuclear testing. Some verification and non-nuclear testing of equipment and systems will start during Phase 3.

By successfully completing Phase 3, the country will have established a nuclear power programme to realize the benefits of energy security and economic development envisioned in the initial policy decision. At the end of Phase 3, the owner/operator must be fully capable of, and licensed for, commissioning and operating the nuclear power plant. If the owner/operator has been newly created, or is new to nuclear power, this will have required significant development and training for all staff and a demonstration that the owner/operator can manage the project throughout the lifetime of the nuclear power plant.

The regulatory body will have been in operation for some time, having developed safety regulations, reviewed contract specifications, licensed construction of the plant and carried out inspections during construction. It should now be clearly seen as a competent, effectively independent regulatory body to provide continuing oversight of all facilities and activities, and to enforce continuing compliance with all regulatory requirements.

The competence of both the owner/operator and the regulatory body may well be ensured through expertise and support from experienced foreign organizations, including the nuclear power plant supplier. Consideration should be given to the need to ensure competence throughout the lifetime of the nuclear power plant.

While achieving Milestone 3 is a major accomplishment, it should be remembered that it is only the beginning of a lasting commitment to the safe, secure, peaceful and sustainable application of nuclear power.

3. DESCRIPTION OF INFRASTRUCTURE ISSUES

Each of the 19 infrastructure issues presented in this section requires specific actions during each of the three phases. Completion of the actions for a phase represents attainment of the associated milestone. Those actions are described here at a relatively high level. More details are available in the IAEA publications listed in the bibliography at:

http://www.iaea.org/NuclearPower/Infrastructure/Bibliography/index.html

Again, the order in which the 19 infrastructure issues are presented does not imply relative importance. All are important and require appropriate attention.

3.1. National position

The government should adopt a clear statement, which reflects broad political support, of its intent to develop a nuclear

power programme, and it should communicate that intent locally, nationally, regionally and internationally. The rationale and strategy for pursuing such a programme should be based on a national energy policy supporting the desired economic development goals of the country and should identify the contribution that nuclear power will make to that policy. While nuclear energy is most often used to generate electricity, if there is an intention to develop nuclear powered desalination or process heat production, this should also be addressed in the statement.

Strong government support at every stage is vital to the success of a nuclear power programme, and the intention to develop such a programme should be announced at the most senior level of government. Government leadership and funding is necessary for initial programme development, and continued government support will be required throughout the lifetime of the nuclear power programme. The government will also have to consider underwriting certain financial risks associated with the programme through, for example, loan guarantees or a power purchase agreement. Careful consideration should be given to the means of maintaining the long term political, economic and social stability that will be required for a successful programme.

3.1.1. National position: Milestone 1 — Ready to make a knowledgeable commitment to a nuclear power programme

The introduction of nuclear power requires long term commitments, both nationally and internationally. A time frame in the order of 100 years should be considered for a nuclear power plant, with waste disposal obligations extending significantly longer. The initial implementation period will be at least 10–15 years. It is of the utmost importance to fully understand these long term programmatic commitments before even considering a specific nuclear power plant project.

A full understanding of the commitments can best be achieved by forming a NEPIO. Its principal purpose in Phase 1 is to compile the information and to complete the studies necessary for a knowledgeable policy decision on whether or not to proceed at this time with the development of a nuclear power programme. It should have clear terms of reference to that effect. Its role should be recognized by all relevant government ministries and organizations. It should report to a senior minister or directly to the head of government, and be given the necessary resources and staff to perform its functions and tasks. It may make considerable use of consulting expertise, but it is critical for the leadership to remain with the NEPIO. The NEPIO should ensure engagement, communication and cooperation of all important parties, including the country's major utilities, the regulatory body for security and radiation safety, other relevant government agencies, legislative representatives and other decision makers. Key staff from a number of these organizations should be part of the NEPIO itself. It should establish a policy and guidance to inform interested parties of nuclear power benefits, costs and risks in order to facilitate their involvement in the decision making.

At the end of Phase 1, the NEPIO should produce a comprehensive report that, should it recommend a positive national decision, defines and justifies a national strategy for nuclear power. Any pre-feasibility study done during Phase 1 can be a significant input to the comprehensive report, although it is important that the report fully address all 19 infrastructure issues. It should address:

- An analysis of energy demand and energy alternatives;
- An evaluation of the impacts of nuclear power on the national economy, for example gross domestic product and employment;
- A preliminary technology assessment to identify technologies that are consistent with national requirements;

- Consideration of siting possibilities and grid capacity;
- Consideration of financing options, ownership options and operator responsibilities;
- Consideration of long term costs and obligations relating to spent fuel, radioactive waste and decommissioning;
- Consideration of possible human resource needs and external support needs of the regulatory body and owner/operator;
- Recognition that there remains a non-zero possibility of a severe accident, and the country will need to be able to deal with the consequences of such an accident;
- Consideration of the needs of each of the infrastructure issues and a plan for how they will be met in Phase 2.

The report should also address:

- The necessity of ensuring the safety, security and peaceful use of radioactive material and nuclear facilities;
- Joining the appropriate international legal instruments;
- Developing a comprehensive legal framework;
- Having an effectively independent regulatory body;
- Planning for emergencies;
- Developing project management capabilities and human resources;
- Ensuring long term financial resources;
- Funding decommissioning and radioactive waste management;
- Ensuring domestic and international confidence by maintaining open, transparent and timely communication.

3.1.2. National position: Milestone 2 — Ready to invite bids/negotiate a contract for the first nuclear power plant

Phase 2 starts with a policy decision to proceed with the development of a nuclear power programme. The government should formally approve a specific proposed nuclear power programme, based on the Phase 1 comprehensive report, and it should decide on the strategy for developing contract arrangements for the nuclear power plant (e.g. competitive bidding, strategic partnerships, 'build-own-operate' or another alternative).

During Phase 2, the NEPIO then ensures that the approved programme policies and strategies are translated into firm action plans for each of the 19 infrastructure issues and that corresponding responsibilities are assigned to the organizations that will become permanent parts of the overall infrastructure. The remaining subsections of Section 3 give more specifics for each of the issues.

As noted earlier, what is important is that the NEPIO's coordination functions are carried out and that responsibilities are clear. It is recognized that this can be accomplished through various organizational arrangements.

In Phase 2, one key step is the development of an effectively independent regulatory body with all the required expertise, resources and responsibility for all regulatory matters necessary for a nuclear power programme. This is addressed further in Section 3.7.2. A second key step is the designation of an owner[24] that will negotiate the specific contract with the supplier of the nuclear power

[24] The reference here to just the owner, rather than the owner/operator, reflects the possibility that a country may prefer that a sole supplier or strategic partner offer operating services as part of its proposals. In those cases, the 'operator' would only be established with the conclusion of the contract negotiations at the beginning of Phase 3.

plant at the beginning of Phase 3. This is addressed further in Sections 3.3.2.

3.1.3. National position: Milestone 3 — Ready to commission and operate the first nuclear power plant

To be ready to commission and operate a nuclear power plant, the country should have established by the end of Phase 3 the infrastructure to regulate and safely operate the plant in compliance with national laws, national regulations and international commitments. It should have developed a competent regulatory body and a competent owner/operator for commissioning and operating the nuclear power plant. It should also have assigned to a specific agency continuing responsibility for the government's role in the nuclear power programme.

Over the course of Phase 3, the NEPIO — with representation from the owner/operator, the regulatory body and the specific agency now responsible for the government's role in the nuclear power programme — should ensure the overall development of the infrastructure to meet the national strategy. Areas requiring particular coordination across organizations include:

— Ensuring that the relevant legislation is maintained and amended, as appropriate;

— Ensuring that the owner/operator and the regulatory body are fully funded, staffed with competent personnel and provided with the necessary resources, and have assumed their responsibilities with full authority;

— Ensuring all organizations give appropriate attention to safety, security and safeguards;

— Ensuring funding and implementation of grid developments;

— Ensuring that emergency response plans are established and demonstrated;

— Ensuring that stakeholder involvement remains a priority;

— Ensuring that the financing is sufficient to sustain safe and secure operations, and that mechanisms are available for compensation for nuclear damage;

— Ensuring that the human resource development programmes are sufficient to support continuing safe operation;

— Ensuring that responsibilities have been assigned and an appropriate funding plan has been implemented for waste, long term spent fuel management and decommissioning;

— Ensuring that mechanisms are in place for exchanging information with other nuclear power countries and providing mutual support.

3.2. Nuclear safety

Nuclear safety requires commitments by all elements of the government, owner/operator, regulatory body, nuclear technology and equipment suppliers and other organizations to ensure safety in all aspects of the nuclear power programme. Most of the actions described in this publication have some impact upon safety.

Past experience has demonstrated that reliance on engineered safety systems is, by itself, insufficient to ensure nuclear safety. Nuclear safety also requires an infrastructure that ensures vigilance, fosters a safety culture and includes emergency preparedness and response.

3.2.1. Nuclear safety: Milestone 1 — Ready to make a knowledgeable commitment to a nuclear power programme

An integral part of becoming ready to make a knowledgeable commitment to a nuclear power programme is the recognition of the importance of safety. Safety is a necessary component of all activities associated with the design, manufacture, construction,

commissioning, operation and decommissioning of a nuclear power facility.

With respect to safety, the studies and report prepared in Phase 1 by the NEPIO should focus on the need to take into account:

— The IAEA safety standards;

— The prime responsibility of the licensee for safety[25];

— An effective legal and regulatory framework for safety, including an independent regulatory body;

— The establishment of effective leadership and management for safety;

— Decommissioning and long term management of spent fuel and radioactive waste;

— Efforts to prevent and mitigate accidents;

— Arrangements for emergency preparedness and response (see Section 3.14.1);

— Siting (see Section 3.12.1).

In addition to the importance of the legislative and regulatory frameworks for a successful nuclear programme, the NEPIO Phase 1 report should stress that it is essential that a safety culture be developed within all organizations involved in the nuclear programme. A safety culture requires that all individuals involved in the programme recognize that safety is intrinsic to every aspect of the programme, accept personal responsibility for safety and perform all their activities with that responsibility in mind.

Building a nuclear power plant implies a long term commitment to participate in the international framework on nuclear safety. The country should plan to become a party to international instruments on safety (see Section 3.5) and to share knowledge and experience through information networks and participation in regional and international organizations. Early membership as a Contracting Party to the Convention on Nuclear Safety, and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention) (see Section 3.5), and active participation in the

associated peer reviews will demonstrate commitment to the global nuclear safety framework.

3.2.2. Nuclear safety: Milestone 2 — Ready to invite bids/negotiate a contract for the first nuclear power plant

Following the policy decision to proceed with the development of a nuclear power programme, in Phase 2 all organizations contributing to the programme should develop a safety culture. This includes government representatives, suppliers, the owner/operator and the regulatory body.

The country will likely have a policy and strategy for nuclear safety covering its current facilities and activities. The government should expand the policy and strategy to cover nuclear power.

Senior positions in the regulatory body should be filled early in Phase 2, and senior positions in the owner/operator should be filled as early as possible. Qualifications for the head of the regulatory body should be defined in the national laws or regulations. The regulatory body should specify requirements on how the competence for owner/operator staff in positions related to safety and security is ensured.

The regulatory body and the owner/operator should develop a detailed understanding of the IAEA safety standards. The intended strategy for developing safety regulations should be established early in Phase 2, as it

[25] The Convention on Nuclear Safety and the IAEA safety standards refer to the entity with the prime responsibility for safety as the licensee. A country's legal and regulatory frameworks (see Sections 3.5 and 3.7) will define requirements for becoming a licensee.

may have an impact on the choice of technology. The use of proven licensed technology creates the possibility for the country's regulatory body, in establishing its own regulations, to make use of the experience of regulatory bodies from countries that have used the technology.

A protocol for communications about licensing and safety issues between the regulatory body, the owner/operator and the suppliers should be developed and, as needed, implemented by the regulatory body and the owner/operator (see Section 3.7.2).

3.2.3. Nuclear safety: Milestone 3 — Ready to commission and operate the first nuclear power plant

A country's first nuclear power plant may be supplied by a foreign supplier, and the supplier will likely propose a set of codes and standards. The regulatory body and owner/operator should assess the applicability of these codes and standards and their consistency with national safety requirements.

The owner/operator as well as the regulatory body should continue to develop a safety culture in their organizations.

Early in Phase 3, the owner/operator should, with the support of the supplier as appropriate, prepare all documentation required for obtaining the necessary licences in accordance with regulatory requirements. It should maintain good communication with the regulatory body. The documentation should include a safety analysis report, as defined by the national licensing process established by the regulatory body. It should include safety and security analyses of the plant's design.

The owner/operator should also establish mechanisms to maintain the knowledge of the safety design and its configuration management over the lifetime of the plant. In addition, it is suggested that the owner/operator maintain a long term relationship with the nuclear power plant supplier to support safe operation in both normal and emergency situations.

The regulatory body will be responsible for conducting a comprehensive review and independent verification of the owner/operator's safety analysis report to verify compliance with regulatory requirements. Other responsibilities for the regulatory body in Phase 3 are summarized in Section 3.7.3.

3.3. Management

The roles and responsibilities of management will change as the process of developing a national nuclear power programme progresses from study to implementation to operation. Management of a nuclear power programme is demanding, and highly competent managers are vital to success at all stages. Effective management entails strong leadership, management systems, project management, strategy and planning, organization and competence development.

3.3.1. Management: Milestone 1 — Ready to make a knowledgeable commitment to a nuclear power programme

In Phase 1, management requirements for both the country's nuclear power programme and the first nuclear power plant project within that programme will be one of the issues addressed in the comprehensive report prepared by the NEPIO. The NEPIO will need the expertise necessary to address all relevant issues. While gaps in the necessary expertise can be filled by consultants, leadership responsibility and accountability should remain with national institutions.

The NEPIO Phase 1 report should emphasize the need for a commitment to leadership and management systems that will promote a safety and security culture. The national regulatory body for security and radiation safety will be represented in the NEPIO, and the NEPIO report should identify the future management developments required to regulate a nuclear power programme. This is addressed further in Section 3.7.1. Similarly, the country's major utilities will be represented in the NEPIO and can help to identify management developments required

to plan, procure, construct and operate a nuclear power plant.

It is important that the knowledge gained on management issues during the Phase 1 comprehensive study be shared. Those in the NEPIO or engaged by the NEPIO in Phase 1 should ensure the transfer of this knowledge to the future regulatory body and future owner/operator.

3.3.2. Management: Milestone 2 — Ready to invite bids/negotiate a contract for the first nuclear power plant

In Phase 2, the owner/operator should be designated and should begin to implement the defined strategy for the first nuclear power plant and to prepare to negotiate a commercial contract. This publication uses the phrase 'bid invitation specifications', which is applicable to a country using a competitive bidding process. A country using an intergovernmental agreement, strategic partner or sole supplier, instead of a competitive process, should therefore interpret 'bid invitation specifications' as 'specifications for negotiating with a sole supplier'.

During this phase, the owner/operator should:

— Define an organizational structure and recruit appropriate staff;

— Establish an integrated management system;

— Develop, in conjunction with the NEPIO, a financing strategy, a contracting strategy, a fuel supply strategy and a spent fuel and radioactive waste management strategy (see Sections 3.4.2 and 3.16.2);

— Begin staff training to create a safety and security culture;

— Establish a nuclear security programme (see Section 3.15.2);

— Assess alternative technologies to determine which are most appropriate or preferred;

— Complete site selection, site assessment and environmental impact assessment studies (see Sections 3.12.2 and 3.13.2);

— Implement a stakeholder involvement programme (see Section 3.11.2), especially with respect to candidate sites;

— Establish bid invitation specifications and evaluation criteria;

— Build project management capabilities and a competent procurement team, recognizing that different contracting approaches (turnkey, split package or others) will require different levels of competence;

— Establish working relationships with the regulatory body;

— Train staff and establish a project management organization that will emphasize quality management and be able to ensure that all contract requirements are fully met;

— Institute procedures to ensure that knowledge critical to safe and secure operation will always be preserved.

For many of these activities, the national strategy may have already defined the high level decisions, and the NEPIO will look to confirm that the detailed implementation is in accordance with the national strategy. The NEPIO should also ensure that the rationale for the national decision to introduce nuclear power is well understood by all stakeholders.

There are existing and proposed owner/operator arrangements where the owner and the operator are separate entities. Detailed arrangements in such cases will depend on the legal and regulatory regime, the allocation of liabilities and the need to demonstrably meet regulatory requirements for licensees.

The government, during Phase 2, should ensure that relevant government agencies expand their capabilities to be ready to handle

expanded demands, for example, for managing environmental protection, immigration, import and export controls, and emergency preparedness and response.

The regulatory body should establish an integrated management system and take the additional associated steps described in Section 3.7.2.

3.3.3. Management: Milestone 3 — Ready to commission and operate the first nuclear power plant

For a country using competitive bidding, the owner/owner designated during Phase 2 should begin Phase 3 by inviting bids, evaluating the bids received and selecting the winning bid(s) in accordance with the bid evaluation criteria. The subsequent activities listed below apply both to countries using competitive bidding and to countries using alternative approaches. Specifically, the owner/operator should:

— Negotiate the contract(s) consistent with the contracting strategy developed in Phase 2;

— Obtain financing consistent with the financing strategy and the contract;

— Prepare a licence application in compliance with the regulatory requirements;

— Initiate and manage the construction contract, including appropriate auditing to verify compliance;

— Complete construction and apply for a licence/authorization to operate the plant;

— Develop the capability for safe and secure operation, including recruiting and training staff, obtaining licences and obtaining certifications as required for any needed external maintenance and support organizations;

— Establish working relationships with international and professional organizations related to nuclear power, for example the World Association of Nuclear Operators;

— Develop procedures for event reporting;

— Contract for a continuing fuel supply;

— Establish mechanisms for turnover responsibility from the main supplier to the owner/operator;

— Maintain public support for the operation of the plant.

By the end of Phase 3, the owner/operator must be capable of assuming full responsibility for safe, secure operation in accordance with national laws and regulations which take into account internationally accepted norms and standards.

Steps to be taken by the regulatory body in Phase 3 are addressed in Section 3.7.3.

There are a number of government responsibilities in Phase 3 — for example handling finance and tax issues, providing environmental oversight, and managing trade and immigration — which will be distributed to appropriate government ministries.

It is important that the NEPIO continue:

— To maintain momentum and to provide a continuing forum for communication and cooperation among the important organizations;

— To ensure that the roles of the key organizations (i.e. the government, regulatory body and owner/operator) are well defined and understood by all stakeholders;

— To ensure that the key organizations develop in line with the project schedule;

— To ensure that the rationale for the national decision to introduce nuclear power is also well understood by all stakeholders;

— To ensure that decisions made throughout Phase 3 remain consistent with the country's economic development strategy and the joint interests of the important parties.

3.4. Funding and financing

The funding and financing requirements for a nuclear power programme overall, and a nuclear power plant specifically, are very large. In this publication, 'funding' refers to items that are the responsibility of the government (e.g. ensuring resources for regulation). 'Financing' refers to items that are the responsibility of the owner/operator (whether government owned or a private utility), whose costs will be recovered by selling electricity (e.g. the costs of construction, fuel and equipment replacements).[26]

Initial *funding* for infrastructure development will likely come from government sources. Specific items that will require government funding are listed in Section 3.4.1, such as the development of human resources and the establishment of the legal framework, regulatory body and safeguards arrangements. A demonstrated, continuing government commitment to funding all the areas outlined in this subsection will be important in developing the confidence of the financial community to invest in the plant.

Financing for the first nuclear power plant can be pursued in a number of ways, and a typical financing structure for a project will include both debt and equity finance from several sources. One potential source is the host government itself. However, the viability and extent of such financing will depend on the country's overall economic situation, and for some countries the potential for such financing may be severely limited.

Export financing is typically a significant source of debt financing for a nuclear power plant. However, export financing will still cover only part of the overall investment, even though that part may be substantial.

Local or foreign commercial debt financing may also be needed, possibly encouraged by specific government guarantees. Such guarantees may be direct (e.g. a guarantee to lenders that their loans will be repaid) or indirect (e.g. power purchase agreements or electricity market regulation to guarantee sufficient revenue from electricity sales). Perceived creditworthiness will be very important if the government's direct or indirect guarantee is to benefit the project. The country's economic policy, debt management and legal risk sharing mechanisms are all important to creditworthiness.

A country may seek to reduce the extent to which it must provide financing by engaging local or foreign equity partners who invest directly in the project in exchange for a share in the owner/operator profits or electricity supplied at an agreed price. A foreign equity partner may also supply expertise to the jointly owned owner/operator (e.g. in design, manufacturing, construction or operation); such a partner is often referred to as a strategic partner. An arrangement in which the country seeks a foreign company or consortium to build, own and operate the plant is one particular type of partnership arrangement.

With any partnership, the country would still have significant funding responsibilities (e.g. for its regulatory body and emergency preparedness), and it might be required to cover some financial risk through, for example, a power purchase agreement or loan guarantees. Strategic partnerships arrangement would be more likely to involve direct negotiations with selected suppliers than the solicitation of competitive bids and could require agreements between the partners' respective governments.

[26] Funding and financing sometimes intertwine. For example, if the regulatory body is to be funded partly by fees from the owner/operator, the owner/operator will need to finance these fees through electricity sales. Similarly, the costs of long term storage and disposal of radioactive waste, or of decommissioning, may be covered by building up *funds* that would be *financed* by small percentages of the revenues from electricity sales, rather than *funded* from the government's general revenues.

3.4.1. Funding and financing: Milestone 1 — Ready to make a knowledgeable commitment to a nuclear power programme

The comprehensive study conducted by the NEPIO in Phase 1 should review all relevant funding requirements and financing options.

Regarding *funding*, the study should recommend how the following activities will be funded:

— Establishment of the legal framework;

— The regulatory body for safety, security and safeguards;

— The government's stakeholder involvement programme;

— Siting and environmental protection activities that are the responsibility of the government (see Sections 3.12 and 3.13);

— Emergency preparedness and response;

— Education, training and research;

— Any required improvements to the electrical grid if such improvements are the government's responsibility;

— Any proposed incentives and direct government support to promote localization;

— Storage and disposal of radioactive waste, including spent fuel;

— Decommissioning.

Regarding *financing*, the NEPIO's recommendation should identify potential options together with financial and risk management strategies that together (a) create sufficient confidence for lenders and investors to support a nuclear power plant project and (b) ensure the long term viability of the owner/operator to fulfil all its responsibilities. Even if the recommendation does not include the government as a direct sponsor of the project, it should address the government's role in reducing financial risks.

3.4.2. Funding and financing: Milestone 2 — Ready to invite bids/negotiate a contract for the first nuclear power plant

During Phase 2, longer term *funding* plans for the items listed in Section 3.4.1 should be developed by the government and any agencies that have been given responsibility for items on the list, with appropriate coordination by the NEPIO. Funding plans for education, training, research, regulation, spent fuel, emergency preparedness and response, waste and decommissioning may involve important contributions from the owner/operator, which should therefore be directly involved in preparing such funding plans during Phase 2.

Regarding *financing*, the complexity of obtaining financing for a first nuclear power plant will require significant expertise. During Phase 2, the financing plan for the nuclear power plant project should be established together with a strategy for managing associated financial risks. The principal responsibility for this should likely lie with the owner/operator, but the government also has a key role to play. This is likely to be an iterative process as organizations (owner/operator, government and potential investors) seek to develop a viable financing strategy.

Controlling the cost of financing will require attention to many issues. Financing sources seek a return on their loans or investments and confidence in their capital recovery over a reasonable period. This is true for both public and private financing, but public financing may have a higher risk tolerance than private financing. However, common to both approaches is the control of risk.

Nuclear power carries some unique and significant financial risks. There is a risk of a nuclear accident or a nuclear security event that causes substantial damage liability and the loss or permanent shutdown of the facility. There are risks of significantly increased costs and uncertainty because of construction delays, regulatory delays, operational difficulties and delays from public intervention. Possible changes in the electricity

price — if it is not guaranteed in a power purchase agreement or by market regulation — during the long period required to recover investment costs could result in low, or negative, returns on the original investment.

A successful financial plan should consider the country's susceptibility to these risks, allocate the management of each risk to the most appropriate organization, consider how to minimize them and, should delays arise nonetheless, determine how any cost overruns will be financed. Factors that are important to financial institutions include the political and economic stability of the country, the degree of stakeholder involvement, prospects for continued economic development, the protection of foreign investment, the promulgation of legislation conducive to nuclear power, the existence of a competent operator and regulatory body, and the capability to manage large capital construction projects. Particularly important considerations for the government in making the country's financial environment attractive to potential lenders and investors include:

— A strong policy in support of nuclear power;

— Established creditworthiness;

— Good stakeholder involvement to foster sufficient public support;

— A complete legal and regulatory framework to support both the safe, secure and peaceful use of nuclear power and the financial guarantees necessary for the chosen financial approach;

— A competent, effectively independent regulatory body with secure continuing funding;

— Effective nuclear security and safeguards programmes with secure continuing funding;

— A commitment to developing national expertise and human resources to support a long term commitment;

— Plans in place to fully cover the costs of decommissioning, and the costs of long term management and disposal of spent fuel and radioactive waste;

— A structure for electricity tariffs that is sufficient to ensure a return on capital investment.

3.4.3. Funding and financing: Milestone 3 — Ready to commission and operate the first nuclear power plant

Regarding *funding,* it is important that mechanisms be implemented to provide funding for decommissioning, long term spent fuel and radioactive waste management, including disposal. Reliable funding must be ensured for the regulatory body and the government's responsibilities with respect to stakeholder involvement, safeguards, environmental protection, human resources development, improvements to the electrical grid and incentives for localization. It is also important that the operator have insurance to cover a nuclear accident in place before the nuclear fuel is transported to the reactor.

Regarding *financing*, most important in this phase will be the agreement about the financing arrangements based on the contract and financing negotiations. It will also be important that there be a high level of confidence that electricity tariffs will be sufficient to ensure both a return on capital investment and the safe operation of the plant. If support for financing was part of the competitive bidding process, the evaluation of proposed financing arrangements will be a key aspect of the owner's[27] evaluation of bids at the beginning of Phase 3.

[27] The reference here to just the owner, rather than the owner/operator, reflects the possibility that a country may prefer that a sole supplier or strategic partner offer operating services as part of its proposals. In those cases, the 'operator' would only be established with the conclusion of the contract negotiations at the beginning of Phase 3.

3.5. Legal framework

The legal framework for nuclear power should establish the responsibilities of all organizations necessary for a successful nuclear power programme.

National legislation should comprehensively cover all aspects of nuclear law (i.e. nuclear safety, nuclear security, safeguards and civil liability for nuclear damage). It should implement international legal instruments to which the country is a party or intends to become a party. Box 1 lists the international instruments adopted under IAEA auspices that are relevant to the establishment of a nuclear power programme.

Experience has proven that safety and credibility are best served by institutionally separating the enabling and regulatory aspects of nuclear power. Legislation should therefore separate the functions of the nuclear regulatory body from those of any other body or organization promoting or using nuclear power.

BOX 1: RELEVANT INTERNATIONAL LEGAL INSTRUMENTS ADOPTED UNDER IAEA AUSPICES

Convention on Early Notification of a Nuclear Accident (INFCIRC/335)

Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (INFCIRC/336)

Convention on Nuclear Safety (INFCIRC/449)

Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (INFCIRC/546)

Convention on the Physical Protection of Nuclear Material (INFCIRC/274) and Amendment thereto (GOV/INF/2005/10-GC(49)/INF/6)

Vienna Convention on Civil Liability for Nuclear Damage (INFCIRC/500)

Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage (INFCIRC/566)

Convention on Supplementary Compensation for Nuclear Damage (INFCIRC/567)

Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention (INFCIRC/402)[a]

Comprehensive safeguards agreement — based on The Structure and Content of Agreements Between the Agency and States Required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons (INFCIRC/153 (Corrected))

Additional protocol — following the provisions of Model Protocol Additional to the Agreement(s) Between States(s) and the International Atomic Energy Agency for the Application of Safeguards (INFCIRC/540 (Corrected))

Revised Supplementary Agreement Concerning the Provision of Technical Assistance by the IAEA

[a] The Convention on Third Party Liability in the Field of Nuclear Energy (Paris Convention) is another relevant legal instrument under the auspices of the Organisation for Economic Co-operation and Development.

As noted in Section 2.2, any country considering nuclear power would probably already have an infrastructure for radiation safety that covers the country's existing facilities and activities, including radioactive waste management and transport. In overseeing the development of the legal framework for a nuclear power programme, the government should make use of the experience and knowledge gained in developing and implementing the existing infrastructure.

Nuclear law is a specialized field. Professional input from experts is essential to correctly formulate appropriate legislation. The legislation should be consistent with national legal practices, institutions, economic circumstances, the level of technological development and cultural values.

3.5.1. Legal framework: Milestone 1 — Ready to make a knowledgeable commitment to a nuclear power programme

A fundamental understanding of the requirements for a legal framework should be developed by the NEPIO and discussed with the appropriate government institutions. The knowledge and experience of the regulatory body for the control of radiation sources will be valuable, and the existing legal framework for radiation safety, security and emergency response should be taken into account. An understanding of the relevant international legal instruments and their implications for national legislation will be needed.

The NEPIO's comprehensive Phase 1 report should include the need to put in place legislation to establish an independent nuclear regulatory body with adequate human and financial resources and a system of authorization, inspection and enforcement. The legislation should clearly delineate the responsibilities of all authorities involved in the nuclear power programme and cover all areas of nuclear law, for example radiation protection, the safety and security of nuclear facilities and radioactive material including physical protection, emergency preparedness and response, mining and milling, transport, radioactive waste and spent fuel management, decommissioning, nuclear liability and coverage, safeguards, and export and import controls.

The report should also identify all additional legislation that may affect the nuclear programme, including legislation which would need to be enacted or amended. This could include, for example, legislation on environmental protection, emergency preparedness and response, occupational health and safety, foreign investment, financial guarantees or other financial legislation.

3.5.2. Legal framework: Milestone 2 — Ready to invite bids/negotiate a contract for the first nuclear power plant

During Phase 2, as outlined in Section 3.5.1, the country should enact comprehensive national legislation covering all aspects of nuclear safety, nuclear security, safeguards and civil liability for nuclear damage. It should also put in place all legislation that may affect the nuclear power programme. The legislation should be in force prior to inviting bids for the first nuclear power plant. Failure to do so significantly increases the risk of subsequent costly delays. Because nuclear legislation is complex and specialized, the country should be sure to allow sufficient time and devote sufficient resources to completing it on schedule.

Also during Phase 2, the country should take the necessary steps to adhere to the international legal instruments in Box 1.

3.5.3. Legal framework: Milestone 3 — Ready to commission and operate the first nuclear power plant

By the beginning of Phase 3, comprehensive nuclear legislation and all other legislation that may affect the nuclear power programme should be in force, together with mechanisms to ensure compliance. During Phase 3, all actions to implement the relevant international legal instruments should be completed. The legal framework should be maintained, reviewed and amended as

necessary during the lifetime of the nuclear power programme.

3.6. Safeguards

There are a number of international treaties and agreements, such as the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), in which parties undertake to accept safeguards. In the case of the NPT, the safeguards accepted by each party are set forth in an agreement concluded with the IAEA for verifying the fulfillment of the country's obligations. The objective is to prevent the diversion of nuclear material from peaceful uses.

A country contemplating a nuclear power programme should have a clear commitment to its international non-proliferation obligations and safeguards agreement with the IAEA. It should have a clear understanding that with the introduction of nuclear power, there will be a substantial jump in the capabilities required to meet its safeguards obligations. The size of the jump will partly depend on the country's technological and fuel cycle choices (e.g. plans for the number of reactors, options for the front and back ends of the fuel cycle, and whether refuelling is on-line or off-line).

3.6.1. Safeguards: Milestone 1 — Ready to make a knowledgeable commitment to a nuclear power programme

Non-nuclear-weapon States that are party to the NPT are required to have a comprehensive safeguards agreement (CSA) and associated Subsidiary Arrangements conforming to INFCIRC/153 (Corrected) in force with the IAEA. Many countries with a CSA have also concluded an additional protocol on the basis of INFCIRC/540 (Corrected), providing for the implementation of the IAEA's strengthened safeguards system. The country should be aware of the obligations of the Additional Protocol and, if it intends to ratify and has not already done so, a plan should be in place by the end of Phase 1 for timely ratification. The CSA and the Additional Protocol contain specific rights and obligations undertaken by the country and the IAEA to provide for the effective implementation of safeguards.

Many countries that do not have any nuclear facilities have concluded small quantities protocols (SQPs), which have the effect of temporarily suspending many of the detailed provisions of the CSA. However, if the country currently has an SQP in force, by the end of Phase 1 it should have in place a plan for rescinding the protocol in a timely manner.

In order to exercise the required State control and to facilitate cooperation with the IAEA in implementing the provisions of its CSA and Additional Protocol, the country should establish and maintain an effective State system of accounting for and control of nuclear material (SSAC). This is an obligation under the CSA, independent of the amount of nuclear material or the extent of nuclear applications in the country. Establishing an SSAC includes designating, as part of the country's nuclear law, the responsible regulatory body. Making the regulatory body for safety and/or security also responsible for the SSAC offers potential synergies.

The NEPIO's comprehensive report at the end of Phase 1 should cover the country's additional efforts that will be needed with the introduction of nuclear power to ensure the required:

— Cooperation between the country, facility operator and the IAEA in safeguards implementation;

— Completeness and correctness of the country's declaration in order to ensure effective independent verification by the IAEA;

— Preparations by entities likely to be involved in the programme to meet their reporting obligations to the designated regulatory body.

3.6.2. Safeguards: Milestone 2 — Ready to invite bids/negotiate a contract for the first nuclear power plant

In the preliminary stages of the development of a nuclear programme, the SSAC and its regulatory oversight might involve only one or two individuals, whose primary objective would be to provide information to the IAEA and to implement activities required by the applicable safeguards agreement, for example early provision of initial design information to the IAEA. The country should consider including in the bid invitation specifications requirements on safeguards design features that would facilitate effective safeguards implementation.

As the nuclear programme develops, the SSAC organizational and functional responsibility should be adjusted as required for the country to fulfil its safeguards obligations most effectively. In addition, the terms of all international and regional instruments to which the government is a party, or intends to become a party, should be examined to ensure that its national legislation is consistent with the obligations in those instruments. The country may need to prepare new legislation, rules, regulations and procedures. For example, development of the nuclear power programme may require adjustments in the country's import–export controls. Plans for the effective implementation and enforcement of such legislation should be completed during Phase 2.

If a country plans to develop enrichment, fuel fabrication or reprocessing capabilities, it should provide early information on its plans to the IAEA. If it is party to conventions or agreements requiring early notifications about its plans, it should comply with such requirements.

3.6.3. Safeguards: Milestone 3 — Ready to commission and operate the first nuclear power plant

In non-nuclear-weapon States party to the NPT, safeguards measures are applied to all nuclear material and facilities, and most nuclear related activities, under the jurisdiction of a country. During Phase 3, the IAEA will work closely with facility personnel and the regulatory body to verify the design information provided to the IAEA, to install IAEA equipment for containment and surveillance, and to put clear communication mechanisms in place for the fulfillment of all agreements between the country and the IAEA. All elements of the safeguards infrastructure at the facility should be in place and ensured for the long term prior to fuel arriving at the first nuclear power plant. This includes trained and fully equipped staff, procedures for the accounting and control of nuclear materials, an accounting system that can be verified by the IAEA and established reporting mechanisms to the regulatory body.

3.7. Regulatory framework

A competent, effectively independent, well resourced nuclear regulatory body that has the strong support of the government is crucial to the long term success of a national nuclear power programme and the confidence of the public and international community. The development of such a body should be given high priority by the NEPIO, either as a new regulatory body or as an extension of the existing regulatory body. The development of competent human resources is as important for the regulatory body as it is for the owner/operator. The technical capabilities of the regulatory body should be sufficient for evaluating regulatory compliance and nuclear and radiation safety, security and safeguards issues involving all aspects of the nuclear power programme.

The structure of the regulatory framework for nuclear power varies from country to country and may reflect the country's existing regulatory framework for the regulation of radiation sources and radiological facilities. In some countries, there may be different regulatory bodies responsible for nuclear security and nuclear safety. Thus, as noted earlier, statements about the 'regulatory body' should generally be read as the 'regulatory body or bodies'.

As noted in Section 3.5, experience proves that safety and credibility are best served by institutionally separating the enabling and regulatory aspects of nuclear power. For developing the infrastructure for a nuclear power programme, however, separation does not mean that the regulatory body should not take part in the communication, engagement and cooperation fostered by the NEPIO. Any existing regulatory body should be represented in the NEPIO in Phase 1, and in subsequent phases the regulatory body for the nuclear power programme should continue to be part of the NEPIO while maintaining its full independence.

Countries introducing nuclear power may consider building on the infrastructure already in place for radiation safety and nuclear security while recognizing that regulating nuclear power is significantly more complex than regulating radiation sources. Expanding an existing regulatory body to cover nuclear power may be a more efficient use of resources — particularly human resources — that are likely to be limited in many countries.

The body of regulations to fully support a nuclear power programme is extensive. If a country is only considering a single reactor design, it may be helpful to base its regulations largely on those of a country that has experience with that design. The advantages of this approach are that the buyer country's regulatory body might be able to finalize its regulations more quickly and the supplier would already be familiar with the regulations. If a country chooses to adopt the regulations of another country, it is essential that the country fully understand them and be competent to implement them. It should also adapt the regulations to reflect specific national requirements and to ensure that the IAEA safety standards are adequately incorporated.

3.7.1. Regulatory framework: Milestone 1 — Ready to make a knowledgeable commitment to a nuclear power programme

The NEPIO's recommendations at the end of Phase 1 should include plans to develop a regulatory framework in Phase 2 that matches the proposed nuclear power programme and takes account of the existing regulatory framework for radiation safety and nuclear security. The fundamental elements of a regulatory framework include:

— Designation of an effectively independent competent regulatory body with clear authority, adequate human and financial resources and strong government support;

— Assignment of core safety, security and safeguards regulatory functions for developing regulations, review and assessment, authorization, inspection, enforcement and public information;

— Authority and resources to obtain technical support as needed;

— A clear definition of the relationship of the regulatory body to other organizations;

— Clearly defined responsibilities of licensees;

— Authority to implement international obligations, including IAEA safeguards;

— Authority to engage in international cooperation;

— Provisions to protect proprietary, confidential and sensitive information;

— Provisions for stakeholder involvement and communication with the public.

In developing its recommendations, the NEPIO should ensure communication and cooperation among all important parties, including the country's major utilities, the regulatory body for security and radiation safety, other relevant government agencies, public stakeholders, legislative representatives and other decision makers. As the regulatory body will need to be established early in Phase 2, prospective senior managers should be identified in Phase 1.

3.7.2. Regulatory framework: Milestone 2 — Ready to invite bids/negotiate a contract for the first nuclear power plant

Early in Phase 2, the country should establish a licensing system and an effectively independent regulatory body with sufficient competence to evaluate licence applications and to make safety, safeguards and security decisions. The legal framework (see Section 3.5) will define the scope of the regulatory body's authority.

Early in Phase 2, the regulatory body will need to define siting requirements. It should determine criteria for approving nuclear power plant designs and establish a licensing process prior to the definition of the bid invitation specifications for the first nuclear power plant.

The regulatory body should establish with all stakeholders mechanisms for open communications that are transparent and demonstrate the independence of the regulatory body. As the licensing process is developed, it should be publicized, so it is clear to all stakeholders. The regulatory body and the owner/operator should develop and, as needed, implement a protocol for communications about licensing and safety, security and safeguards issues between the regulatory body, the owner/operator and the suppliers. This should include arrangements for the transmittal of information, correspondence, agreement of actions and formal meetings at a range of levels of seniority.

During Phase 2, the priority issues for regulatory attention are:

— Overall organization, staffing and training;

— Management systems within the regulatory body and training to create a safety and security culture;

— Establishment of technical support arrangements and international relationships with other regulatory bodies to, among other things, expand the technical support available to the regulatory body;

— The import/export, transshipment, transport, storage and handling of nuclear material and other radioactive material;

— The safety of nuclear material and other radioactive material in use, storage and transport;

— Nuclear security, including physical protection of nuclear material and nuclear facilities;

— Safeguards;

— Radiation protection;

— Regulations, codes and standards for siting, design and construction necessary for licensing a nuclear power plant;

— Emergency preparedness requirements and emergency response responsibilities (site, off-site and national)[28];

— The formal licensing process;

— The oversight process for regulated activities that includes inspections and enforcement.

— The framework will ultimately need to cover all phases of the programme, including operation, decommissioning and spent fuel and radioactive waste management, but at this stage some

[28] Off-site emergency arrangements are not necessarily the responsibility of the regulatory body. Responsibilities for off-site emergency preparedness and response should be defined in legislation, and the government should establish procedures for coordination between the owner/operator and other response organizations. Response organization is an organization designated or recognized by a State as being responsible for managing or implementing any aspect of an emergency response. It includes the operator in addition to other response organizations such as disaster management agencies, civil protection authorities, medical emergency services and fire brigades.

aspects may be covered by future work plans.

— Sufficient competent staff should be in place with adequate financial resources:

— To license or approve sites;

— To review, assess and license nuclear plant designs and/or project activities as called for in the national legal and regulatory framework;

— To inspect and oversee nuclear construction and to enforce compliance with regulations;

— To ensure sufficient communication and stakeholder involvement.

The regulatory body should have plans to augment the staff as necessary to perform its functions during licensing, construction, commissioning and operation.

3.7.3. Regulatory framework: Milestone 3 — Ready to commission and operate the first nuclear power plant

In Phase 3, the independent regulatory body should continue staff development, conduct safety and security reviews of the proposed nuclear power plant, conduct licensing and inspection activities, and develop an operational oversight plan.

Once the nuclear power plant supplier has been chosen, the regulatory body should consider cooperation with regulatory bodies in countries that have regulated similar plants, whether provided by the same supplier or by others.

By the beginning of Phase 3, all regulations, codes and standards for nuclear facility construction should be in place, and staffing should be sufficient for efficiently licensing the nuclear power plant and providing regulatory oversight.

Prior to fuel arriving on-site, staffing should be sufficient for carrying out the regulatory body's emergency response role.

Regulatory requirements for operator training and certification should have been developed, and the regulatory body should confirm that the licensee has demonstrated compliance.

The regulatory body's plans to maintain competent staff and develop future staff should be in place. Open communications with appropriate stakeholders should be well established, including the government, the owner/operator, the public and international organizations.

Prior to commissioning, the regulatory body should issue the appropriate licence or approvals. By the end of Phase 3, the regulatory body should have developed comprehensive programmes for inspection and enforcement, and competent staff should be in place to provide regulatory oversight of the operation and maintenance of the plant by conducting inspections and enforcing regulations in accordance with these programmes.

3.8. Radiation protection

This subsection covers protection of workers and the public on-site during planned operation. Radiation protection from off-site releases from planned operation is addressed in Section 3.13, and protection from accidental releases is addressed in Section 3.14.

As noted earlier, because of medical, industrial and research applications of ionizing radiation, a country considering nuclear power would likely already have a national infrastructure for radiation safety. While the radiation protection aspects of a nuclear power programme require additional consideration, they will likely best be addressed by building on the existing infrastructure. Appropriate expansion to cater for the special needs of a nuclear power programme would then take place.

The IAEA safety standards provide guidance in establishing the necessary radiation protection requirements and practices. The IAEA safety standards take into account the guidelines of the International Commission on Radiological

Protection, and they incorporate the latest knowledge on the consequences of radiation exposure as presented in the United Nations Scientific Committee on the Effects of Atomic Radiation.

3.8.1. Radiation protection: Milestone 1 — Ready to make a knowledgeable commitment to a nuclear power programme

The NEPIO should develop an understanding of the additional hazards presented by nuclear power plant operation over and above those posed by medical, industrial and research applications of ionizing radiation. In its report at the end of Phase 1, the NEPIO should identify how existing programmes will need to be enhanced to address nuclear power plant operation, transport, storage and radioactive waste management.

3.8.2. Radiation protection: Milestone 2 — Ready to invite bids/negotiate a contract for the first nuclear power plant

Although the radiation risk associated with nuclear power plant operation will not be present for some time, plans need to be prepared in Phase 2, and preliminary actions taken, to develop programmes to control and monitor the exposure of individuals on-site before any radioactive material arrives on-site. This includes:

— Developing specific regulations by the regulatory body;

— Planning by the owner/operator for monitoring and protecting workers and the public;

— Establishing mechanisms to involve and communicate transparently with all stakeholders;

— Reflecting radiation protection plans in the plant's design requirements;

— Planning for associated staff recruitment and training and the procurement of equipment and services.

3.8.3. Radiation protection: Milestone 3 — Ready to commission and operate the first nuclear power plant

It is necessary to have all radiation monitoring and protection programmes implemented prior to the time radioactive material first arrives on-site. Therefore, by the time of initial fuel delivery, the owner/operator should have:

— Radiation monitoring equipment in place on-site;

— Radiation dosimetry requirements in place for all workers;

— Programmes in place to minimize radiation exposure during plant operation and maintenance.

The regulatory body should have reviewed the owner/operator's radiation protection programmes and verified their compliance with regulatory requirements, including requirements for procedures and equipment to protect workers and responders during severe accidents.

3.9. Electrical grid

Nuclear power plants are most efficiently and safely run as base load generation, and the grid should be large enough to make that possible. In addition, the system frequency is difficult to control if more than 10% of the grid's capacity is suddenly taken off-line, as might happen if there were a reactor trip in a unit that large. As a result, if a new nuclear reactor were to account for more than 10% of the total grid capacity at the time it were connected, detailed studies would need to establish that the system frequency could be reliably controlled after a reactor trip. In addition to its size, the grid's reliability is also important, since the off-site power it provides for safety systems needs to be highly reliable. Therefore, an early step in considering the introduction of nuclear power is an assessment of the electrical grid's current and planned size and reliability. For this reason, the grid operator should be represented in the NEPIO.

3.9.1. Electrical grid: Milestone 1 — Ready to make a knowledgeable commitment to a nuclear power programme

The NEPIO Phase 1 study should address the following in connection with the electrical grid:

— The capabilities of the existing grid in relation to the available nuclear power plant technology, including its ability to reliably take a nuclear power plant's base load output, its ability to withstand a loss of the plant's output and its ability to reliably supply off-site power during outages and in an emergency;

— The anticipated future growth of grid capacity;

— The historical reliability of the electrical grid;

— The potential for local or regional interconnections to improve grid characteristics.

3.9.2. Electrical grid: Milestone 2 — Ready to invite bids/negotiate a contract for the first nuclear power plant

In Phase 2, the grid operator should identify the requirements for connecting a nuclear power plant. The grid operator, in cooperation with the owner/operator, should undertake detailed studies to determine any expansion, upgrade or improvement necessary to accommodate the size, technology and site that are anticipated for the new plant.

The grid operator, again in cooperation with the owner/operator, should have in place by the end of Phase 2:

— Plans for enhancing or expanding the grid to be compatible with the new nuclear power plant;

— Plans to increase or strengthen regional interconnections to achieve acceptable grid reliability;

— Plans to provide redundant, reliable sources of off-site power for the nuclear power plant;

— Funding and/or financing to ensure that these plans are implemented on schedules compatible with the new nuclear power plant.

3.9.3. Electrical grid: Milestone 3 — Ready to commission and operate the first nuclear power plant

The execution of the plans adopted in Section 3.9.2 should create the necessary conditions to successfully commission and operate a nuclear power plant. During Phase 3, the grid operator, in conjunction with the owner/operator should:

— Develop arrangements to ensure coordination of grid operations with power plant operations;

— Verify the completion of all upgrades and enhancements to the grid and interconnections;

— Continue to analyse and improve the reliability of the grid;

— Install and test the redundant off-site power supplies to the nuclear power plant.

The owner/operator and regulatory body should ensure that there is a contingency plan for timely restoration of off-site power in the event of a major loss of grid capability.

3.10. Human resource development

The knowledge and skills necessary to introduce nuclear power include much of the knowledge and skills needed for other large power plants. They include management and administrative skills and technical skills spread across most scientific and engineering disciplines. There are also specific needs for nuclear power, for example expertise in reactor, nuclear and atomic physics and nuclear materials science. This applies to the regulatory body, the owner/operator,

technical support organizations and other relevant organizations.

In addition to their fundamental scientific and technical education, staff typically require special training in safety, security and radiation protection. A nuclear power programme requires all individuals to recognize that safety, security and safeguards are intrinsic to every aspect of the programme, to accept personal responsibility for these issues and to perform all their activities with that responsibility in mind.

Human resource needs will depend on the scope of the nuclear power programme, for example the number and variety of envisioned facilities and technologies. How to fill those needs, both initially and in the longer term, will depend on the balance the country chooses between engaging foreign expertise and building up its own expertise, and how quickly it plans to shift that balance over time. Building up national capabilities will require significant education and training, and that national personnel gain practical experience. This can be achieved in a variety of ways, for example by hiring experienced foreign staff to work alongside national personnel and by sending national personnel to work in foreign organizations.

Certain roles will require several years of specialized training and experience in the design and operation of the specific technology chosen for deployment. Specialized education and training can be obtained from the suppliers of the nuclear system. To ensure a sustainable workforce, it is important for a country to expand its own education and training capabilities and to develop a strategy to retain skilled human resources.

3.10.1. Human resource development: Milestone 1 — Ready to make a knowledgeable commitment to a nuclear power programme

At the beginning of Phase 1, the NEPIO's first human resource concern will be its own staffing. As noted in Section 3.1.1, it is important that the NEPIO be given the necessary resources, staff and any training required. It may well use consultants, but it is critical for leadership to remain with the NEPIO.

During Phase 1, the NEPIO should identify the knowledge and skills needed for a nuclear power programme. Its comprehensive report at the end of Phase 1 should review human resource development options and recommend an outline of the principle features of a national human resource development plan. Even if the country will initially make extensive use of knowledge and skills from other countries, it should consider how it would develop its own long term knowledge and skills.

Important areas for consideration by the NEPIO include:

— Identifying the full range of scientific, technical, managerial and administrative disciplines that will be needed, and assessing their availability within the country;

— Assessing the domestic and foreign capacity for educating and training the people who will be needed;

— Identifying specialized recruiting and training that will be needed in, for example, nuclear safety, nuclear security, safeguards, radiation protection, management systems and emergency preparedness and response;

— Assessing the domestic and foreign availability of specialized education and training;

— Assessing the domestic research capabilities that may need to be developed;

— Outlining workforce plans to either develop or import the human resources needed by the owner/operator, the regulatory body and other involved

organizations in order to implement the nuclear power programme;

— Aligning recommendations on human resource development with recommendations about the country's policy on industrial involvement (see Section 3.18).

3.10.2. Human resource development: Milestone 2 — Ready to invite bids/negotiate a contract for the first nuclear power plant

The owner/operator should develop sufficient knowledgeable staff during Phase 2 to prepare for negotiating the contract. While operation and maintenance staff will not be in place in Phase 2, some knowledge of operational and maintenance requirements will be needed.

During Phase 2, the regulatory body will need to develop its competence, as by the end of Phase 2, the majority of the human resources for the regulatory body will need to be in place and competent to fulfil their licensing functions. In view of the high value placed on licensing and inspection experience, the regulatory body should investigate opportunities for its staff to gain experience through cooperative arrangements with foreign regulatory bodies. Arrangements with those experienced in regulating the reactor technologies that the country will most likely acquire would be particularly valuable.

In Phase 2, the NEPIO should establish both a policy on national participation in the manufacturing, construction, operation and support of the nuclear power plant and a plan to put that policy into effect. The policy and the plan will affect human resource development plans.

All organizations should identify the knowledge and skills they will need in Phase 3 and beyond and establish workforce plans to develop them. The plans should identify future organizational structures as well as staff requirements and include recruitment and training plans based on capacity gap analyses.

The NEPIO should coordinate the plans of the different organizations, including the owner/operator, regulatory body, research and technical support organizations, to optimize the country's efforts as much as possible. The coordinated plans should cover education, training and experience requirements, and should consider bilateral and international training activities. For all organizations, the intended senior staff should be in place or identified as soon as possible during Phase 2. For the regulatory body, this will need to be early in Phase 2.

Depending on the country's acquisition strategy, human resource needs in Phase 2 may include:

— Engineering, operational, legal, contracting and procurement expertise to prepare for contract negotiations;

— The technical and scientific expertise needed to manage and review the site assessment;

— The technical and regulatory expertise to develop and implement regulations, codes and standards for nuclear safety, site approval, plant licensing, radiation protection, safeguards, nuclear security (including physical protection systems), emergency preparedness and response, spent fuel and radioactive waste management, and decommissioning;

— Design safety assessment expertise as part of the three bullet points above;

— Expertise in stakeholder involvement;

— Business and technical expertise for fuel cycle procurement and management;

— Expertise in systematic approach to training (SAT) to develop and conduct training programmes.

3.10.3. Human resource development: Milestone 3 — Ready to commission and operate the first nuclear power plant

While significant planning of human resource development is needed in the earlier phases, the main task of staff development for the owner/operator organization takes place in Phase 3. At the start of the phase, its main focus will be on project management, and by the end of Phase 3, all the necessary human resources should be in place and competent to commission and operate the first nuclear power plant. In addition, education and training programmes to develop a continuing flow of qualified people to all areas of the programme should be well under way, and the government should continue to promote educational and industrial development for national participation in the nuclear programme.

The owner/operator should acquire, or have access to, a plant specific, full scope simulator for training control room operators, and their initial training should be completed prior to fuel being loaded. Initial training for the rest of the staff should be completed by the end of Phase 3. (Training will be ongoing throughout the lifetime of the plant and, in that sense, never completed.) If possible, the owner/operator should arrange with the supplier or other owner/operators for training of the operating team on existing similar plants. All organizations involved in the nuclear power programme should have a systematic way of categorizing, disseminating and retaining knowledge, including training material, obtained through international cooperation and contracted commercial services. The start of operation may involve significant support from an existing nuclear power country with plans to transfer knowledge. It is important that the plans for that knowledge transfer be clearly defined and resourced in order to ensure a smooth transfer of capability and responsibility.

Specific human resource requirements include:

— The technical and scientific expertise needed to prepare a licence application, including the required safety analysis report;

— Technical and management expertise in construction project management and the management system required to control and supervise the plant's construction and commissioning;

— The technical and regulatory expertise to develop and implement regulations, codes and standards for operator licensing;

— Full competent staffing for the regulatory body covering all aspects of authorization, inspection and enforcement;

— Full competent staffing for nuclear power plant operation, maintenance and technical support;

— Workforce succession and personnel development planning to sustain competence in all areas of the national nuclear power programme;

— Enhanced educational opportunities for nuclear science and technology.

3.11. Stakeholder involvement

Strong, continuing government support is necessary through all phases of a nuclear power programme. Government support is facilitated by stakeholder support, which is in turn facilitated by effective stakeholder involvement. Effective stakeholder involvement addresses concerns early and explains the nuclear power programme's rationale, plans and progress.

Stakeholders include the general public, legislators, government agencies and decision makers, and, as the nuclear power programme progresses, the owner/operator, the regulatory body, potential suppliers, workers, communities near possible sites, neighbouring countries and non-governmental organizations.

Stakeholder involvement is best achieved through an open dialogue between the government, owner/operator and all stakeholders. The most influential stakeholders and societal opinion leaders will vary across countries and could include national and local government officials, heads of business and industry, the media, and leaders of non-governmental organizations. However, all concerned citizens should be provided with the relevant information and opportunities to be involved.

While open information programmes are important, sustained, successful sociopolitical involvement will depend on the competence and credibility of the organizations and individuals responsible for the nuclear power programme. The competence of the regulatory body and the owner/operator is vital to maintaining public confidence.

3.11.1. Stakeholder involvement: Milestone 1 — Ready to make a knowledgeable commitment to a nuclear power programme

Each of the three key organizations — the government, the owner/operator and the regulatory body — will eventually need its own stakeholder involvement strategy and plan. In Phase 1, however, the government and the NEPIO are the ones with major roles. It is important that they understand the importance of gaining and keeping the confidence of the country and the international community by maintaining open and timely interaction regarding all aspects of the programme.

The government and the NEPIO should begin to address this commitment from the very beginning. Expert consultants in the areas of public communication and education may be employed to assist. However, national leaders are in the best position to understand the social norms of their society and provide the necessary guidance. Effective public communication is a skilled discipline and those involved should receive professional training.

During Phase 1, the NEPIO should take initial steps:

— To conduct surveys to determine the public's knowledge and receptiveness to nuclear power;

— To develop public information tools that respond to the results of the surveys and to explain the government's interest in, and the potential benefits from, nuclear power;

— To develop and begin implementing a plan of interaction with all stakeholders, including neighbouring countries[29];

— To train senior staff to interact with stakeholders in response to any request.

The NEPIO's comprehensive Phase 1 report should take account of the views of stakeholders involved in the Phase 1 process and propose a stakeholder involvement plan based on transparency and openness. This should be designed to make the public and other stakeholders familiar with nuclear technology, nuclear power, its benefits and its risks, including the non-zero potential for severe accidents.

3.11.2. Stakeholder involvement: Milestone 2 — Ready to invite bids/negotiate a contract for the first nuclear power plant

As the country begins to implement the plan recommended in the Phase 1 report, the three key organizations should establish stakeholder involvement programmes as they are created. Different organizations will have different messages, mechanisms and principal stakeholders, and the NEPIO should provide a continuing forum for communication and cooperation among the key parties and ensure clarity about the roles and responsibilities of each organization in stakeholder involvement.

The government should continue public information and consultation activities according to the plan developed in Phase 1.

[29] States party to conventions or agreements such as the Convention on Nuclear Safety and the UNECE Convention on Environmental Impact Assessment in a Transboundary Context have obligations regarding foreign stakeholders.

The regulatory body and the owner/operator should each develop, and begin to implement, its own stakeholder involvement programme.

Appropriate actions in Phase 2 are that:

— The government continues to communicate the reasons for, and expected benefits of, nuclear power and to respond to concerns raised by stakeholders.

— The government communicates the national process used for site selection, supporting the owner/operator, who should engage local stakeholders and address their issues.

— The regulatory body explains its independent role in licensing, inspection and compliance.

— The regulatory body establishes and communicates the formal process for public participation in licensing.

— The owner/operator explains the basic technology being employed, its construction plans, its safety responsibilities and the impact on, and benefits for, the local community.

— All organizations conduct knowledge and opinion surveys as part of their stakeholder involvement programmes.

— All organizations ensure that senior staff who communicate with the public are trained.

— All organizations openly discuss issues and how they are being addressed.

— Public information centres are established as appropriate.

3.11.3. Stakeholder involvement: Milestone 3 — Ready to commission and operate the first nuclear power plant

By the start of construction, each of the organizations involved should have established credibility with all stakeholders. The communication efforts should continue throughout the construction and preparation for operation, and the NEPIO should continue to provide a forum for communication and cooperation among the key parties.

Appropriate actions in Phase 3 are that:

— All organizations continue to conduct surveys as part of their stakeholder involvement programmes.

— The government continues to communicate the reasons for, and expected benefits of, nuclear power and respond to concerns raised by stakeholders.

— The owner/operator routinely communicates the construction progress and preparations for operation.

— The regulatory body continues to communicate its role and provides information on its licensing, inspection and enforcement programmes.

— The regulatory body provides opportunities for public involvement in licensing, inspection and enforcement according to the process established in Phase 2.

— Governmental agencies (e.g. for environmental protection, emergencies, and public and occupational health) communicate on issues relevant to their responsibilities.

— The regulatory body and owner/operator communicate their plans for routine communication, once the nuclear power plant is operational, with all stakeholders, including local communities.

— The government, regulatory body and owner/operator communicate the on-site and off-site emergency response plans.

— All organizations continue to openly discuss issues and how they are being addressed.

3.12. Site and supporting facilities

Siting studies involve several stages. To ensure that each stage builds smoothly on its predecessor, it is essential to maintain a validated, referenced databank with all information collected on all the sites that are considered. Good data management is important not just for selecting and licensing the best site, but also to help to resolve possible future issues that arise during operations and require further justification. It also facilitates future siting studies for future nuclear power plants.

In addition to the site for the nuclear power plant, sites for other facilities, such as interim spent fuel storage or other fuel cycle and waste processing facilities, should also be studied. The possibility of siting a low level waste disposal facility near the new nuclear power plant should be considered, as it would reduce waste transport. Other important considerations are transport options between facilities, physical infrastructure to house workers, ready access for equipment delivery, the availability of water and electricity, and ways to minimize impacts on local communities.

Involving all stakeholders early, substantively and frequently in the site selection process contributes to the success of the project.

Important elements of site study and characterization are:

— Ease of integration into the electric system;

— Demography;

— Land use;

— Geology and tectonics;

— Seismology and volcanology;

— Other external natural hazards;

— Heat removal options;

— Hydrology;

— Meteorology;

— Oceanography;

— Nuclear safety and radiation protection;

— Nuclear security;

— Environmental impacts and environmental monitoring;

— Risks from human induced events;

— Availability of local infrastructure;

— Ease of access;

— Legal constraints;

— Public interaction;

— Emergency planning.

3.12.1. Site and supporting facilities: Milestone 1 — Ready to make a knowledgeable commitment to a nuclear power programme

Siting activities need to begin early. In Phase 1, these will be the responsibility of the NEPIO. The first step is a site survey, which should investigate potential regions and sites and reject unsuitable sites through a screening analysis. To screen potential sites, the NEPIO will need to identify exclusion and avoidance criteria[30] covering safety, security, cost, socioeconomic issues, engineering, environmental impacts, and the possible impact of external hazards on security and emergency response capabilities. The site survey should include consultations with stakeholders early in the process and before any substantive decisions are made. It should identify one or more candidate sites for the

[30] 'Exclusion' criteria identify features that would absolutely preclude a site from consideration. 'Avoidance' criteria identify features that make a site less attractive, while recognizing that it might still be suitable if it has sufficient compensating benefits.

NEPIO to recommend in its comprehensive report at the end of Phase 1. If acceptable candidate sites cannot be identified, the programme cannot go forward.

3.12.2. Site and supporting facilities: Milestone 2 — Ready to invite bids/negotiate a contract for the first nuclear power plant

Early in Phase 2, the regulatory body will need to define siting requirements that should be taken into account by the owner/operator in the site selection and assessment.

The owner/operator should then carry out the additional ranking analysis needed for site selection, which narrows the list of candidate sites to a shorter list of preferred candidate sites. The selection should be justified against clearly defined siting criteria covering safety, engineering, security, environmental impacts, emergency response and socioeconomic aspects. The next stage after site selection is site assessment to justify the acceptability of the preferred sites based on detailed investigations and site characterizations. The site assessment results in the derivation of the site related design basis, which should be reflected in the bid invitation specifications for the nuclear power plant.

Other actions to be completed in Phase 2 include:

— Ensuring the availability and integrity of the preferred sites;

— Identifying local legal, political and public acceptance issues and resolutions implemented or planned;

— Identifying necessary improvements and developing implementation plans for local infrastructure at the preferred site or sites, such as access, services and facilities;

— Initiating environmental monitoring to establish site baselines.

3.12.3. Site and supporting facilities: Milestone 3 — Ready to commission and operate the first nuclear power plant

Phase 3 includes the formal confirmation of the site's suitability and the completion of all licensing and approval processes established by the nuclear regulatory body. It includes ongoing monitoring of the site before operation to confirm its acceptability. Monitoring will continue subsequently to confirm that the site continues to meet the design intent.

3.13. Environmental protection

This subsection addresses impacts on people and the environment from small releases of gaseous and liquid radioactive effluents during normal plant operation. Large radionuclide releases are low probability events, which are treated through the nuclear safety programme, although there will need to be some discussion of potential accidents in the environmental impact assessment. This subsection also addresses land use, water use, water quality and other more conventional environmental impacts.

3.13.1. Environmental protection: Milestone 1 — Ready to make a knowledgeable commitment to a nuclear power programme

During Phase 1, the NEPIO should consider land use, water use, water quality, and impacts on people and the environment from low level radioactive effluents associated with the normal operation and maintenance of a nuclear power plant and related facilities.

The NEPIO should review the suitability of the country's existing framework for environmental protection and its international obligations, and it should collect and analyse initial environmental information in connection with the site survey described in Section 3.12.

The NEPIO's comprehensive report at the end of Phase 1 should reflect the initial environmental information and the exclusion and avoidance criteria discussed in Section

3.12. It should also include recommendations about possible enhancements or clarifications in existing environmental laws, regulations and responsibilities.

3.13.2. Environmental protection: Milestone 2 — Ready to invite bids/negotiate a contract for the first nuclear power plant

Based on the recommendations from Phase 1, any desired enhancements or clarifications in existing environmental laws, regulations and responsibilities should be implemented in Phase 2. The country's environmental regulatory body for the nuclear power programme should develop the skills and resources required to fulfil its responsibilities, and the interface between it and the nuclear regulatory body should be clearly established.

The owner/operator should study the prospective impacts on people and the environment as needed to select its preferred candidate sites and to ensure that they can comply with the country's environmental laws and regulations.

Important issues to be considered include:

— Pathways for effluent transport and concentration in the surrounding environment;

— Predominant plant and animal life and their particular sensitivities;

— Local demographics and trends;

— Predominant land use;

— Water use and the possible need for cooling towers;

— Impacts of construction activities on the local environment.

For its preferred candidate site or sites, the owner/operator should conduct environmental assessments according to the country's environmental laws and regulations. Based on such assessments, it should include, in the bid invitation specifications developed in Phase 2, a comprehensive specification of the environmental site conditions, factors, characteristics and data for the sites.

3.13.3. Environmental protection: Milestone 3 — Ready to commission and operate the first nuclear power plant

In Phase 3, the owner/operator will complete all licensing and approval processes established by the nuclear regulatory body and the environmental regulatory body for the nuclear programme. The licensing conditions for facility operation should include any specific environmental requirements identified in the environmental studies and assessments carried out in Phases 1 and 2.

In Phase 3, an environmental monitoring programme should be implemented, including the establishment of baseline data.

3.14. Emergency planning

Nuclear power plant safety systems are designed to minimize the probability of a large release of radioactive material from the plant. The probability is not zero, however, and previous accidents have demonstrated that emergency planning for the protection of plant personnel, emergency workers and the public beyond the site boundary is a necessary element of overall plant safety. Emergency planning ensures the capability to take actions that will effectively mitigate the consequences of an emergency.

3.14.1. Emergency planning: Milestone 1 — Ready to make a knowledgeable commitment to a nuclear power programme

The NEPIO should develop an appreciation of the requirements for emergency planning. Its comprehensive report at the end of Phase 1 should evaluate the status of the country's emergency preparedness and response (EPR) and ensure that the government is aware of:

— Any expansion of EPR capabilities that will be required to support a nuclear power programme;

— The resources that will be needed to develop, maintain and demonstrate an emergency response capability;

— Its responsibility for EPR and the need to define clear responsibilities for all organizations involved.

The evaluation should address any need for new arrangements at an international level, including participation in international legal instruments and cooperation with neighbouring countries, the IAEA and other international organizations. The Phase 1 site survey discussed in Section 3.12.1 should cover site characteristics important for EPR.

3.14.2. Emergency planning: Milestone 2 — Ready to invite bids/negotiate a contract for the first nuclear power plant

In Phase 2, the evaluation and recommendations in the NEPIO Phase 1 report about the country's EPR status and needs should be used as the basis for enhancing EPR capabilities. In the course of Phase 2:

— The government should specify the response organizations at national, regional and local levels with responsibilities for EPR and establish a national coordination mechanism.

— It should specify the general approach for EPR on the basis of the probability and severity of possible emergencies, both safety related and security related, and establish regulations governing all EPR requirements.[31]

— It should start implementing new arrangements as identified in Phase 1 for strengthening EPR infrastructure. Gaps in existing national and local institutions and communication networks should be identified and filled or included in an action plan to be implemented in Phase 3.

3.14.3. Emergency planning: Milestone 3 — Ready to commission and operate the first nuclear power plant

Before the first nuclear fuel arrives on-site, emergency arrangements should be completed and tested. Actions to be taken during Phase 3 are the following.

The government should prepare a national plan for dealing with emergencies irrespective of their causes (i.e. accidents or nuclear security events) that includes:

— International cooperation;

— Dealing with multiple external initiating events;

— Severe accident management on-site;

— Protecting workers, emergency workers and the public;

— Radioactive waste management.

Consistent with this plan:

— The owner/operator should implement an emergency preparedness programme for the nuclear power plant.

— The government should implement emergency preparedness programmes at the local, national and international level.

— The government should ensure that the emergency response plan of the nuclear power plant is coordinated with the plans of other national institutions involved in emergency response and with neighbouring countries.

— The regulatory body should verify the compliance of the on-site emergency arrangements with regulatory requirements.

— The government, the regulatory body and the owner/operator should demonstrate

[31] As noted in Section 3.7.2, off-site emergency arrangements are not necessarily the responsibility of the regulatory body. Off-site regulations should be established according to responsibilities defined in legislation.

emergency response capabilities by conducting exercises including local authorities and communities.

3.15. Nuclear security

Nuclear security concerns the prevention of, detection of, and response to, intentional unauthorized acts related to nuclear material, other radioactive material, and associated facilities and activities.

The responsibility for nuclear security rests entirely with the country. Its nuclear security regime comprises its legal and regulatory frameworks and administrative measures governing nuclear security, the organizations responsible for nuclear security, and the nuclear security measures themselves. The nuclear security regime is part of the country's overall security regime.

For its nuclear security regime to be effective, all organizations assigned responsibilities for nuclear security must first be fully aware of the importance of nuclear security and ensure the development of a nuclear security culture. There are 12 essential elements:

— Government responsibility;

— Definition of nuclear security responsibilities;

— Legislative and regulatory frameworks for nuclear security;

— Protection of nuclear material and other radioactive material during international transport;

— Definitions of offences and associated penalties related to nuclear security;

— International cooperation and assistance in nuclear security;

— Assessment of nuclear security threats;

— Assessment of targets and potential consequences;

— Use of risk informed approaches;

— Detection of nuclear security events;

— Planning for, preparedness for and response to nuclear security events;

— Measures to sustain the nuclear security regime.

3.15.1. Nuclear security: Milestone 1 — Ready to make a knowledgeable commitment to a nuclear power programme

The NEPIO's comprehensive Phase 1 report should prepare recommendations concerning the national policy and strategy for nuclear security, roles and responsibilities of government agencies for nuclear security and international legal instruments relevant to nuclear security. It should identify the elements of a legal framework for nuclear security and evaluate the country's human resource needs and the availability of institutions to develop competence in nuclear security.

3.15.2. Nuclear security: Milestone 2 — Ready to invite bids/negotiate a contract for the first nuclear power plant

The nuclear security regime should use a graded approach based on assessments of the credibility and potential consequences of both internal and external nuclear security threats.

In the course of Phase 2, the following actions should be implemented:

— The legislative and regulatory frameworks for nuclear security should be put in place (see Sections 3.5 and 3.7).

— Nuclear security requirements for the physical protection of nuclear material and nuclear facilities should be defined through the development of design basis threat(s); such requirements should ensure security is maintained even during severe accidents.

— Programmes for the management of sensitive information, promotion of a nuclear security culture and

trustworthiness of personnel should be put in place.

— Roles and responsibilities should be assigned for preparing for, detecting and responding to nuclear security events.

— A programme should be put in place to develop competencies to approve nuclear security plans and to inspect facilities to verify the plans' effectiveness.

3.15.3. Nuclear security: Milestone 3 — Ready to commission and operate the first nuclear power plant

Security arrangements will need to come progressively into place during Phase 3 in order to secure the plant during construction and the fuel once it arrives on-site. The required timing of activities should be agreed by the main organizations. The main actions to be completed in Phase 3 are:

— Construction, testing and acceptance of the physical protection system by the owner/operator as approved by the regulatory body;

— Ensuring good coordination between safety, security and safeguards arrangements;

— Approval of the security plan (including a contingency plan[32]) by the regulatory body;

— Implementation of nuclear security requirements for protecting nuclear material and facilities, and the inspections, verification and on-site exercises needed to demonstrate the physical protection system's effectiveness;

— Implementation of the national response plan, including arrangements with outside response forces to supplement on-site response, as well as training and exercises.

3.16. Nuclear fuel cycle

A country should choose its fuel cycle strategy relatively early, as the choice will influence its selection of a specific nuclear technology. The fuel cycle has two components. The front end comprises activities prior to using the fuel in a nuclear power plant. The back end comprises activities after the fuel is removed from the reactor. The front end consists of mining, milling, chemical conversion, enrichment and fabrication. The back end consists of spent fuel storage, transport and either the disposal of spent fuel or reprocessing and disposal of high level radioactive waste. Enrichment and reprocessing technologies are sensitive from the point of view of proliferation.

All front end services can be routinely purchased in the international nuclear market, which reduces the need to develop a national fuel cycle infrastructure. Back end functions are generally provided nationally, and some can also be provided internationally. On-site and interim storage are generally the responsibility of the owner/operator. Technologies for spent fuel storage are mature, with multiple suppliers available to respond to specific needs. Ultimate disposal is generally a national responsibility, either of the government or the owner/operator. There are also some opportunities for international reprocessing of spent fuel.

3.16.1. Nuclear fuel cycle: Milestone 1 — Ready to make a knowledgeable commitment to a nuclear power programme

In Phase 1, the NEPIO should develop a broad knowledge of the steps in the nuclear fuel cycle and identify approaches that may be feasible for the country. Investments and human resource needs will vary considerably across options. For most countries, the development of a completely indigenous nuclear fuel cycle concurrent with the first nuclear power plant would be difficult and unlikely to yield economic benefits. However, a country with abundant uranium may decide to embark on

[32] A contingency plan is a predefined set of actions to counter suspected sabotage or theft. The contingency plan is one component of the security plan.

mining and milling operations, while purchasing conversion, enrichment and fabrication services.

In Phase 1, the NEPIO should also analyse the country's energy security concerns and the desirable levels for fresh fuel inventories.

Regarding the back end, it will be necessary to provide on-site spent fuel storage for at least ten years of cooling time, irrespective of future plans for the fuel. It is also likely that interim spent fuel storage, whether on-site or off-site, will be needed for several decades. The NEPIO should analyse possible alternative options for spent fuel and radioactive waste management so that decisions taken at the end of Phase 1 are well informed about the challenges that spent fuel and waste create for a nuclear power programme. The issue of ultimate disposal is discussed in Section 3.17.

The NEPIO Phase 1 report should provide thorough information on:

— The individual steps in the nuclear fuel cycle;

— Potential sources of supplies and services for each step;

— National natural resources and capabilities with respect to each step;

— Feasible options for a national fuel cycle strategy covering all steps in both the front and back ends;

— Security and non-proliferation implications of different fuel cycles;

— Human resource requirements.

3.16.2. Nuclear fuel cycle: Milestone 2 — Ready to invite bids/negotiate a contract for the first nuclear power plant

Decisions on the fuel cycle strategy should be made in Phase 2, since the chosen strategy will influence the bid invitation specifications to be prepared in Phase 2. These need to cover:

— Arrangements for purchasing the first reactor core;

— The additional fuel inventory to be contracted with the first nuclear power plant;

— The specific fuel cycle services that will be either purchased or developed domestically as part of the nuclear power programme;

— The long term strategy with respect to purchasing or developing fuel cycle capabilities;

— The long term strategy with respect to reprocessing;

— The capacity of the on-site spent fuel storage to be contracted along with the first nuclear power plant;

— The strategy for interim spent fuel storage, transport and ultimate disposal.

3.16.3. Nuclear fuel cycle: Milestone 3 — Ready to commission and operate the first nuclear power plant

During Phase 3, the fuel for the initial core will be delivered to the site, provisions for the additional fuel inventory, in accordance with the national strategy, will have been contractually committed and on-site spent fuel storage will have been constructed as part of the nuclear power plant. The ultimate waste disposal strategy is discussed in Section 3.17.

During Phase 3, it will also be necessary to develop plans to implement the interim storage strategy, including identifying a suitable location, transport capabilities and funding arrangements. The plans for interim spent fuel storage will need to be consistent with the on-site storage capabilities.

3.17. Radioactive waste management

The management and disposal of all radioactive waste is an essential aspect of nuclear power. Such waste needs to be properly managed to avoid imposing undue

burdens on future generations. The Joint Convention stipulates that radioactive waste should be disposed of in the country in which it is generated. However, it also allows the possibility of waste being disposed of elsewhere in the interests of safety and efficiency.

Radioactive waste is divided into six levels, three of which require particular attention when developing the infrastructure for a nuclear power programme: low, intermediate and high.[33] The ability to manage low level waste (LLW) and intermediate level waste (ILW) exists in many countries in conjunction with medical, industrial and research applications. Programmes and technology for LLW and ILW minimization and processing have been implemented in many countries, and some countries have also developed disposal capacity for LLW and ILW. Even in these cases, however, a country introducing nuclear power will need to understand the additional volume and the different spectrum of radioactive isotopes in LLW and ILW associated with nuclear power.

No disposal facility for high level waste (HLW) (including spent fuel that is not intended for reprocessing) is yet in operation. The most advanced projects are scheduled for operation after 2020. In the meantime, the demonstrated capability to store spent fuel safely for decades provides time for developing final disposal strategies. Nevertheless, waste disposal is often a subject of public concern, and early consideration should therefore be given to the country's final disposal strategy. Currently, the most common strategy for HLW is planned disposal in deep geological formations.

3.17.1. Radioactive waste management: Milestone 1 — Ready to make a knowledgeable commitment to a nuclear power programme

The NEPIO Phase 1 report should identify all additional responsibilities for radioactive waste that will come with a nuclear power programme. It should emphasize the need to communicate effectively about the options for safely and securely dealing with radioactive waste and should consider:

— The country's existing capabilities, regulatory framework and experience with radioactive waste handling, storage, transport and disposal;

— The additional volume of LLW and ILW, and the variety of isotopes expected from nuclear power facilities;

— Technological options and research on the ultimate disposal of spent fuel and HLW from reprocessing;

— Options for financing spent fuel and HLW management and disposal;

— The benefits of becoming a party to the Joint Convention if the State is not yet a party;

— The human resource and other infrastructure development needs associated with radioactive waste management for a nuclear power programme.

3.17.2. Radioactive waste management: Milestone 2 — Ready to invite bids/negotiate a contract for the first nuclear power plant

During Phase 2:

— The government should lead national planning for waste disposal, including LLW, ILW and HLW. It should establish policies, identify a responsible organization or agency to lead the national planning and give it clear terms of reference.

— The national planning for radioactive waste disposal should consider the extent to which geological conditions exist in the country to allow disposal of all types of radioactive waste and/or the potential for

[33] The other three levels are exempt waste, very short lived waste and very low level waste.

contracting for waste disposal with other countries.

— National strategies should be established for all expected radioactive waste streams, and the government should revise as needed the laws and regulations for radioactive waste management.

— Plans should be established to fully finance long term radioactive waste management, radioactive waste disposal and decommissioning as noted in Section 3.4.2.

— The owner should develop, for inclusion in the bid invitation specifications, provisions for minimizing radioactive waste volumes and toxicity, requirements for associated facilities and requirements for a decommissioning plan.

— The government and owner/operator should plan to begin or enhance the country's radioactive waste disposal programmes and facilities to accommodate operation of the first nuclear power plant.

3.17.3. Radioactive waste management: Milestone 3 — Ready to commission and operate the first nuclear power plant

LLW and ILW will be generated as soon as the reactor begins operation. Therefore, towards the end of Phase 3:

— Existing, enhanced or new facilities for the storage or disposal of LLW and ILW should be fully operational and prepared to receive radioactive waste from the nuclear power plant.

— The responsible organization and funding system should be in place.

— An initial decommissioning plan should have been developed as part of the licensing of the design, and appropriate funding arrangements should be in place.

The organization leading the national planning for radioactive waste disposal should continue to follow international progress on HLW disposal, and national policy should be revised as appropriate.

3.18. Industrial involvement

Many commodities, components and services are required to construct and support the operation of nuclear facilities. Such supporting activities can be a source of jobs and economic growth for the country. They can also help to transfer technology to the country. However, supplying equipment and services to nuclear facilities requires an industry that can comply with nuclear codes, standards and quality requirements, and may well require government commitment and investment. In the early stages of developing the country's nuclear power programme, the NEPIO should establish a policy on developing industrial capabilities and technology transfer. As the programme proceeds, the policy should lead to plans and their eventual implementation to develop the desired level of industrial involvement.[34]

3.18.1. Industrial involvement: Milestone 1 — Ready to make a knowledgeable commitment to a nuclear power programme

The NEPIO Phase 1 study should assess opportunities for national and local industrial involvement in the nuclear power programme. Its Phase 1 report should explain the qualifications necessary to provide nuclear equipment and services, and nuclear quality standards, which are more stringent than for other industrial operations. Before agreeing to participation by the domestic industry, a nuclear power plant supplier would need to be assured that the domestic industry is able to meet nuclear standards. It is important that the NEPIO carry out a realistic assessment of the country's capabilities. A country's first nuclear power plant may be constructed with limited local industrial involvement, but there

[34] Another term for increasing national and local participation is 'localization'.

may well be plans to expand that involvement as the programme develops.

The NEPIO Phase 1 report should:

— Assess national and local industrial capabilities and potentials, including the training and development needs to realize those potentials;

— Assess industry's interest in participating in the nuclear power programme;

— Assess the level and likelihood of the investments required to upgrade industrial facilities and programmes;

— Recommend targets for short term and long term industrial participation and policies to reach those targets.

3.18.2. Industrial involvement: Milestone 2 — Ready to invite bids/negotiate a contract for the first nuclear power plant

Based on the short term and long term targets recommended in the NEPIO Phase 1 report, the government and industry should establish programmes to transition to national and local suppliers as their capabilities develop.

The owner/operator and/or the government should assess directly, or through the supplier, the national and local capabilities to supply on schedule, at competitive prices and with appropriate quality controls and assurance, commodities, components and services for building and operating a nuclear power plant. The results should be taken into account in the bid invitation specifications and evaluation criteria developed during Phase 2, which may include incentives to encourage bids promoting domestic industrial involvement. Whatever the desired degree of national industrial participation may be, it is important that the actual level of involvement should be within the domestic industry's ability to meet schedule and quality requirements on time and within budget. Construction delays can greatly increase costs and decrease regulatory and public confidence.

Thus in Phase 2, the owner/operator should consider:

— Which national or local suppliers can reliably supply commodities, components or services to the nuclear related or non-nuclear portions of the nuclear power plant;

— Which upgrades in skills and capabilities are realistic in the time frame that would be required to support nuclear construction.

Decisions should be made about using national or foreign sources for commodities, components and services, and these should be reflected in any localization criteria in the bid invitation specifications developed in this phase.

3.18.3. Industrial involvement: Milestone 3 — Ready to commission and operate the first nuclear power plant

The government, in Phase 3, should continue to promote educational and industrial development for national participation in the nuclear programme. As the construction phase of the nuclear power programme nears completion, a reassessment of the supply sources to support operation can be undertaken. If the national and local industrial structure has progressed sufficiently, the supply of spare parts, consumable supplies, maintenance services and calibration services can be allocated accordingly. However, the same supplier qualification necessary for facility construction by the owner/operator is also needed for operational support, and in some cases the operational requirements may be even more stringent.

3.19. Procurement

This publication assumes that a country will procure its first nuclear power plant via a turnkey contract. Section 3.3 addresses the capability needed for procurement of the nuclear power plant. This subsection, therefore, only addresses the procurement of specific equipment that has requirements

beyond those of standard procurement and the procurement of services for a nuclear facility. It is important that the owner/operator specify the quality requirements and verify that the supplier meets those requirements.

3.19.1. Procurement: Milestone 1 — Ready to make a knowledgeable commitment to a nuclear power programme

The NEPIO should:

— Be aware of the unique requirements associated with purchasing equipment and services for nuclear facilities;

— Recognize the level of competence required to procure equipment and services for a nuclear facility.

Its comprehensive report at the end of Phase 1 should recommend a procurement policy that reflects these considerations and is consistent with the report's overall recommendations for the nuclear power plant strategy and industrial involvement policy.

3.19.2. Procurement: Milestone 2 — Ready to invite bids/negotiate a contract for the first nuclear power plant

As noted above, the assumed strategy for a new owner/operator is to procure the plant via a turnkey contract. Nonetheless, in Phase 2 the owner/operator will need to establish a procurement capability for certain services. It should develop the capability to procure required services for pre-project activities (e.g. environmental impact assessment, siting and consulting), in particular:

— To ensure suppliers have appropriate expertise and experience;

— To prepare formal specifications for the services required;

— To include quality standards in the service specifications.

3.19.3. Procurement: Milestone 3 — Ready to commission and operate the first nuclear power plant

In preparing for nuclear power plant operation and maintenance, it is likely that the owner/operator will establish its own procurement organization with the programmes and skills necessary to conduct ongoing purchasing of equipment and services. In doing so, it should consider not only procurement for normal operation and for emergency equipment to be pre-positioned on-site, but also procedures for the urgent procurement of additional supplies and equipment as needed in emergency situations. To prepare for such activities, it is recommended that the owner/operator develop a plan to ensure the required competence and procedures are available before the end of Phase 3. Part of this should include arranging for procurement staff to work alongside the supplier procurement team in order to gain the experience required.

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ABBREVIATIONS

CSA	comprehensive safeguards agreement
EPR	emergency preparedness and response
HLW	high level waste

ILW	intermediate level waste
Joint Convention	Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
LLW	low level waste
NEPIO	nuclear energy programme implementing organization
NPT	Treaty on the Non-Proliferation of Nuclear Weapons
SQP	small quantities protocol
SSAC	State system of accounting for and control of nuclear material

EVALUATION OF THE STATUS OF NATIONAL NUCLEAR INFRASTRUCTURE DEVELOPMENT

IAEA Nuclear Energy Series No. NG-T-3.2 (Rev. 1)

1. INTRODUCTION

1.1. Background

A nuclear power programme is a major undertaking requiring careful planning, preparation and investment in time, institutions and human resources. While nuclear power is not alone in this respect, it differs from other energy sources because of the safety, security and safeguards requirements associated with using nuclear material.

The development of a nuclear power programme involves attention to many complex and interrelated issues over a long period. The introduction of a nuclear power programme involves a commitment of at least 100 years to maintain a sustainable national infrastructure throughout construction, operation, decommissioning and waste disposal.

The IAEA publication NG-G-3.1 (Rev. 1), Milestones in the Development of a National Infrastructure for Nuclear Power [1] (hereinafter referred to as the Milestones publication), describes the detailed infrastructure needed to support such a programme. It identified 19 infrastructure issues to be addressed by a Member State that is considering the introduction of nuclear power as part of its national energy strategy. It noted that early attention to all the identified issues would facilitate a successful nuclear power programme, whereas insufficient attention to any of them may compromise safety or lead to costly delays or even project failure.

As with any major programme, the commitment of resources to a nuclear power programme needs to be phased and decisions to move to subsequent phases, where the commitment of resources will increase significantly, need to be made with a full understanding of the requirements, risks and benefits. The Milestones publication [1] identified three distinct phases in the introduction of a nuclear power programme:

- Phase 1: Considerations before a decision to launch a nuclear power programme is taken;
- Phase 2: Preparatory work for the construction of a nuclear power plant after a policy decision has been taken;
- Phase 3: Activities to implement a first nuclear power plant.

This publication is intended to complement the information presented in the Milestones publication [1] by providing an approach for evaluating the status of each of the 19 infrastructure issues in a Member State. It is therefore essential that people involved in developing infrastructure read and fully assimilate the guidance of the Milestones publication [1] before considering this evaluation approach.

This publication addresses only the first two phases described in the Milestones publication [1]. Guidance on a methodology for addressing Phase 3 is under development and will be incorporated in the next revision of this publication.

It is necessary to review progress across all 19 infrastructure issues, as each one is essential, and because they are interconnected. The management of each infrastructure issue and the human and financial resources required to

support them need to be fully integrated. It is for this reason that the evaluation approach described in this publication addresses all 19 infrastructure issues.

This publication supports Member States in ensuring that all 19 infrastructure issues are reviewed and to ensure that results are compiled to provide an integrated view of progress. An assessment can be carried out at any time; however, the basis of evaluation provided in this publication is specifically appropriate to the end of Phase 1 and the end of Phase 2. Such an assessment will allow the Member State to identify those areas that need more focus or additional resources or to confirm its readiness to move to the next phase.

The basis for the evaluation approach provided here comes from the Milestones publication [1], the requirements and guidance of the IAEA safety standards and the experience and good practices of Member States with developed nuclear power programmes. It is possible that there will be additional items, particular to Member State specific requirements, that will need to be addressed.

1.2. Objectives

This publication provides a holistic approach to evaluating progress in the development of nuclear power infrastructure based on the guidance contained in the Milestones publication [1]. It can be used either by a Member State wishing to evaluate its progress (self-evaluation), or as a basis for an external evaluation where the Member State wishes to invite the IAEA to conduct an Integrated Nuclear Infrastructure Review mission. The aim of the evaluation approach is to:

- Evaluate all relevant infrastructure issues in a consistent manner;
- Compile results in order to identify a comprehensive action plan for moving into a subsequent phase of the establishment of infrastructure for nuclear power;
- Provide a consistent, international approach;
- Enhance national coordination and competence through participation in a detailed and comprehensive evaluation.

1.3. Scope

The scope of this publication includes the evaluation of the 19 infrastructure issues that are discussed in the Milestones publication [1]. It provides a means of evaluating the status of the issues for both Phase 1 and Phase 2 in the development of a nuclear power programme.

The results of the evaluation described in this publication include evidence that:

- All the work required in the phase leading up to the milestone has been adequately completed.
- The plans for the following phase are comprehensive and realistic.

1.4. Users

This publication is principally for decision makers, advisers and senior managers in government, industry and regulatory bodies in a Member State interested in developing nuclear power. This publication can also be used by Integrated Nuclear Infrastructure Review team members to help them to assess a Member State's progress in developing the infrastructure necessary for nuclear power and to provide timely and meaningful assistance. Other organizations, such as suppliers, nuclear energy agencies and operating organizations, may also use this publication to increase confidence that a Member State has the infrastructure necessary for nuclear power or to identify areas for potential assistance. Member States interested in expanding their existing nuclear power programmes may also find the publication helpful, particularly if it has been a long time since they last built a new nuclear power plant.

1.5. Structure

This publication consists of two main sections in addition to this introduction. Section 2 summarizes the programme phases and milestones associated with a nuclear power programme. It also describes the steps of the evaluation approach. Section 3 provides detailed guidance on the evaluation of each issue for Phases 1 and 2. The Appendix provides examples of evaluation forms for recording the results of the review.

1.6. Using this publication

This publication provides best practices to assist Member States on how to evaluate the progress of their nuclear power infrastructure development and their readiness to move to the next phase. Neither this publication nor the Milestones publication [1] is intended to provide a comprehensive description of how to create the entire infrastructure needed for a nuclear power programme. More detailed information and guidance on each of the 19 issues is available in the IAEA publications listed in the regularly updated nuclear infrastructure bibliography on the IAEA web site[35].

2. INTEGRATED INFRASTRUCTURE EVALUATION

2.1. Development of the national infrastructure

The Milestones publication [1] provides an overview of the overall programme to develop the national infrastructure for nuclear power. Figure 1, taken from that publication, shows the various phases of such a programme.

The activities are split into three progressive phases of development. The completion of each phase is marked by a specific milestone at which the progress of the development effort can be evaluated and a decision made to move on to the next phase. For reaching each milestone, the 19 issues that need to be considered are listed in Table 1.

In general, the evaluation of Phase 1 involves the examination of the proposed work programme for Phase 2 and beyond in order to establish if the issues have been fully understood and researched. It is necessary to understand the purpose of the evaluation of each phase. For Phase 1, the evaluation concerns the quality of information available, the effective investment of resources for informed decisions, and the management of programme risk. While a Member State can do less work in Phase 1, there is a much greater risk of an ill informed decision or of Phase 2 taking much longer than planned because the necessary issues have not been properly investigated. This publication take into account the international experience on how best to control these programme risks. However, there is no unique approach to developing the programme for the first nuclear power plant; therefore, the evaluation methodology provided here can only seek to ensure that a Member State has properly considered all the issues, is aware of key risks and has plans to manage them.

[35] See https://www.iaea.org/NuclearPower/Infrastructure/Bibliography/index.html

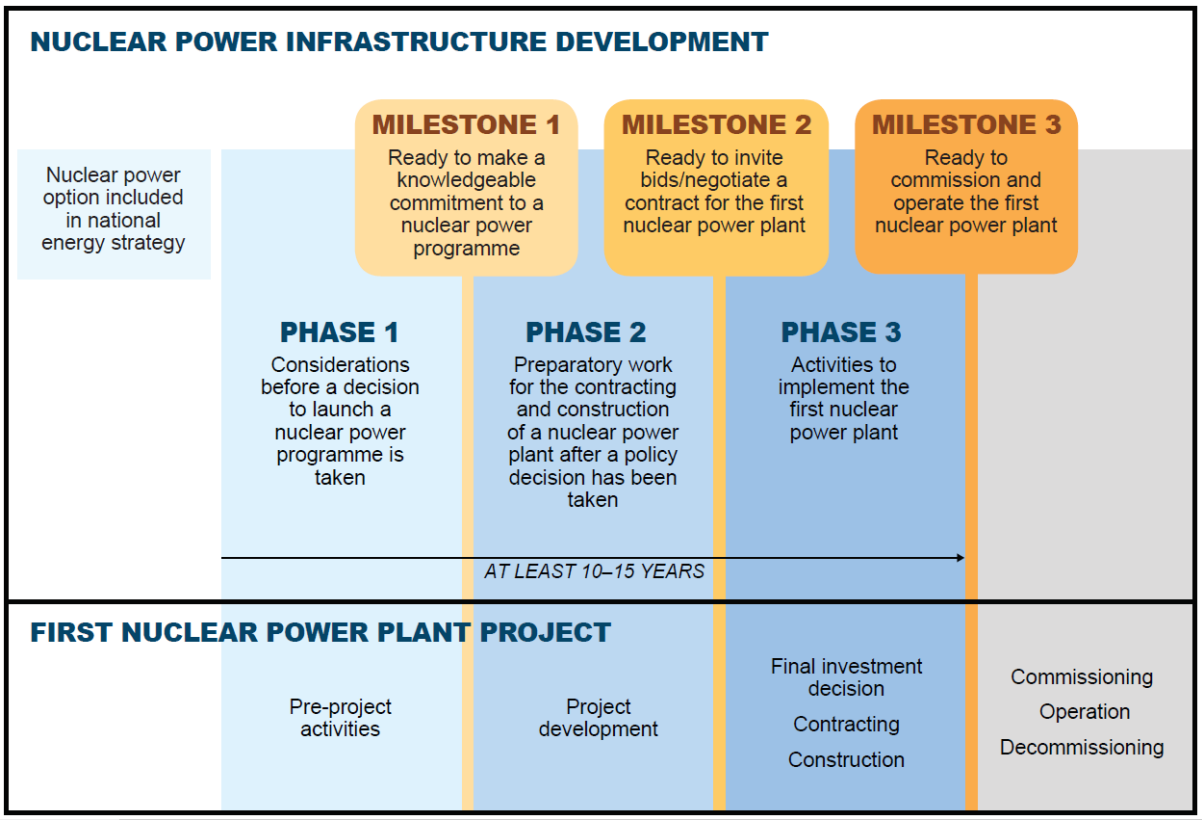

TABLE 1. THE 19 INFRASTRUCTURE ISSUES [1]

1. National position
2. Nuclear safety
3. Management
4. Funding and financing
5. Legal framework
6. Safeguards
7. Regulatory framework
8. Radiation protection
9. Electrical grid
10. Human resource development
11. Stakeholder involvement
12. Site and supporting facilities
13. Environmental protection
14. Emergency planning
15. Nuclear security
16. Nuclear fuel cycle
17. Radioactive waste management
18. Industrial involvement
19. Procurement

Clearly, the introduction of a nuclear power programme in a country will involve the use of available international experience. Partnership agreements with vendors and Member States with experience operating nuclear power plants and the use of recognized experts as consultants are encouraged. However, any evaluation of readiness to proceed to a further phase will need to ensure that a Member State wishing to implement a nuclear power programme has full ownership and a complete understanding of the key issues involved.

2.2. The milestones framework

2.2.1. Milestone 1

By Milestone 1, the Member State will be in a position to make a knowledgeable decision on whether it is appropriate to introduce a nuclear power programme. In order to achieve this milestone, the Member State will not only have assessed that it needs additional energy and has included nuclear power as a possible option to meet some of these needs, but it will also have carried out the first phase of the programme, which involves the considerations and planning that occur before a firm decision is made to develop a nuclear power programme. During this phase, the responsible organization is the nuclear energy programme implementing organization (NEPIO) established by the government. A successful NEPIO is appropriately staffed and resourced and includes adequate expertise and experience.

In the context of national and socioeconomic development, the NEPIO develops a clear understanding of the Member State's energy needs and the potential role, appropriateness and viability of nuclear power in its long term energy plan. The end of Phase 1 report will clearly demonstrate whether there is an adequate understanding of the infrastructure that needs to be developed, and will include viable plans for its introduction and identify resource requirements and timescales. The report will include plans for the development of organizations to undertake the role of regulator, owner and operator. It is also essential that the report addresses the development of an appropriate management system and that the organizations involved recognize their responsibilities for safety, security and safeguards.

2.2.2. Milestone 2

At Milestone 2, the Member State will have the necessary infrastructure for the contracting, financing and construction of a nuclear power plant. Following the policy decision to proceed with the development of a nuclear power programme, substantive work for achieving the necessary level of technical and institutional competence will have been undertaken, and the necessary legal and regulatory framework will be in place. An effectively independent regulatory body[36] will have been developed to a level at which it can fulfil all of its authorization and inspection duties.

The owner/operator has a key role at this stage to ensure that by the end of Phase 2, it has developed the competence to manage a nuclear project, meet regulatory requirements and be a knowledgeable customer in Phase 3. The owner/operator will also need to have clear plans to develop or acquire the capability to safely operate the plant by the end of Phase 3.

2.2.3. Milestone 3

Although this publication does not cover the evaluation of achieving Milestone 3, a brief description is included to provide a complete overview. At this point, the Member State will be in a position to commission and operate its first nuclear power plant. The owner/operator needs to be fully capable and licensed. This will have required significant recruitment, development and training for all levels of staff. The regulatory body will have been in operation for some time and will have developed regulations, licensed construction of the plant and carried out inspections during

[36] There may be more than one regulatory body. This publication follows the same approach as that of the Milestones publication [1]. Thus, the phrase 'the regulatory body' should generally be read as 'the regulatory body or bodies'.

construction. The regulatory body will now be clearly seen as a competent, effectively independent regulatory body, capable of providing continuous oversight over the nuclear power programme and enforcing compliance with all regulatory requirements.

While achieving Milestone 3 is a major accomplishment, it is important to remember that it is only the beginning of a lasting commitment to the safe, secure, peaceful and sustainable application of nuclear power.

2.3. Evaluation approach

2.3.1. Overview

Self-evaluation is an important tool for any organization. The evaluation methodology described in this publication is to be carried out firstly by those who are directly involved in the development of the nuclear infrastructure issues. This may be followed by an independent review by others not involved directly in the initial evaluation. The methodology also forms the basis of the IAEA Integrated Nuclear Infrastructure Review missions, which can be used to provide a peer review of the status of the nuclear infrastructure in a country after the self-evaluation process has been concluded.

2.3.2. Evaluation steps

The Member State needs to determine the scope of the evaluation. However, it is important that all 19 infrastructure issues be covered in order to obtain a complete picture of the progress made. A complete evaluation comprises four main steps:

(1) Identifying the terms of reference for the evaluation, the organizations to be involved and the individuals who will conduct the evaluation;

(2) Evaluating the status of development of the infrastructure against the basis listed in Section 3 of this publication for the appropriate milestone being evaluated;

(3) Identifying areas needing further attention;

(4) Preparing an action plan to address these areas.

All of the above steps should be undertaken to obtain a comprehensive and accurate picture of whether the Member State has completed its work across all the issues for a particular milestone and any outstanding work.

2.3.3. Documenting results and formulating an action plan

It is important to prepare an evaluation report that contains, as a minimum, the following elements:

— A description of the process used to conduct the evaluation;

— Summaries of the evidence reviewed and further actions required;

— Summary conclusions giving the state of achievement of each condition;

— Identification of the 'team of evaluators' by position and role;

— Identification of the 'team of respondents';

— References to any relevant material used for conducting the evaluation;

— Confidentiality requirements, if any.

A tabular format is proposed to collate and summarize the results of the evaluations carried out for each condition. A sample form is suggested in the Appendix (A.1. Evaluation form for each infrastructure area). The form contains:

— The summary of the condition and examples of how the condition may be demonstrated (taken from Section 3 of this publication).

— The observations of the reviewer as to whether the summary of the condition

has been met (e.g. work completed, work still outstanding).

— The evidence that supports the statements made in the observations section.

— An evaluation rating that indicates one of three status conditions:

- Significant actions needed: Work still needs to be initiated or completed to meet the condition[37];
- Minor actions needed: Work needs to be finalized or revised[37];
- No actions needed: All the work expected to meet the condition has been completed.

It is helpful to summarize these individual evaluations to give an overall picture. A sample form is provided in the Appendix (A.2. Example summary form).[38]

Upon completion of the report, an action plan is developed. The observations from the evaluation report are to be used by the Member State to determine the action plan. Each Member State decides the most appropriate manner of preparing the action plan, but it needs to include:

— The issue being addressed;

— A clear statement of the action or actions showing how the identified shortfall will be addressed;

— An agreed completion time;

— The organization, function or person responsible for the completion of the actions.

A suggested form for the action plan is included in the Appendix (A.3. Action plan pro forma). At the request of a Member State, the IAEA can provide a self-evaluation workshop covering the approach described in this publication, as well as practical examples of its application.

3. BASIS FOR EVALUATION

3.1. Overview

Sections 3.2 and 3.3 provide a series of tables covering each infrastructure issue in Phases 1 and 2. Each table contains the conditions that apply to that issue in that phase and an explanation of what is expected for each condition through a row entitled 'Summary of the condition to be demonstrated'. It then lists examples of the detailed information that may provide evidence that the summary of the condition has been fulfilled, although it may not be necessary to have all the information listed. For several of the items listed, it is not so much whether the document exists but whether the scope and quality of the document are adequate. The point of the evaluation is not to tick the items off following an audit style inspection, but to ascertain whether adequate analysis and research have been conducted to judge that the condition has been fulfilled. For a self-assessment, this may involve reviewing a number of detailed documents, but for an Integrated Nuclear Infrastructure Review mission it is more likely to involve the review of some document contents lists and consideration of relevant questions about the content and methodology.

The tables in Section 3.2 include a list of IAEA publications which are relevant to the summary of the condition to be demonstrated or which are dedicated publications for Member States embarking on nuclear power programmes. These publications, together with other publications related to the infrastructure issue, can be found in the regularly updated nuclear infrastructure

[37] The judgement on whether the actions are significant or minor is based on the importance of the work to the overall programme and the resources needed to complete it.

[38] Electronic forms are available at https://www.iaea.org/NuclearPower/Infrastructure/home.html

bibliography on the IAEA web site[39]. Two of these publications, IAEA Safety Standards Series No. SSG-16, Establishing the Safety Infrastructure for a Nuclear Power Programme [2], and IAEA Nuclear Security Series No. 19, Establishing the Nuclear Security Infrastructure for a Nuclear Power Programme [3], are structured in a manner that addresses specific infrastructure issues. For this reason, the tables in Sections 3.2 and 3.3 refer to specific sections or actions identified in these publications. For other publications, the reference is to the publication as a whole.

The tables often refer to evidence and plans. Evidence can include reports, meeting notes, correspondence, presentations, conferences attended with meeting reports, organization descriptions, job descriptions and summaries of experience. Plans can include various levels of detail, but they generally have clear actions with associated timescales and resources required. The documents will have been approved by a person/organization with the appropriate authority.

There are, of course, various approaches that can be used to implement a nuclear power plant project, for example strategic partnerships, intergovernmental agreements or build–own–operate arrangements. This publication does not assume any particular approach, since the actual nuclear infrastructure requirements do not change. What may change is the means by which the conditions are fulfilled, so not all the examples listed will apply in every case.

Some conditions make explicit reference to understanding and using the experience from other States operating nuclear power plants. This is not repeated for every issue, but it is clearly important for all infrastructure issues that the Member State makes use of the available international experience.

As stated earlier, the purpose of this methodology is to evaluate whether a Member State is ready to move to the next phase of infrastructure development. For this reason, the conditions look not only to see whether activities have been completed, but also whether there is a clear work programme for the next phase of the project.

Following the detailed evaluation of each condition, the Member State needs to follow a holistic approach to information gathering, development of resources and decision making. It is, for example, necessary to ensure that the development of regulations and guides progresses in a manner that is consistent with the readiness of the owner/operator to issue a bid specification.

[39] See http://www.iaea.org/NuclearPower/Infrastructure/Bibliography/index.html

3.2. Evaluation of infrastructure status in Phase 1

1. National position	Phase 1
Conditions	**Basis for evaluation**
1.1. Long term commitment made and importance of safety, security and non-proliferation recognized	**Summary of the condition to be demonstrated** A clear statement adopted by the government of its intent to develop a nuclear power programme and of its commitment to safety, security and non-proliferation, with evidence that their importance is embedded in the ongoing work programme.
	Examples of how the condition may be demonstrated (1) A clearly stated government commitment (2) Evidence of clear responsibilities for each issue, with government coordination of activities
	Relevant IAEA publication NG-T-3.14, Building a National Position for a New Nuclear Power Programme [4]
1.2. The NEPIO established	**Summary of the condition to be demonstrated** The NEPIO: (a) Has clear terms of reference that call for a comprehensive review of all the issues relevant to making a decision to proceed with a nuclear power programme; (b) Is recognized by all relevant ministries as having that role; (c) Reports to a senior minister or directly to the head of government; (d) Has appropriate human and financial resources; (e) Involves all relevant stakeholders, including the country's major utilities, the regulatory body for security and radiation safety, other relevant government agencies, legislative representatives and other decision makers.
	Examples of how the condition may be demonstrated (1) The charter establishing the NEPIO and to whom it reports (2) Evidence that the roles and responsibilities of the NEPIO are known by all its members and by other government ministries (3) A document defining objectives and timescales and an adequate scope of investigations (4) A clear description of how the NEPIO operates in terms of funding, planning, reporting, scope of studies and use of consultants (5) Evidence that the NEPIO has adequate skills to address all issues either directly or through commissioning specialist studies (6) Evidence of relevant interactions between the head of NEPIO and appropriate ministries, such as those responsible for energy and the environment
	Relevant IAEA publications — SSG-16, actions 2, 25 and 146 [2] — NG-T-3.6, Responsibilities and Capabilities of a Nuclear Energy Programme Implementing Organization [5]

1. National position	Phase 1
Conditions	**Basis for evaluation**
1.3. National strategy defined	**Summary of the condition to be demonstrated** A comprehensive report, defining and justifying the national strategy for nuclear power, including: (a) An analysis of energy demand and energy alternatives; (b) An evaluation of the impacts of nuclear power on the national economy, for example gross domestic product and employment; (c) A preliminary technology assessment to identify technologies that are consistent with national expectations; (d) Consideration of siting possibilities and grid capacity; (e) Consideration of financing options, ownership options and operator responsibilities; (f) Consideration of long term costs and obligations relating to spent fuel, radioactive waste and decommissioning; (g) Consideration of the human resource needs and external support needs of the regulatory body and the owner/operator; (h) Recognition that there remains a non-zero possibility of a severe accident and the need to deal with the consequences of such an accident will need to be addressed; (i) Consideration of the demands of each of the infrastructure issues and a plan for how they will be met in the next phase of development. **Note:** Any prefeasibility study conducted during Phase 1 can provide significant input to the comprehensive report, although it is important that the report fully address all 19 infrastructure issues.
	Examples of how the condition may be demonstrated (1) List of the studies that are feeding into the report(s) (2) Current status and conclusions (3) Contents list for the report(s) (4) Executive summary of the report(s) (5) Evidence of ministerial review of the report(s)
	Relevant IAEA publications — SSG-16, actions 3, 4, 62 and 148 [2] — IAEA Nuclear Security Series No. 19, section 2 [3] — NW-G-1.1, Policies and Strategies for Radioactive Waste Management [6] — NW-T-1.24, Options for Management of Spent Fuel and Radioactive Waste for Countries Developing New Nuclear Power Programmes [7]

2. Nuclear safety	**Phase 1**
Conditions	**Basis for evaluation**
2.1. Key requirements of nuclear safety understood	**Summary of the condition to be demonstrated** The key requirements for nuclear safety, specified in the IAEA safety standards, are understood by the NEPIO and other relevant stakeholders, and their implications are recognized.
	Examples of how the condition may be demonstrated (1) Evidence that the NEPIO has an understanding of, and commitment to, nuclear safety and the principles described in IAEA Safety Standards Series No. SF-1, Fundamental Safety Principles [8], and is aware of how nuclear safety requirements are taken into account in various designs of nuclear power plants (NPPs) (2) Evidence that the responsibility for nuclear safety is recognized, for example in consideration of leadership, funding and expertise (3) Evidence that the need to develop adequate capability and skills in nuclear safety is recognized (4) Evidence of familiarity with IAEA safety standards and other States' practices, and recognition of the need for, and commitment to, the development of national safety standards
	Relevant IAEA publication SSG-16, actions 1, 117, 170 and 193 [2]
2.2. Support through international cooperation initiated	**Summary of the condition to be demonstrated** The need for international cooperation and open exchange of information related to nuclear safety as an essential element is recognized and demonstrated.
	Examples of how the condition may be demonstrated (1) Evidence of review of options for bilateral or regional cooperation and specific actions for selected cooperation started, especially with countries with an established nuclear power programme (2) Implementation of a national technical cooperation programme with the IAEA and evidence of government financial support including nuclear safety aspects
	Relevant IAEA publications — SSG-16, actions 11–13 [2] — SF-1 [8]

3. Management	Phase 1
Condition	**Basis for evaluation**
3.1. Need for appropriate leadership and management systems recognized	**Summary of the condition to be demonstrated** There is a commitment to leadership and management systems that will ensure success and promote a safety and security culture as well as the peaceful use of nuclear technologies. There are plans to ensure the knowledge gained by the NEPIO is transferred to the future regulatory body and the owner/operator of the programme.
	Examples of how the condition may be demonstrated (1) Plans to ensure appointment of leaders with the appropriate training and experience to plan, procure, construct and operate an NPP as well as to ensure the leadership and management of nuclear safety, security and safeguards (2) Evidence that the importance of nuclear safety and security culture in each of the organizations to be established is recognized (3) Evidence that the importance of ensuring the peaceful use of nuclear technology is recognized (4) Evidence of a clear understanding of management system requirements (5) A plan to implement management systems in future key organizations is consistent with the appropriate standards and guidance
	Relevant IAEA publications — SSG-16, actions 72–74 [2] — IAEA Nuclear Security Series No. 19, paras 4.10–4.13 [3]

4. Funding and financing	**Phase 1**
Conditions	**Basis for evaluation**
4.1. Strategies for funding established	**Summary of the condition to be demonstrated** Mechanisms have been defined for funding a range of key activities that are specific to a nuclear power programme but may not be the fiscal responsibility of the owner/operator. The activities include: (a) Establishing the legal framework; (b) Activities of the regulatory body for safety, security and safeguards; (c) The government's stakeholder involvement programme; (d) Siting and environmental protection activities that are the responsibility of the government; (e) Emergency preparedness and response (EPR); (f) Education, training and research; (g) Any required improvements to the electrical grid, if such improvements are the government's responsibility; (h) Any proposed incentives and direct government support to promote localization; (i) Storage and disposal of radioactive waste, including spent fuel; (j) Decommissioning of the NPP.
	Examples of how the condition may be demonstrated (1) Clear statements of how the above areas will be funded, based on a consideration of options (2) Evidence that the scale of the costs of each of these activities has been recognized
	Relevant IAEA publication SSG-16, actions 48, 50 and 51 [2]
4.2. Potential strategies for financing identified	**Summary of the condition to be demonstrated** Potential options have been identified with financial and risk management strategies, which together: (a) Create sufficient confidence for lenders and investors to support an NPP project; (b) Ensure the long term viability of the owner/operator to fulfil all its responsibilities. **Note:** A large part of the government's role in nuclear power financing, if the government is not directly a sponsor of the project, relates to financial risk reduction.
	Examples of how the condition may be demonstrated A review of financing options and risk management strategies, considering the long term economics and risks associated with the NPP and including the extent of government funding, equity partners and borrowing, among other things.

4. Funding and financing	Phase 1
Conditions	**Basis for evaluation**
	Relevant IAEA publications — SSG-16, actions 49 and 147 [2] — NG-T-4.1, Issues to Improve the Prospects of Financing Nuclear Power Plants [9] — NG-T-4.2, Financing of New Nuclear Power Plants [10]

5. Legal framework	Phase 1
Conditions	**Basis for evaluation**
5.1. Adherence to all relevant international legal instruments planned	**Summary of the condition to be demonstrated** There is an understanding of the requirements of the relevant international legal instruments, their implications and a commitment to adhere to them. The following instruments are covered: (a) Convention on Early Notification of a Nuclear Accident (INFCIRC/335) [11]; (b) Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (INFCIRC/336) [12]; (c) Convention on Nuclear Safety (INFCIRC/449) [13]; (d) Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (the 'Joint Convention') (INFCIRC/546) [14]; (e) Convention on the Physical Protection of Nuclear Material (INFCIRC/274/Rev.1) [15] and Amendment thereto (INFCIRC/274/Rev.1/Mod.1) [16]; (f) Vienna Convention on Civil Liability for Nuclear Damage (INFCIRC/500) [17][a]; (g) Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage (INFCIRC/566) [19]; (h) Convention on Supplementary Compensation for Nuclear Damage (INFCIRC/567) [20]; (i) Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention (INFCIRC/402) [21]; (j) Comprehensive safeguards agreement — based on The Structure and Content of Agreements Between the Agency and States Required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons (INFCIRC/153 (Corrected)) [22]; (k) Additional protocol — following the provisions of Model Protocol Additional to the Agreement(s) Between States(s) and the International Atomic Energy Agency for the Application of Safeguards (INFCIRC/540 (Corrected)) [23]; (l) Revised Supplementary Agreement Concerning the Provision of Technical Assistance by the IAEA.

5. Legal framework	Phase 1
Conditions	**Basis for evaluation**
	Examples of how the condition may be demonstrated (1) Plans for when each of the instruments will be adhered to (2) Identification of the actions that will need to be undertaken and the required timescales (3) Evidence that the resources required are understood and have been defined
	Relevant IAEA publications — Handbook on Nuclear Law [24] — Handbook on Nuclear Law: Implementing Legislation [25] — Guidance for States Implementing Comprehensive Safeguards Agreements and Additional Protocols [26] — SSG-16, action 11 [2] — IAEA Nuclear Security Series No. 19, action 3.1 [3]
5.2. Plan in place for development of a comprehensive national nuclear law	**Summary of the condition to be demonstrated** There is an understanding of the requirements of the comprehensive national nuclear law that needs to be enacted, a plan with the actions and timescales for development and enactment, together with a commitment from the government to achieve the stated plan. The plan includes the need for the law to: (a) Establish an independent nuclear regulatory body with adequate human and financial resources, and a clear and comprehensive set of functions; (b) Identify responsibilities for safety, security and safeguards; (c) Formulate safety principles and rules (radiation protection, nuclear installations, radioactive waste and spent fuel management, decommissioning, mining and milling, EPR and the transport of radioactive material); (d) Formulate nuclear security principles; (e) Give appropriate legal authority to, and define the responsibilities of, the regulatory body and all competent authorities establishing a regulatory control system (authorization, inspection and enforcement, review and assessment, and development of regulations and guides); (f) Implement IAEA safeguards, including a State system of accounting for and control of nuclear material (SSAC); (g) Implement import and export control measures for nuclear and radioactive material and items; (h) Establish compensation mechanisms for nuclear damage.
	Examples of how the condition may be demonstrated (1) A plan on how the law will be developed and approved (2) A summary of how each of the areas listed above will be addressed within the law (3) Interactions with the IAEA and the other relevant organizations

5. Legal framework	Phase 1
Conditions	**Basis for evaluation**
	Relevant IAEA publications — Handbook on Nuclear Law [24] — Handbook on Nuclear Law: Implementing Legislation [25] — Guidance for States Implementing Comprehensive Safeguards Agreements and Additional Protocols [26] — SSG-16, actions 20, 21, 24 and 189 [2] — IAEA Nuclear Security Series No. 19, actions 3.2 and 3.3 [3]
5.3. Plans in place to enact and/or amend other legislation affecting the nuclear power programme	**Summary of the condition to be demonstrated** There is an understanding of which legislation that affects the nuclear power programme needs to be enacted and/or amended, the timescales for its development and approval, together with a commitment from the government to achieve the stated plan. The legislation to be considered includes that on: (a) Environmental protection; (b) EPR; (c) Occupational health and safety of workers; (d) Protection of intellectual property; (e) Local land use controls; (f) Foreign investment; (g) Taxation, fees, electricity tariffs and incentives; (h) Roles of national and local governments; (i) Stakeholders and public involvement; (j) International trade and customs; (k) Financial guarantees and any other required financial legislation; (l) R&D.
	Examples of how the condition may be demonstrated (1) A plan on how the legislation will be developed and approved (2) A summary of how each of the areas listed above will be addressed within the proposed legislation (3) Interactions with the IAEA and the other relevant organizations

[a] The Convention on Third Party Liability in the Field of Nuclear Energy (Paris Convention) [18] is another relevant legal instrument under the auspices of the Organisation for Economic Co-operation and Development.

6. Safeguards	Phase 1
Conditions	**Basis for evaluation**
6.1. Terms of international safeguards agreement in place	**Summary of the condition to be demonstrated** (a) The Member State has a comprehensive safeguards agreement with associated subsidiary arrangements in force with the IAEA (b) If the Member State currently has concluded a small quantities protocol to its comprehensive safeguards agreement, a plan needs to be developed setting out the necessary steps to rescind the small quantities protocol in a timely manner (c) The Member State is aware of the requirements of the additional protocol [23]; if the Member State has made the decision to ratify the additional protocol [23] but has not already done so, a plan is in place for the timely ratification
	Examples of how the condition may be demonstrated (1) Plans for rescinding the small quantities protocol and/or for ratification of the additional protocol [23], including the actions that need to be taken, clear assignment of responsibilities and understanding of the resources and the required timescales (2) Evidence that the need for outreach activities is recognized to ensure that all existing and future entities having to report to the State authority for safeguards are aware of their roles and obligations
	Relevant IAEA publications — Guidance for States Implementing Comprehensive Safeguards Agreements and Additional Protocols [26] — Safeguards Implementation Guide for States with Small Quantities Protocols [27]
6.2. Strengthening of the SSAC planned	**Summary of the condition to be demonstrated** The Member State has a plan describing how the existing SSAC will be strengthened or adjusted to deal with the increase of activities and resources, as well as the need for enhancement of capabilities.
	Examples of how the condition may be demonstrated (1) Evidence that the NEPIO includes a representative knowledgeable in the requirements of the comprehensive safeguards agreement (2) A plan produced by the NEPIO covering the enforcement of national legislation, policies and procedures relevant to safeguards; the development of the legislation itself is covered under infrastructure issue No. 5, legal framework (3) Evidence that approaches undertaken by one or more States with existing nuclear power programmes have been reviewed and the information gained has been adapted for the national context

6. Safeguards	Phase 1
Conditions	**Basis for evaluation**
	Relevant IAEA publications — Guidance for States Implementing Comprehensive Safeguards Agreements and Additional Protocols [26] — Nuclear Material Accounting Handbook [28] — Safeguards Implementation Practices Guide on Facilitating IAEA Verification Activities [29] — ISSAS Guidelines: Reference Report for IAEA SSAC Advisory Service [30]
6.3. Recommendations from any previous reviews or audits being addressed	**Summary of the condition to be demonstrated** If any reviews or audits have been conducted on the existing safeguards provisions, there is evidence that the actions resulting from it are progressing.
	Examples of how the condition may be demonstrated Action plans resulting from a review or audit with progress identified indicating the required timescales, responsibilities and resources required.
	Relevant IAEA publications — Guidance for States Implementing Comprehensive Safeguards Agreements and Additional Protocols [26] — Safeguards Implementation Guide for States with Small Quantities Protocols [27] — Nuclear Material Accounting Handbook [28] — Safeguards Implementation Practices Guide on Facilitating IAEA Verification Activities [29]

7. Regulatory framework	**Phase 1**
Conditions	**Basis for evaluation**
7.1. Development of an adequate regulatory framework planned	**Summary of the condition to be demonstrated** The prospective senior managers of the regulatory body have been identified. There are plans to develop a regulatory framework for nuclear safety, nuclear security and safeguards that matches the overall plan for the NPP, and includes: (a) Designation of an effectively independent competent regulatory body with clear authority, adequate human and financial resources, and strong government support; (b) Assignment of core safety, security and safeguards regulatory functions for developing regulations, review and assessment, authorization, inspection, enforcement and public information; (c) Authority and resources to obtain technical support as needed; (d) A clear definition of the relationship of the regulatory body to other organizations (e.g. technical support organizations and environmental agency); (e) Clearly defined responsibilities of licensees; (f) Authority to implement international obligations, including IAEAsafeguards; (g) Authority to engage in international cooperation; (h) Provisions to protect proprietary, confidential and sensitive information; (i) Provisions for stakeholder involvement and communication with the public. There are agreed terms of reference for each regulator and a clear definition of roles of, and interfaces with, other regulators. There is recognition of the need for integrating existing security and radiation safety regulations with new regulations for NPPs. **Note:** Plans to develop competence are addressed under infrastructure issue No. 10, human resource development.
	Examples of how the condition may be demonstrated (1) Evidence of what has been done, or is planned, to develop the experience of the senior regulators (2) Proposals on the overall approach to assessment, licensing, inspection and enforcement, among other things (3) Plans to develop the regulatory body for safety, security and safeguards (4) Plans to develop the required regulations (5) Evidence of interaction and cooperation with established regulatory organizations (6) Plans to enhance or develop appropriate technical support organizations (see also infrastructure issue No. 10, human resource development) to support the regulatory body (7) Plans to secure support from international regulatory organizations

7. Regulatory framework	Phase 1
Conditions	**Basis for evaluation**
	Relevant IAEA publications — Guidance for States Implementing Comprehensive Safeguards Agreements and Additional Protocols [26] — SSG-16, actions 24–26, 62, 107 and 189 [2] — IAEA Nuclear Security Series No. 19, action 3.2 [3]

8. Radiation protection[b]	Phase 1
Conditions	**Basis for evaluation**
8.1. Enhancements to radiation protection programmes planned	**Summary of the condition to be demonstrated** The needed enhancements to the existing radiation protection programme to address NPP operation have been identified, including consideration of transport of radioactive materials and radioactive waste management. They consider both the increase in scale and the need to cover new technical issues. **Note:** This issue is closely linked to infrastructure issue No. 7, regulatory framework. In particular, the development of regulations and whether the existing regulatory body will expand its role or whether the infrastructure issues will be addressed by a separate organization.
	Examples of how the condition may be demonstrated (1) Evidence of discussions with specialists from other countries (2) Identification of the main areas requiring enhancement (3) Recognition that additional competences will be required to review proposed designs against the requirement to control contamination and to reduce exposures to as low as reasonably achievable, also known as ALARA (4) Recognition that the programme for dose assessment will need to be significantly expanded (5) Plans for who will be responsible for the main elements of a radiation protection programme
	Relevant IAEA publication SSG-16, action 105 [2]

[b] This covers protection of workers and the public on-site during planned operation. Off-site releases from planned operation are addressed in infrastructure issue No. 13, environmental protection; and accidental releases and associated radiation protection are addressed in infrastructure issue No. 14, emergency planning.

9. Electrical grid	**Phase 1**
Conditions	**Basis for evaluation**
9.1. Electrical grid requirements considered	**Summary of the condition to be demonstrated** A preliminary study of the grid system has been conducted covering: (a) Capability and reliability to take the output from the NPP; (b) Ability to withstand loss of the output; (c) Reliability to minimize the risk of loss of power to the NPP from the grid.
	Examples of how the condition may be demonstrated (1) An analysis of the grid covering: (a) The expected grid capacity; (b) The historical stability and reliability of the electrical grid; (c) The historical and projected variation in energy demand. (2) Evidence of consideration of: (a) Available NPP designs to identify those with output consistent with required grid performance and reliability ('grid code'), with due consideration taken for safety aspects; (b) Potential NPP sites and their impact on grid operation; (c) The anticipated growth of grid capacity; (d) The potential for local or regional interconnectors to improve grid characteristics. (3) Preliminary plans to enhance the grid to meet NPP requirements.
	Relevant IAEA publications — SSG-16, action 171 [2] — NG-T-3.8, Electric Grid Reliability and Interface with Nuclear Power Plants [31]

10. Human resource development	Phase 1
Conditions	**Basis for evaluation**
10.1. Necessary knowledge and skills identified, and gaps in current capability assessed	**Summary of the condition to be demonstrated** A broad assessment of the typical staffing needs of each of the key organizations and their technical support has been completed together with an assessment of improvements required in the current capability of the country to meet the projected need. The assessment covers the full range of scientific, technical, managerial and administrative disciplines and considers: (a) Current human resource competences and capabilities; (b) Estimated required competence and capability; (c) Availability of domestic and foreign capacity for education and training; (d) Additional education, recruitment, training and experience that will be required (gap analysis), including specialist training in nuclear safety, nuclear security, safeguards, radiation protection, spent fuel and radioactive waste management, management systems and EPR; (e) Which facilities and programmes need to be established for education, training and experience building; (f) Which research capability needs to be developed; (g) A senior leaders development programme.
	Examples of how the condition may be demonstrated (1) An analysis identifying the competences and number of staff needed, covering all the future organizations. The analysis needs to include: (a) Bulk workforce needs per phase; (b) A breakdown by knowledge, skills and discipline per phase; (c) The flow of workforce to other projects (e.g. future NPPs). (2) An analysis of existing human resource capabilities and the ability to attract experienced staff from other countries. (3) An assessment of the capability of existing education and training facilities.
	Relevant IAEA publications — SSG-16, actions 85–89, 99 and 100 [2] — IAEA Nuclear Security Series No. 19, actions 4.37–4.44 [3] — NG-T-3.10, Workforce Planning for New Nuclear Power Programmes [32]
10.2. Development of human resources planned	**Summary of the condition to be demonstrated** Outline plans have been agreed to: (a) Enhance national education and training; (b) Develop a detailed human resource development plan for each key organization; (c) Integrate the plans to develop a national strategy including the development of an initial core leadership group.
	Examples of how the condition may be demonstrated (1) Plans to develop human resources required including: (a) Identification of national organizations that could support human

10. Human resource development	Phase 1
Conditions	**Basis for evaluation**
	resource development; (b) Enhancement of education and training infrastructure; (c) Development of national competences (through schools, universities, institutes and industry); (d) Non-national human resources that are needed to augment national resources and how they will be secured; (e) International cooperation and vendor support; (f) Leadership development. (2) Strategies for the recruitment and retention of staff. (3) Recognition of the need for qualification and certification programmes for personnel. (4) Evidence that key stakeholder organizations have participated in the development and review of the plans.
	Relevant IAEA publications — SSG-16, actions 85–89, 99 and 100 [2] — IAEA Nuclear Security Series No. 19, actions 4.37–4.44 [3] — NG-T-3.10 [32]

11. Stakeholder involvement	Phase 1
Conditions	**Basis for evaluation**
11.1. Open and transparent stakeholder involvement programme initiated	**Summary of the condition to be demonstrated** Stakeholder involvement strategy and plan, with the required resources and competence, implemented by the NEPIO based on transparency and openness. The public, and other relevant interested parties, receive information about the benefits and risks of nuclear power, including the non-zero potential for severe accidents.
	Examples of how the condition may be demonstrated (1) A clear mandate for the NEPIO to engage with stakeholders (2) Actions to disseminate information in the context of the national energy outlook, policy and needs, and pros and cons of all sources of energy, using a range of effective tools (3) Evidence of a professional communication team available to the NEPIO, with appropriate financial resources (4) Results of surveys to determine the public's knowledge and receptiveness to nuclear power (5) Approaches to address public concerns, including waste management and severe accidents (6) Evidence of activities at the local, regional and national level (7) A plan for ongoing interaction with the public, in particular, opinion leaders, media, local and national governmental officials and neighbouring countries (8) Plans for regular opinion polls managed by specialist companies (9) A training programme to enable identified spokespersons to interact with stakeholders
	Relevant IAEA publications — SSG 16, actions 12 and 39 [2] — NG-T-1.4, Stakeholder Involvement Throughout the Life Cycle of Nuclear Facilities [33]

12. Site and supporting facilities	Phase 1
Conditions	**Basis for evaluation**
12.1. General survey of potential sites conducted and candidate sites identified	**Summary of the condition to be demonstrated** Exclusion and avoidance criteria (covering safety, security, cost, socioeconomic issues, engineering and the environment) have been identified and regional analysis to identify candidate sites has been conducted. The analysis includes the impact of external hazards on security and emergency response capability. Consultations with stakeholders have been part of the process.

12. Site and supporting facilities	Phase 1
Conditions	**Basis for evaluation**
	Examples of how the condition may be demonstrated (1) A report covering: (a) Safety and security criteria for initial NPP site selection; (b) National criteria (e.g. socioeconomic and environmental); (c) Engineering and cost criteria. (2) An assessment report issued and approved identifying: (a) Regional analysis and identification of potential sites; (b) Screening of potential sites and selection of candidate sites. (3) Evidence that the resources that were used for NPP site selection are competent and have experience with NPP site selection. (4) Plans for the work that will be required in Phase 2 to select and justify the site. (5) Evidence that safety and security related activities conducted (e.g. site evaluation and environmental impact studies) are included within the framework of an effective management system.
	Relevant IAEA publications — NS-R-3 (Rev. 1), Site Evaluation for Nuclear Installations [34] — SSG-35, Site Survey and Site Selection for Nuclear Installations [35] — SSG-16, action 160 [2] — NG-T-3.7, Managing Siting Activities for Nuclear Power Plants [36]

13. Environmental protection[c]	**Phase 1**
Conditions	**Basis for evaluation**
13.1. Environmental requirements considered	**Summary of the condition to be demonstrated** The NEPIO has considered the main environmental requirements related to the siting of an NPP, including land use, water use, water quality and the impacts of low level radioactive effluents.
	Examples of how the condition may be demonstrated (1) Identification of key requirements for siting and during construction (2) Evidence of discussions by specialists with States operating nuclear power (3) Evidence that the non-radiological environmental issues, such as water use, transport of materials, disposal of hazardous waste, additional environmental monitoring requirements and construction impact, have been considered and taken into account by the NEPIO
	Relevant IAEA publications — SSG-16, action 106 [2] — NG-T-3.11, Managing Environmental Impact Assessment for Construction and Operation in New Nuclear Power Programmes [37]
13.2. Framework for environmental protection reviewed	**Summary of the condition to be demonstrated** The NEPIO has reviewed the suitability of the State's existing framework for environmental protection and for meeting its international obligations.
	Examples of how the condition may be demonstrated (1) Procedures developed for the elaboration, reporting and assessment of environmental studies for nuclear and other related facilities (2) Evidence of interactions by specialists with States operating nuclear power
	Relevant IAEA publications — SSG-16, action 106 [2] — NG-T-3.11 [37]

[c] This covers off-site releases from planned operation and all other environmental issues. Protection of workers and the public on-site during planned operation are addressed in infrastructure issue No. 8, radiation protection. Accidental releases and radiation are addressed in infrastructure issue No. 14, emergency planning.

14. Emergency planning	**Phase 1**
Conditions	**Basis for evaluation**
14.1. Requirements of, and resources for, developing an emergency response capability recognized	**Summary of the condition to be demonstrated** (a) The NEPIO is aware of the EPR arrangements and capabilities that will be required for the nuclear power programme. It has evaluated existing EPR arrangements and capabilities in the country and is aware of the major gaps that will need to be addressed. (b) The NEPIO has identified the main organizations and resources that will need to be involved in the establishment of adequate national EPR capabilities. (c) The lead for the execution of the action plan and the action plan coordination framework has been identified. **Notes:** (1) The process of developing adequate EPR will be initiated in Phase 2 and will be largely carried out in Phase 3. (2) The requirements of the conventions on early notification [11] and assistance [12] are covered under infrastructure issue No. 5, legal framework.
	Examples of how the condition may be demonstrated Report summarizing existing EPR arrangements and capabilities and identifying those to be enhanced and/or developed as well as identifying the main organizations and resources that will need to be involved in the establishment of adequate national EPR capabilities.
	Relevant IAEA publications — GSR Part 7, Preparedness and Response for a Nuclear or Radiological Emergency [38] — GSG-2, Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency [39] — GS-G-2.1, Arrangements for Preparedness for a Nuclear or Radiological Emergency [40] — SSG-16, actions 133 and 134 [2] — Considerations in Emergency Preparedness and Response for a State Embarking on a Nuclear Power Programme [41]
14.2. Recommendations from any previous reviews or audits being addressed	**Summary of the condition to be demonstrated** If any reviews or audits have been undertaken of the existing framework, there is evidence that the actions resulting from it are progressing.
	Example of how the condition may be demonstrated Presentation of any action plans resulting from a review or audit with progress identified.

15. Nuclear security	**Phase 1**
Conditions	**Basis for evaluation**
15.1. Nuclear security requirements recognized and the actions of all relevant organizations coordinated	**Summary of the condition to be demonstrated** The NEPIO recognizes the importance of nuclear security, based on a national threat assessment and principles of prevention, detection and response. All competent authorities that are involved in nuclear security have been identified and there is a coordinating body or mechanism established that brings together all of the organizations that have responsibility for nuclear security. **Note:** The need to establish legislation and a regulatory framework is addressed under infrastructure issues Nos 5 and 7, legal framework and regulatory framework, respectively.
	Examples of how the condition may be demonstrated (1) Evidence of familiarity with IAEA Nuclear Security Series publications and other States' practices (2) Clear identification of all organizations that have roles and responsibilities for nuclear security and of the work that will need to be carried out in the subsequent phases (3) Evidence that nuclear security considerations for siting have been defined and have been considered as part of the siting assessment (see infrastructure issue No. 12, site and supporting facilities) (4) Evidence that international cooperation and assistance is being used (5) Evidence that the need to address the interface with safety and safeguards is recognized
	Relevant IAEA publication IAEA Nuclear Security Series No. 19, actions 2.1–2.10, 4.1, 4.2, 4.26 and 4.53 [3]
15.2. Recommendations from any previous reviews or audits being addressed	**Summary of the condition to be demonstrated** If any reviews or audits have been undertaken of the existing framework, there is evidence that the actions resulting from it are progressing.
	Example of how the condition may be demonstrated Presentation of any action plans resulting from a review or audit with progress identified.

16. Nuclear fuel cycle	Phase 1
Conditions	**Basis for evaluation**
16.1. Options for nuclear fuel cycle (front end and back end) considered	**Summary of the condition to be demonstrated** At a strategic level, options have been considered for the front end and back end of the fuel cycle. For the front end, options for uranium sourcing and fuel manufacture and supply have been addressed. For the back end of the fuel cycle, spent fuel storage needs and capacities (on-site and off-site) and possible reprocessing have been considered.
	Examples of how the condition may be demonstrated (1) A document: (a) Identifying available national natural resources and capacities for individual steps in the nuclear fuel cycle; (b) Identifying potential sources of supply and services; (c) Assessing available options for a national fuel cycle strategy, taking into account non-proliferation issues. (2) A document clearly demonstrating that the NEPIO understands the long term commitments related to the back end of the nuclear fuel cycle and has considered the options and their implications. The document needs to address the need for adequate capacity for spent fuel storage at the reactor site, the possibility of interim storage of spent fuel at a dedicated facility and any plans for reprocessing. (3) Clear allocation of responsibilities for development of the fuel cycle policy and strategy (front end and back end) to be undertaken during Phase 2.
	Relevant IAEA publications — SSG-16, actions 122 and 123 [2] — NW-G-1.1 [6] — NW-T-1.24 [7]

17. Radioactive waste management	Phase 1
Conditions	**Basis for evaluation**
17.1. The requirements for management of radioactive waste from NPPs recognized	**Summary of the condition to be demonstrated** The NEPIO understands the significantly increased requirements for the processing, storage and disposal of high, intermediate and low level radioactive waste from a nuclear power programme, and has developed options for the management of radioactive waste, taking into account existing arrangements.
	Examples of how the condition may be demonstrated A document addressing possible approaches to the management of radioactive waste arising from NPP operation and decommissioning, the capabilities and resources needed, and the options and technologies for its processing, handling, storage and disposal. If reprocessing is being considered, this needs to include the management of high level waste. Regulatory framework and financing schemes are addressed under infrastructure issues Nos 7 and 4, regulatory framework, and funding and financing, respectively.
	Relevant IAEA publications — SSG-16, actions 122 and 123 [2] — NW-T-1.24 [7]
17.2. Options for disposal of all radioactive waste categories understood	**Summary of the condition to be demonstrated** The NEPIO understands the options for disposal of each of the different waste categories. Although the specific routes for disposal of the different waste categories (including spent fuel if considered as waste) can be decided later, the need to select and plan for adequate options is recognized.
	Example of how the condition may be demonstrated A document indicating that the NEPIO understands options for disposal of different radioactive waste categories and options for funding these activities.
	Relevant IAEA publications — NW-G-1.1 [6] — NW-T-1.24 [7]

18. Industrial involvement	Phase 1
Conditions	**Basis for evaluation**
18.1. National policy developed with respect to industrial involvement	**Summary of the condition to be demonstrated** A policy for national involvement in the nuclear power programme has been developed, taking into account current industrial capacity and technical services, current and required quality standards, and potential investment requirements. The policy may include short term and longer term targets for industrial involvement.
	Examples of how the condition may be demonstrated (1) A survey of companies with the potential to participate in the nuclear power programme for construction, equipment provision or support services, with a review of their ability to satisfy the requirements of a nuclear power programme. (2) Meetings with, or training of, potential suppliers to explain standards and qualifications required, review feasibility of involvement, and identify required actions and funding requirements.
	Relevant IAEA publications — SSG-16, action 61 [2] — NG-T-3.4, Industrial Involvement to Support a National Nuclear Power Programme [42]

19. Procurement	Phase 1
Conditions	**Basis for evaluation**
19.1. Requirements for purchasing NPP services recognized	**Summary of the condition to be demonstrated** Recognition of the requirements associated with purchasing services.
	Examples of how the condition may be demonstrated (1) Appropriate procurement of consulting services in Phase 1 (2) Evidence that the issues related to services for Phase 2 activities are recognized, allowing for both national and foreign suppliers

3.3. Evaluation of infrastructure status in Phase 2

1. National position	**Phase 2**
Conditions	**Basis for evaluation**
1.1. Government support role defined and effective	**Summary of the condition to be demonstrated** The government has approved a specific nuclear power programme, with a clear commitment to safety, security and non-proliferation. The NEPIO continues to ensure that the work to develop the nuclear infrastructure is coordinated and a government ministry has been assigned the responsibility to support the development of the programme to ensure that: (a) All the government actions needed to support the programme are monitored and coordinated with the project schedule; (b) A policy for nuclear fuel cycle, radioactive waste management and decommissioning is established; (c) Safety, security and safeguards responsibilities are formulated and understood by all relevant organizations; (d) Appropriate support and encouragement of knowledge transfer from States that have experience with a nuclear power programme are available through bilateral agreements; (e) The State fully participates in all the activities associated with the global nuclear safety and security and non-proliferation regime.
	Examples of how the condition may be demonstrated (1) Evidence that an ongoing government role for nuclear power programme implementation has been clearly defined and established within a government agency (e.g. energy or industry) (2) Evidence that the required government actions are monitored and coordinated with the project schedule (3) Appropriate bilateral agreements in place with vendor countries (e.g. an intergovernmental agreement) **Note:** These may not be complete at the end of Phase 2 or subject to review given that the detailed contract may still need to be agreed (4) A defined responsibility for formulating a strategy for fuel cycle and radioactive waste management (5) Examples of how the State participates in the global nuclear safety and security regime
	Relevant IAEA publications — SSG-16, actions 5 and 6 [2] — IAEA Nuclear Security Series No. 19, section 2 [3] — NG-T-3.6 [5] — NW-G-1.1 [6]

1. National position	Phase 2
Conditions	**Basis for evaluation**
1.2. Overall strategic approach established for contracting for the NPP	**Summary of the condition to be demonstrated** The State has a clear justification for its nuclear power programme and has established a strategy for developing contract arrangements for the NPP (e.g. build–own–operate, build–own–operate–transfer, strategic partnerships, and turnkey and multiple contracts) and has a rationale supporting the decision. The strategy may include requesting bids for more than one option.
	Examples of how the condition may be demonstrated (1) A document reviewing contracting strategies and justifying the chosen approach with evidence that the chosen strategy is consistent with national legislation and has been agreed to by all relevant stakeholders (2) Implications recognized, and a plan to fulfil necessary requirements in place; a document setting out responsibilities of key national organizations and intended contracting strategy
	Relevant IAEA publication SSG-16, actions 5, 6, 7 and 8 [2]
1.3. Commitments and obligations of owner, operator and regulatory body established	**Summary of the condition to be demonstrated** The owner, operator and regulatory body have been established and the responsibilities of each organization have been clearly defined and understood, including their safety, security and safeguards responsibilities. The role of any national supporting organization (e.g. a technical support organization) has been clearly defined, as has any significant role for non-national organizations (e.g. vendor or other regulator). The latter is clearly defined in the contracting strategy.
	Examples of how the condition may be demonstrated (1) Roles and responsibilities clearly defined with respect to nuclear safety, security and safeguards in the operating, regulatory and technical support organizations. (2) Definition of the organization that will be the licensee of the NPP and evidence of adequate resources to comply with licence requirements. Definition of the roles and responsibilities of the owner if different from the operator. (3) Definition of any intended regulatory collaboration.
	Relevant IAEA publications — SSG-16, actions 5, 7, 8, 14, 16 and 149 [2] — Guidance for States Implementing Comprehensive Safeguards Agreements and Additional Protocols [26]

2. Nuclear safety	Phase 2
Conditions	**Basis for evaluation**
2.1. Safety responsibilities of key organizations recognized	**Summary of the condition to be demonstrated** The government has expanded its nuclear safety policy and strategy to include nuclear power. The owner/operator and the regulatory body have a detailed understanding of safety standards and have begun the task of understanding the safety basis of an NPP. Senior positions in the owner/operator and the regulatory body have been filled for some time and the leadership of both the owner/operator and the regulatory body have initiated programmes and practices to build a safety culture in their respective organizations. They have also agreed on a protocol for communication between the owner/operator, the regulatory body and the vendor that covers correspondence, meetings and actions, among other things. The regulatory body has specified requirements on how the competence of owner/operator staff in positions related to safety is ensured. The owner/operator, the regulatory body and technical support organizations, as appropriate, have the expertise to prepare for the review of safety assessments supplied by the vendor.
	Examples of how the condition may be demonstrated (1) Nuclear safety principles and requirements developed by the regulatory body and the owner/operator (2) Appropriate training for regulators, owner/operators and technical specialists carried out (3) Knowledge of international experience that is relevant to NPP designs being considered (4) For key leadership positions, a summary of NPP safety related experience and development (5) Programmes to promote safety culture through leadership (6) Protocol agreed for interactions between owner/operator, regulator, vendor and technical support organizations (7) Process and responsibilities defined for review and understanding of information supplied by the vendor during construction
	Relevant IAEA publication SSG-16, actions 32, 149, 151, 152, 172, 190 and 191 [2]
2.2. Expectations for relationship with suppliers established	**Summary of the condition to be demonstrated** Future role of the vendor, or other bodies, in supporting safe operation has been defined by the owner/operator (e.g. any design authority role or support role in managing emergency situations). Training requirements from the vendor or other bodies have also been defined.
	Examples of how the condition may be demonstrated Statements defining the required levels of support from the vendor and other bodies and mechanisms for information exchange, training and technical support, among other things.
	Relevant IAEA publication SSG-16, actions 14–16 and 154 [2]

3. Management	Phase 2
Conditions	**Basis for evaluation**
3.1. Contract specifications and evaluation criteria determined	**Summary of the condition to be demonstrated** If competitive bidding for an NPP is being undertaken, a detailed bid invitation specification (BIS) has been completed, together with the criteria that will be used to evaluate the bids. If the vendor has already been selected (e.g. by an intergovernmental agreement), the owner/operator has included its requirements in the specifications for negotiating with a sole supplier[d]. Negotiating strategy and criteria have also been developed.
	Examples of how the condition may be demonstrated (1) Documented BIS available and evaluation criteria clearly defined (2) Description of the negotiating strategy defined by the NPP owner/operator
	Relevant IAEA publications — SSG-16, actions 113, 153 and 173 [2] — NG-T-3.9, Invitation and Evaluation of Bids for Nuclear Power Plants [43]
3.2. Owner/operator competence for procuring and managing the NPP contract evident and plans to develop operator competence available	**Summary of the condition to be demonstrated** The owner/operator is competent to manage the procurement requirements and to ensure the contract requirements are fully met. This will include verification of project progress and quality requirements. This may include the appointment of the owner's engineer to support the owner organization. If this involves a split package or multipackage procurement approach, a significantly greater level of competence will be required. The owner/operator needs to have plans to develop the capability for safe and secure operation, including: (a) Recruiting and training staff; (b) Procedures to ensure that knowledge critical to safe and secure operation will be preserved; (c) Procedures to create the required awareness with regard to the risk of proliferation of nuclear weapons through export or import.

3. Management	Phase 2
Conditions	**Basis for evaluation**
	Examples of how the condition may be demonstrated (1) Description of the organization, including roles and responsibilities of departments and individuals with respect to bid assessment, supervision of construction, development of knowledge base, and understanding of operating and maintenance requirements. (2) Evidence of a suitably qualified and experienced team with competence in all required areas, including: (a) Bid requesting and bid evaluation; (b) Awarding, and issuing purchase orders; (c) Financing, letters of credit and taxes; (d) Quality programmes, including inspection of items under manufacturing, testing and receipt of goods and non-conformance procedures; (e) Transport, insurance and customs clearing; (f) Types of proven design of NPP and potential suppliers; (g) Main technical characteristics of potential plants; (h) Codes and standards; (i) Contracting methodologies; (j) Project management, manufacturing schedule and delivery time. (3) Plans to develop: (a) Project reporting mechanisms; (b) Acceptance procedures and criteria; (c) Commissioning skills; (d) The organization that will be required for commissioning and operating the NPP; (e) Commissioning, operating and maintenance procedures. (4) Interfaces with other organizations defined and agreed. (5) Evidence that appropriate staff have gained experience from operating plants similar to those being considered. (6) Plans to participate in appropriate owners groups.
	Relevant IAEA publication SSG-16, actions 66 and 152 [2]
3.3. Management systems established	**Summary of the condition to be demonstrated** Management systems have been defined for each of the three key organizations and include roles, responsibilities, organizational structure and processes (for Phase 2), including record keeping. The processes for Phase 3 are in place or planned to be produced before they are required. The management systems cover safety, nuclear security and safeguards, and are consistent with IAEA Safety Standards Series No. GSR Part 2, Leadership and Management for Safety [44]. The systems promote a strong safety and security culture, include plans for self and independent evaluation, and include procedures to ensure that knowledge critical to the safe, secure and peaceful use of nuclear energy will always be

3. Management	Phase 2
Conditions	**Basis for evaluation**
	preserved. For the NEPIO and the regulatory body, they also include mechanisms to monitor the programme for infrastructure development and to ensure it is consistent with the project schedule.
	Examples of how the condition may be demonstrated (1) For each organization, availability of the integrated management system manual, definition of key processes and responsibilities, and plans to produce required detailed documentation (2) Mechanism for NEPIO to manage the infrastructure development programme
	Relevant IAEA publications — SSG-16, actions 75–77 and 151 [2] — GSR Part 2 [44] — IAEA Nuclear Security Series No. 19, actions 4.19–4.23 [3]

[d] The rest of this publication refers to BISs, which are applicable to a State using a competitive bidding process. A State using an intergovernmental agreement, strategic partner or sole supplier, instead of a competitive process, needs therefore to interpret BISs as specifications for negotiating with a sole supplier.

4. Funding and financing	Phase 2
Conditions	**Basis for evaluation**
4.1. Funding plan available	**Summary of the condition to be demonstrated** The means by which costs that are not the fiscal responsibility of the owner/ operator have been identified. Depending on the contracting model, these may include costs associated with legislation, setting up the owner/operator, education, training, research, government roles (e.g. environmental assessment process, stakeholder involvement), the regulatory body, emergency planning, spent fuel and radioactive waste management and decommissioning.
	Examples of how the condition may be demonstrated (1) Mechanisms established for funding the regulatory body, including technical support organizations (2) Proposed means identified for funding spent fuel and radioactive waste management and decommissioning (3) Phase 3 funding plan matched to NPP project plan including all national commitments for participation in construction, owner/operator costs, regulator costs, other stakeholders and emergency planning
	Relevant IAEA publication SSG-16, actions 52–55 [2]
4.2. Means of financing established and strategy for management of financial risks available	**Summary of the condition to be demonstrated** A credible feasibility study has been finalized and realistic financing options for the NPP have been identified. An owner/operator financial team has been established, and is competent to identify potential lenders and additional investors, evaluate and/or negotiate financing offers, analyse the extent of, and risks associated with, any State backed power purchase agreement and/or sovereign guarantees, and identify and analyse additional financial risks. A clear sense of what is acceptable to senior decision makers is available. The financial risks have been clearly identified and a strategy for negotiation and/or evaluation of key finance related proposals has been developed.
	Examples of how the condition may be demonstrated (1) A document identifying how the project will be financed and demonstrating financial viability of the project, including implications for electricity tariffs. (2) Risk management proposals identifying all the key financial risks, and how they can be addressed through contracts and/or guarantees. These need to cover operational difficulties, public liabilities, delays in construction, regulatory delays, government/public intervention and electricity price fluctuations. (3) A negotiating mandate and/or more detailed guidance based, for example, on the high level terms in an intergovernmental agreement. **Note:** There are likely to be constraints on how much of this specific information will be available but information needs to be available on the process that has been used to develop and underwrite the plan.

4. Funding and financing	Phase 2
Conditions	**Basis for evaluation**
	Relevant IAEA publications — NG-T-4.1 [9] — NG-T-4.2 [10]

5. Legal framework	Phase 2
Conditions	**Basis for evaluation**
5.1. Adherence to all international legal instruments governing nuclear activities	**Summary of the condition to be demonstrated** The Member State has adhered to the following international legal instruments and is following an action plan for their implementation: (a) Convention on Early Notification of a Nuclear Accident (INFCIRC/335) [11]; (b) Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (INFCIRC/336) [12]; (c) Convention on Nuclear Safety (INFCIRC/449) [13]; (d) Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (the 'Joint Convention') (INFCIRC/546) [14]; (e) Convention on the Physical Protection of Nuclear Material (INFCIRC/274/Rev. 1) [15] and Amendment thereto (INFCIRC/274/Rev.1/Mod.1) [16]; (f) Vienna Convention on Civil Liability for Nuclear Damage (INFCIRC/500) [17][e]; (g) Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage (INFCIRC/566) [19]; (h) Convention on Supplementary Compensation for Nuclear Damage (INFCIRC/567) [20]; (i) Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention (INFCIRC/402) [21]; (j) Comprehensive safeguards agreement — based on The Structure and Content of Agreements Between the Agency and States Required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons (INFCIRC/153 (Corrected)) [22]; (k) Additional protocol — following the provisions of Model Protocol Additional to the Agreement(s) Between States(s) and the International Atomic Energy Agency for the Application of Safeguards (INFCIRC/540 (Corrected)) [23]; (l) Revised Supplementary Agreement Concerning the Provision of Technical Assistance by the IAEA.

5. Legal framework	Phase 2
Conditions	**Basis for evaluation**
	Example of how the condition may be demonstrated Evidence that the State has adhered to the relevant international legal instruments and is implementing the obligations arising from them.
	Relevant IAEA publications — Handbook on Nuclear Law [24] — Handbook on Nuclear Law: Implementing Legislation [25] — SSG-16, action 15 [2]
[e] The Convention on Third Party Liability in the Field of Nuclear Energy (Paris Convention) [18] is another relevant legal instrument under the auspices of the Organisation for Economic Co-operation and Development.	
5.2. A comprehensive nuclear law enacted	**Summary of the condition to be demonstrated** The Member State has enacted the national nuclear legislation that: (a) Establishes an independent nuclear regulatory body with adequate human and financial resources, and a clear and comprehensive set of functions; (b) Identifies responsibilities for safety, security and safeguards; (c) Formulates safety principles and rules (radiation protection, nuclear installations, radioactive waste and spent fuel management, decommissioning, mining and milling, EPR and the transport of radioactive material); (d) Formulates nuclear security principles; (e) Gives appropriate legal authority for, and definition of, the responsibilities of the regulatory body and all competent authorities establishing a regulatory control system (authorization, inspection and enforcement, review and assessment, and development of regulations and guides); (f) Implements IAEA safeguards, including an SSAC; (g) Implements import and export control measures for nuclear and radioactive material and items; (h) Establishes compensation mechanisms for nuclear damage.
	Example of how the condition may be demonstrated Evidence that a comprehensive nuclear law is enacted and promulgated.
	Relevant IAEA publications — Handbook on Nuclear Law [24] — Handbook on Nuclear Law: Implementing Legislation [25] — Guidance for States Implementing Comprehensive Safeguards Agreements and Additional Protocols [26] — SSG-16, actions 22 and 108 [2] — IAEA Nuclear Security Series No. 19, actions 3.4–3.12 [3]

5. Legal framework	Phase 2
Conditions	**Basis for evaluation**
5.3. All other legislation affecting the nuclear power programme reviewed	**Summary of the condition to be demonstrated** Legislation has been reviewed and amended as necessary to cover: (a) Environmental protection; (b) EPR; (c) Occupational health and safety of workers; (d) Protection of intellectual property; (e) Local land use controls; (f) Foreign investment; (g) Taxation, fees, electricity tariffs and incentives; (h) Funding of long term liabilities related to spent fuel, radioactive waste and decommissioning; (i) Roles of national and local governments; (j) Stakeholders and public involvement; (k) International trade and customs; (l) Financial guarantees and any other required financial legislation; (m) R&D.
	Example of how the condition may be demonstrated Presentation of a review identifying relevant laws and evidence that the necessary laws have been enacted, or there is a clear plan to enact them at the appropriate time.
	Relevant IAEA publications — Handbook on Nuclear Law [24] — Handbook on Nuclear Law: Implementing Legislation [25] — IAEA Nuclear Security Series No. 19, actions 3.6–3.12 [3] — Guidance for States Implementing Comprehensive Safeguards Agreements and Additional Protocols [26]

6. Safeguards	Phase 2
Conditions	**Basis for evaluation**
6.1. Strengthening of the SSAC underway	**Summary of the condition to be demonstrated** The State authority responsible for safeguards implementation is established and has defined roles and responsibilities within the SSAC. Measures are implemented to enhance the SSAC's capability to regulate and control all nuclear activities in the State to ensure that the nuclear material is used only for peaceful purposes, including: (a) To collect, process and report, on time, correct and complete safeguards relevant information to the IAEA; (b) To facilitate IAEA activities and to provide access for IAEA in-field verification; (c) To confirm or verify the information provided;

6. Safeguards	Phase 2
Conditions	**Basis for evaluation**
	(d) To resolve questions and inconsistencies through institutional arrangements.
	Examples of how the condition may be demonstrated (1) Description of the SSAC roles and responsibilities (2) Evidence that all organizations involved in the establishment or adjustment of the SSAC are prepared for the increase of activity, the increase of resources and the enhancement of capabilities needed to embark successfully on a nuclear power programme (3) A plan to develop operation relevant safeguards procedures (4) A programme in place to build up the required technical and administrative competence on timescales consistent with the development of the nuclear power programme (5) Evidence through information exchange with the IAEA that the SSAC has a good understanding of the principles of safeguarding an NPP, including the type of equipment the IAEA may install in the facility
	Relevant IAEA publications — Guidance for States Implementing Comprehensive Safeguards Agreements and Additional Protocols [26] — Nuclear Material Accounting Handbook [28]
6.2. SSAC requirements for the NPP recognized and addressed	**Summary of the condition to be demonstrated** The owner/operator is aware of the requirements of nuclear materials accounting and control, including the necessary staffing, training and technical resources.
	Examples of how the condition may be demonstrated (1) Human technical and financial resource requirements are included in the owner/operator organization plans (2) Plans to develop the required system and related procedures for collecting, processing and reporting safeguards relevant information
	Relevant IAEA publications — Guidance for States Implementing Comprehensive Safeguards Agreements and Additional Protocols [26] — Nuclear Material Accounting Handbook [28]
6.3. Design information requirements for safeguards recognized	**Summary of the condition to be demonstrated** The State has notified the IAEA of its plans for NPP construction, understands the need for early planning of safeguards relevant features in the design and construction phases (including such requirements in the BIS), and plans to submit early design information to the IAEA as soon as the technology has been decided. Any plans for fuel cycle facilities have been communicated to the IAEA.

6. Safeguards	Phase 2
Conditions	**Basis for evaluation**
	Examples of how the condition may be demonstrated (1) Additional protocol [23] declaration (under Article 2.a.x) on ten year plans for the NPP submitted and regularly updated (2) Evidence through information exchange with the IAEA that the owner/ operator has a good understanding of the principles of safeguarding an NPP, including the type of equipment the IAEA may install in the facility (3) Information on technology and list of designs being included in the BIS, provided to the IAEA; if a design has already been chosen, design information has been submitted to the IAEA with any specific national variations (4) Future safeguards requirements for the NPP identified and included in the BIS. (5) Any proposals for fuel cycle facilities discussed with the IAEA
	Relevant IAEA publications — Design information questionnaire (DIQ), Template for Research and Power Reactors — Guidance for States Implementing Comprehensive Safeguards Agreements and Additional Protocols [26] — Guidelines and Format for Preparation and Submission of Declarations Pursuant to Articles 2 and 3 of the Model Protocol Additional to Safeguards Agreements [45] — NP-T-2.8, International Safeguards in Nuclear Facility Design and Construction [46]

7. Regulatory framework	Phase 2
Conditions	**Basis for evaluation**
7.1. Competent, effectively independent nuclear regulatory body established	**Summary of the condition to be demonstrated** The regulatory body has the legal authority, technical competence, resources and procedures to fulfil the statutory obligations, and is ready to assess an application for a licence, issue a licence with licence conditions and inspect the construction of the NPP against a clearly defined set of regulatory requirements. Its regulatory decisions are free from undue political and economic influence.
	Examples of how the condition may be demonstrated (1) Demonstration of effective independence, including separation from the promotional aspects of nuclear power (2) Evidence of adequate human and financial resources, including technical and leadership competence (3) Processes for communications with the public and liaison with the international community

7. Regulatory framework	Phase 2
Conditions	**Basis for evaluation**
	(4) A documented, formal management system, including roles, responsibilities, organizational structure and processes and record keeping (see infrastructure issue No. 3, management) (5) Technical support organizations and advisory experts available to support the regulatory function (6) Arrangements for interfaces with operating organizations, other regulatory bodies, transport organizations and international forums (7) Defined process for the assessment of applications for licence, licence issuance, inspections and enforcement actions **Note:** A report evaluating the regulatory framework against the actions described in SSG-16 [2] would address these conditions with respect to safety. If an IAEA Integrated Regulatory Review Service mission (tailored for embarking countries) has been conducted, the results of this mission could be used as evidence. However, subsequent work on any identified recommendations would be noted but not reviewed in detail, as that would occur during an Integrated Regulatory Review Service follow-up mission.
	Relevant IAEA publications — SSG-16, actions 27–32, 108, 109, 126, 161, 174, 190 and 191 (addressing thematic aspects of regulatory framework; see also the other relevant Milestone issues) [2] — IAEA Nuclear Security Series No. 19, actions 3.4, 3.5, 3.13–3.19 [3]

8. Radiation protection[f]	Phase 2
Conditions	**Basis for evaluation**
8.1. Development of radiation protection programmes and expansion of appropriate	**Summary of the condition to be demonstrated** Plans have been developed for programmes to control and monitor the exposure of individuals on-site before any radioactive material arrives on the site, including staff training, procurement of equipment and services, and design requirements. The plans take into account increased requirements during construction and commissioning.

8. Radiation protection[f]	**Phase 2**
Conditions	**Basis for evaluation**
infrastructures planned	**Examples of how the condition may be demonstrated** (1) Plans in place to implement radiation monitoring and protection programmes for exposure of workers and the public on-site before any radioactive material arrives on the site (2) The appropriate equipment and systems for radiation monitoring are included in the BIS (3) A review of the national infrastructure for monitoring and recording radiation doses with plans for the required expansion (4) Evidence of visits to other NPPs to understand the issues of dose and contamination control (5) Availability of competent staff to review vendor proposals for dose and contamination control

[f] This covers protection of workers and the public on-site during planned operation. Off-site releases from planned operation are addressed in infrastructure issue No. 13, environmental protection. Accidental releases and associated radiation protection are addressed in infrastructure issue No. 14, emergency planning.

9. Electrical grid	Phase 2
Conditions	**Basis for evaluation**
9.1. Detailed studies undertaken to determine grid enhancements	**Summary of the condition to be demonstrated** An analysis of the grid system has been completed to identify any enhancements needed to: (a) Cope with the enhanced generating capacity; (b) Achieve grid stability and reliability requirements to allow safe and efficient operation of the NPP (ability to reliably take the power generated and provide supplies to safety equipment). The requirements of the planned NPP have been agreed with the transmission system operator and they are compatible with the capability of NPP designs being considered.
	Examples of how the condition may be demonstrated Plans to address the grid requirements associated with the inclusion of the NPP. The plans need to include: (1) Enhancement and/or expansion compatible with the increased generating capacity; (2) Achieving the overall grid stability and reliability requirements for safe operation of the NPP; (3) Justification of the reliability and capacity of the off-site power for the NPP; multiple grid connections to the NPP site, including provisions for their robustness, diversity, physical security and cybersecurity; (4) Grid related plant characteristics and reliability requirements included in the BIS.
	Relevant IAEA publication NG-T-3.8 [31]
9.2. Plans, funding and schedule for grid enhancement available	**Summary of the condition to be demonstrated** The plans for, and funding of, the identified enhancements are available, and the enhancement programme is consistent with the NPP construction programme.
	Examples of how the condition may be demonstrated (1) Evidence that funding and schedules for grid enhancements, compatible with the foreseen construction, testing and commissioning have been approved and that delivery times of towers, lines and components, substations and switch yards are consistent with the construction schedule (2) If the grid system will be interconnected to other countries, plans for appropriate legal and commercial agreements and operating procedures are in place for proper control of system frequency after an NPP trip and for grid emergency situations (3) If the required performance of the future grid is a significant improvement over the current performance, firm and realistic plans exist to ensure this performance will be achieved in time for the commissioning of the NPP

10. Human resource development[g]	**Phase 2**
Conditions	**Basis for evaluation**
10.1. Knowledge and skills needed in organizations for Phase 3 and operational phase identified	**Summary of the condition to be demonstrated** All relevant organizations have identified an appropriate organizational structure and the staff requirements for Phase 3, and the operational phase and key staff are already in place. The plans need to take into account the staffing requirements for any future units and the strategy for transferring staff between units.
	Examples of how the condition may be demonstrated For each organization (including support organizations), an analysis of what resources and competences are needed at what time during Phase 3 and the initial operational phase and which positions need to be formally licensed. The competence areas need to include: (1) Technical (including those that are nuclear specific); (2) Business (e.g. legal, finance); (3) Licensing; (4) Stakeholder involvement; (5) Fuel cycle management and procurement; (6) Construction management and commissioning; (7) Operation and maintenance; (8) Spent fuel, and radioactive waste management and decommissioning; (9) Training and development (including a systematic approach to training).
	Relevant IAEA publications — SSG-16, actions 52, 90–94, 101–103, 118 and 150 [2] — IAEA Nuclear Security Series No. 19, actions 4.45–4.49 [3] — NG-T-3.10 [32] — NG-T-2.2, Commissioning of Nuclear Power Plants: Training and Human Resource Considerations [47]
10.2. A plan available to develop and maintain human resources	**Summary of the condition to be demonstrated** A gap analysis has been completed (based on the requirements of 10.1, above) and recruitment and training plans developed (for each organization). The plans cover education, training and experience requirements and also include consideration of bilateral and international training activities.

10. Human resource development[g]	Phase 2
Conditions	**Basis for evaluation**
	Examples of how the condition may be demonstrated (1) Training plans for senior executives. (2) Recruitment, training and development programmes to provide the competences defined in 10.1, including: (a) The nature of, and time required for, development of each competence; (b) Proposed courses and location of training; (c) The need for training abroad at a similar operating plant to those being considered, with any necessary language training planned; (d) Programmes in place for the involvement of future operation and maintenance personnel with the construction and commissioning groups; (e) The licensing of identified management and operating staff. (3) Proposals for training infrastructure requirements and development of training expertise. (4) The BIS addresses what is required from suppliers, including competence development of national personnel (training and on the job experience), the provision of a simulator and other training infrastructure requirements, and the development of national trainers.
	Relevant IAEA publications — SSG-16, actions 52, 90–94, 101–103, 118 and 150 [2] — IAEA Nuclear Security Series No. 19, actions 4.45–4.49 [3] — NG-T-3.10 [32] — NG-T-2.2 [47]
10.3. An integrated national strategy developed	**Summary of the condition to be demonstrated** The plans of the different organizations (including educational institutions, research organizations and technical support organizations) have been considered in an integrated manner so as to optimize the development programme.

10. Human resource development[g]	Phase 2
Conditions	**Basis for evaluation**
	Examples of how the condition may be demonstrated (1) Integration of the plans of the individual organizations (including support organizations) to enable development of a national strategy including: (a) An appropriate balance of resources and competence between the operating organization, regulator and specialist organizations with adequate training provision in each; (b) A long term strategy to ensure sustainable, competent resources for each organization; (c) A remuneration structure that will ensure that all organizations are adequately staffed and that staff are retained; (d) Integrating and optimizing opportunities for training abroad; (e) Confirming the adequacy of national education infrastructure (at the secondary and tertiary levels) or identifying any necessary improvements. (2) Evidence that key stakeholder organizations have participated in the development and review of the above plan.
	Relevant IAEA publications — SSG-16, actions 52, 90–94, 101–103, 118 and 150 [2] — IAEA Nuclear Security Series No. 19, actions 4.45–4.49 [3] — NG-T-3.10 [32] — NG-T-2.2 [47]

[g] This issue addresses the future development of capability for Phase 3 and beyond. The skills already required to be in place for Phase 2 are covered under the appropriate issues (e.g. infrastructure issue No. 7, regulatory framework).

11. Stakeholder involvement	Phase 2
Conditions	**Basis for evaluation**
11.1. Stakeholder involvement plans being implemented	**Summary of the condition to be demonstrated** Each of the key organizations (government, regulator and owner/operator) has a proactive stakeholder involvement plan that is in use and regularly updated.
	Examples of how the condition may be demonstrated (1) Documented stakeholder involvement strategy and plan for each of the key organizations (government, regulator and owner/operator) addressing the full range of issues, including technology choice, safety, security, waste management, severe accidents, health and environmental impact (2) Evidence of a competent communications team in each organization, with experience and evidence of engagement with senior staff (3) Examples of communications in a range of formats with the public, local government, industry, media, non-governmental organizations, opposition groups, educational institutions and neighbouring countries (4) Evidence of training and experience of spokespersons (5) Evidence of ongoing government communications with regard to energy policy and energy needs, the role of nuclear power in the energy mix, the benefits and risks of nuclear power, the non-zero potential for severe accidents and response to issues raised (6) Regular reviews of public understanding and acceptance through means such as opinion polls or meetings (7) Effective public information centres in place or planned, including required budgets and facility design (8) Evidence that the owner/operator engages, on a regular basis, with local stakeholders on, for example, construction plans, opportunities for local jobs and benefits to the community (9) Regulator strategy regarding the availability of information to the public, regulatory communication and consultation with stakeholders (10) Evidence that the role of the regulator is understood by stakeholders and that it is perceived as competent and independent
	Relevant IAEA publications — NG-T-1.4 [33] — SSG-16, actions 41 and 42 [2]
11.2. Stakeholder involvement plans coordinated	**Summary of the condition to be demonstrated** The NEPIO provides a continuing forum for communication and cooperation among the key organizations, ensuring that the roles and responsibilities of each organization in stakeholder involvement are clear and that all stakeholders are being involved (including the public, local government, industry, media, non- government organizations, opposition groups and neighbouring States).

11. Stakeholder involvement	Phase 2
Conditions	**Basis for evaluation**
	Examples of how the condition may be demonstrated (1) Integrated national strategy agreed among the key organizations, with a commitment to share plans and to ensure consistency of messages (2) Evidence of regular review by the key organizations of the effectiveness of the strategy
	Relevant IAEA publications — NG-T-1.4 [33] — SSG-16, actions 41 and 42 [2]

12. Site and supporting facilities[h]	Phase 2
Conditions	**Basis for evaluation**
12.1. Detailed site characterization completed	**Summary of the condition to be demonstrated** The basis for the site selection has been justified against clearly defined siting criteria. These cover safety, engineering, security, environmental, emergency response, social and economic aspects. Site characterization and an evaluation by the regulatory body have been completed (the detailed approach will depend on the specific authorization stages defined in the State). Site related design basis information is available and included in the NPP requirements. A plan for addressing the siting of fuel cycle and waste facilities is available.
	Examples of how the condition may be demonstrated (1) A report demonstrating the ranking of possible sites and basis of the chosen site or sites (2) Evidence that the site meets all siting requirements and the necessary characterization studies have been completed (see publications listed below for list of topics to be addressed) (3) Evidence that local legal, political and public acceptance issues have been identified and resolved or their resolution is planned (4) Analysis of sites required for fuel interim storage, and for waste conditioning, storage and, where appropriate, disposal; plans for selecting sites available (5) Evidence that, where appropriate, transport between the NPP and any waste storage/disposal sites has been considered

12. Site and supporting facilities[h]	Phase 2
Conditions	**Basis for evaluation**
	Relevant IAEA publications — NG-T-3.7 [36] — NS-R-3 (Rev. 1) [34] — SSG-35 [35] — SSG-16, actions 162–165 [2]
12.2. Plans in place to prepare site for construction	**Summary of the condition to be demonstrated** Infrastructure either exists, or is planned, to support construction, for example access, workforce housing, water and construction materials. Any outstanding work is planned in accordance with the construction requirements or is included in the BIS.
	Examples of how the condition may be demonstrated (1) A review of the current infrastructure and plans to implement any enhancements required (2) Existing and planned site facilities are clearly described in the BIS
[h] There are also some siting related requirements addressed in infrastructure issue No. 13, environmental protection.	

13. Environmental protection[i]	Phase 2
Conditions	**Basis for evaluation**
13.1. Environmental impact assessment performed	**Summary of the condition to be demonstrated** A complete assessment of the environmental impact of the proposed NPP has been carried out in accordance with national requirements and an environmental impact assessment report has been submitted to the appropriate authority. Plans for monitoring to provide a baseline for the site and its surroundings have been developed.
	Examples of how the condition may be demonstrated (1) Availability of the environmental impact assessment report and the status of approval by all relevant regulators and agencies (2) Mitigation measures evaluated (3) Plans to develop systems and facilities for necessary environmental monitoring (including radiation monitoring), with clearly assigned roles for the operating organization and the environmental regulator

	Relevant IAEA publications — SSG-16, actions 110–112 and 166 [2] — NG-T-3.11 [37]
13.2. Environmental characteristics provided	**Summary of the condition to be demonstrated** Comprehensive specification of environmental site conditions, factors, characteristics and data have been included in the BIS in as much detail as possible.
	Examples of how the condition may be demonstrated (1) BIS identifying local environmental factors. Areas to consider include: (a) Pathways for effluent transport and concentration in the surrounding environment; (b) Local population demographics and trends; (c) Predominant plant and animal life and relevant radioecological sensitivities; (d) Predominant land use; (e) Data relevant to justifying heat removal capability; (f) Sites and means for disposal of hazardous waste; (g) Local environment issues affecting construction. (2) Bidders have free access to all detailed site studies including environmental impact assessment documents and collected site data, with the environmental limitations, commitments and conditions. (3) Established procedure for resolution of vendor questions with regard to the interpretation of the site data.
13.3. Clear and effective regulation of environmental issues established	**Summary of the condition to be demonstrated** The environmental regulator for the nuclear power programme has the skills and resources required to fulfil the roles and responsibilities assigned. The interface between this organization and the nuclear regulator has been defined.
	Examples of how the condition may be demonstrated (1) Roles and responsibilities of the environmental regulator for the NPP defined (2) Memoranda of understanding between the environmental and nuclear regulatory bodies (3) Evidence of adequate skills and resources to evaluate the environmental impact assessment, and plans to develop adequate skills to assess the acceptability of design information, inspect/audit activities during construction and evaluate monitoring results

[i] This covers off-site releases from planned operation and all other environmental issues. Protection of workers and the public on-site during planned operation are addressed in infrastructure issue No. 8, radiation protection. Accidental releases and radiation are addressed mainly in infrastructure issue No. 14, emergency planning.

14. Emergency planning	Phase 2
Conditions	**Basis for evaluation**
14.1. Responsibilities of each organization clearly defined and approach for emergency planning being developed	**Summary of the condition to be demonstrated** An overall action plan is being implemented to provide the required EPR arrangements and capabilities to be demonstrated before fuel is brought to the site. The organizations involved have identified the resources that will be required to execute the action plan and have made a commitment to provide those resources.
	Examples of how the condition may be demonstrated (1) Action plan that addresses the gaps and leads to a demonstration of adequate EPR arrangements and capabilities prior to fuel being brought to site, including: (a) Actions to be completed, schedule and milestones; (b) Organizations responsible for each action; (c) Resources required for the implementation of the action plan; (d) Action plan implementation progress report. (2) Regulations related to EPR developed. (3) EPR roles and responsibilities at all levels are documented. (4) The types of accident have been identified and potential consequences have been assessed including the likely size of emergency planning zones and distances for an NPP. (5) A generic protection strategy has been defined based on assessed hazards and consequences.
	Relevant IAEA publications — GSR Part 7 [38] — GSG-2 [39] — GS-G-2.1 [40] — SSG-16, actions 135–139 [2] — Considerations in Emergency Preparedness and Response for a State Embarking on a Nuclear Power Programme. [41]

15. Nuclear security	**Phase 2**
Conditions	**Basis for evaluation**
15.1. Required physical protection measures developed	**Summary of the condition to be demonstrated** The national threat assessment and design basis threat for the NPP have been completed. Requirements for the design of physical protection for the NPP have been defined in the BIS or in other appropriate documents. Specific physical protection requirements during the construction and transport of nuclear material have also been developed. Roles and responsibilities for preparing for, detecting and responding to nuclear security events have been defined.
	Examples of how the condition may be demonstrated (1) A documented national threat assessment that covers the full range of threats affecting nuclear material and nuclear facilities (2) A competent authority defined with assigned responsibility for developing the design basis threat in coordination with other relevant authorities (3) Clear definition of roles and responsibilities for each organization involved in the response to nuclear security events (4) A design basis threat has been developed, the BIS includes physical protection requirements for the NPP (5) Nuclear security requirements during the construction and transport of nuclear material have been defined
	Relevant IAEA publications — IAEA Nuclear Security Series No. 19, actions 4.3, 4.4, 4.6–4.14, 5.1–5.8 and 5.31–5.33 [3] — IAEA Nuclear Security Series No. 10, Development Use and Maintenance of the Design Basis Threat [48] — IAEA Nuclear Security Series No. 13, Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Revision 5) [49]
15.2. Programmes in place for the management of sensitive information	**Summary of the condition to be demonstrated** For each of the key organizations, a process for categorization and management of sensitive information has been developed. This includes control of any sensitive information made available to contractors.
	Examples of how the condition may be demonstrated Processes for the protection of sensitive nuclear security information and protection of computer systems, networks and other digital systems that store sensitive information.
	Relevant IAEA publication IAEA Nuclear Security Series No. 19, actions 4.27–4.33 [3]
15.3. Programmes in place for the trustworthiness of personnel	**Summary of the condition to be demonstrated** For each of the key organizations, a screening/vetting process for recruitment and selection of personnel with access to facilities, nuclear material and sensitive information has been developed.

15. Nuclear security	Phase 2
Conditions	**Basis for evaluation**
	Examples of how the condition may be demonstrated Processes for the screening/vetting of personnel, including a graded approach depending on the level of access required.
	Relevant IAEA publication IAEA Nuclear Security Series No. 19, action 4.34 [3]
15.4. Programmes in place for promotion of nuclear security culture	**Summary of the condition to be demonstrated** All relevant organizations understand the importance of a nuclear security culture and have plans to develop a nuclear security culture at all levels of the organization.
	Examples of how the condition may be demonstrated Evidence of the promotion of a security culture by leaders and managers within all key organizations involved in the nuclear power programme, including recognition of the importance of integrated management systems and leadership for security, security of information and trustworthiness.
	Relevant IAEA publications — IAEA Nuclear Security Series No. 19, actions 4.54–4.58 [3] — IAEA Nuclear Security Series No. 7, Nuclear Security Culture [50]

16. Nuclear fuel cycle	**Phase 2**
Conditions	**Basis for evaluation**
16.1. Front end fuel cycle strategy defined	**Summary of the condition to be demonstrated** Based on the national policy, a clear front end fuel cycle strategy has been defined identifying how new fuel will be available in the short and long term or which options are being pursued.
	Examples of how the condition may be demonstrated (1) A document defining a realistic front end nuclear fuel cycle strategy at a level of detail appropriate for Milestone 2. (2) Evidence that basic decisions needed for Milestone 2 have been made. This includes a decision on the number of reloads to be requested with the first core, and a short and long term purchasing strategy for the fuel services (natural uranium, conversion, enrichment and fuel manufacturing). (3) An integrated plan for bidding and construction of any intended front end fuel cycle facilities consistent with the national long term fuel cycle strategy, the power plant construction programme and the national non-proliferation commitment.
16.2. Back end fuel cycle strategy defined	**Summary of the condition to be demonstrated** Based on the national policy, a back end fuel cycle strategy has been defined, including plans/options for storage (on-site and off-site), possible reprocessing or arrangements for fuel take back. Actions and timescales are consistent with the planned NPP construction programme.
	Examples of how the condition may be demonstrated (1) A document on spent fuel management strategy, including identification of facilities needed, actions, resources and timescales. (2) Evidence that basic decisions needed for Milestone 2 have been made. This includes a decision on fuel take back if considered, a decision on spent fuel storage capacity on-site and off-site and a strategy for purchasing and building these capacities. (3) Initial requirements clearly defined in the BIS.
	Relevant IAEA publications — SSG-16, actions 124 and 127 [2] — NW-T-1.24 [7]

17. Radioactive waste management	Phase 2
Conditions	**Basis for evaluation**
17.1. Handling the burdens of radioactive waste considered	**Summary of the condition to be demonstrated** Based on the national policy, a clear strategy for the processing, storage and disposal of radioactive waste (including spent fuel if considered as waste) has been developed. If the reprocessing of spent fuel is considered, the waste management strategy includes consideration of the transport, storage and disposal of high level waste. Requirements for processing and storage facilities to be provided by the vendor have been included in the BIS. Plans for any national facilities for radioactive waste management and waste management organizations have been defined and are consistent with the construction programme.
	Examples of how the condition may be demonstrated (1) Policy and strategy documents for the management of radioactive waste (this may include the creation of a specific national waste management organization): (a) Disposal of all waste types; (b) Consideration of regulatory and implementation infrastructures; (c) Allocation of responsibilities; (d) Technical approaches; (e) Funding schemes. (2) Consideration of the suitability of geological conditions in the country for disposal of all types of radioactive waste and/or the potential for contracting for waste disposal with other States. (3) Requirements for facilities to be provided as part of the NPP and provisions for minimizing waste volumes and toxicity included in the BIS. (4) A plan for bidding and construction of any separate waste facilities available and consistent with the power plant construction programme. (5) A plan to initiate or enhance national waste disposal programmes.
	Relevant IAEA publications — SSG-16, actions 124–127 [2] — NW-G-1.1 [6] — NW-T-1.24 [7]
17.2. Preliminary decommissioning plan requested	**Summary of the condition to be demonstrated** A request for a preliminary decommissioning plan from the vendor has been included in the BIS. Specific national requirements have been included.
	Examples of how the condition may be demonstrated (1) A document discussing national requirements for decommissioning (2) Requirements for a decommissioning plan included in the BIS
	Relevant IAEA publications — SSG-16, action 124 [2] — NW-T-1.24 [7]

18. Industrial involvement	**Phase 2**
Conditions	**Basis for evaluation**
18.1. National capabilities assessed and plans to enhance capability defined	**Summary of the condition to be demonstrated** A review of national capability has been completed, identifying areas where national supply is available or can be developed. Based on this, volume targets, or specific areas, for national involvement have been developed. Plans for upgrading national capability have been defined and funded. The transfer of technology including intellectual property has been considered.
	Examples of how the condition may be demonstrated (1) A realistic assessment of the national and local supplier capabilities based on the national policy recommended by the NEPIO. (2) An assessment of the training and funding requirements to upgrade quality. (3) Extent of national industrial participation agreed, desired targets for local and national industrial involvement specified, and requirements for the transfer of technology, including intellectual property, included in the BIS. (4) Clear plans and programmes identifying: (a) Specific industrial involvement in future construction, maintenance or operational support services; (b) Audits of the progress of industrial preparation and ability to meet the requirements for addition to the approved supplier list; (c) Short term and long term programmes (including future projects) to develop the ability to produce items initially being supplied by foreign suppliers; (d) Requirements for industries to be added to the potential vendor/ service supplier lists; (e) Requirements for export and import consistent with the State's commitment and obligations with regard to non-proliferation of nuclear weapons and safeguards implementation.
	Relevant IAEA publications — SSG-16, actions 63–65 and 175 [2] — NG-T-3.4 [42]

19. Procurement	**Phase 2**
Conditions	**Basis for evaluation**
19.1. Procurement capability available	**Summary of the condition to be demonstrated** A procurement capability has been established for specific services, such as siting work and consultancy services.
	Examples of how the condition may be demonstrated (1) Procedures or audits to ensure suppliers have appropriate expertise and experience (2) Evidence of preparation of formal specifications for the services required (3) Quality standards included in the service specifications (4) Awareness of the non-proliferation regime with regard to nuclear or nuclear related trade

Appendix

EXAMPLES OF EVALUATION FORMS

A.1. Evaluation form for each infrastructure area

1. National position **Condition 1.1. Long term commitment made and importance of safety, security and non-proliferation recognized**		**Phase 1**
Summary of the condition to be demonstrated	A clear statement adopted by the government of its intent to develop a nuclear power programme and of its commitment to safety, security and non-proliferation, with evidence that their importance is embedded in the ongoing work programme.	
Examples of how the condition may be demonstrated	(1) A clearly stated government commitment (2) Evidence of clear responsibilities for each issue, with government coordination of activities	
Observations		
Evidence		
EVALUATION: **Significant actions needed ☐**	**Minor actions needed ☐**	**No actions needed ☐**

1. National position **Condition 1.2. The NEPIO established**	**Phase 1**
Summary of the condition to be demonstrated	The NEPIO: (a) Has clear terms of reference that call for a comprehensive review of all the issues relevant to making a decision to proceed with a nuclear power programme; (b) Is recognized by all relevant ministries as having that role; (c) Reports to a senior minister or directly to the head of government; (d) Has appropriate human and financial resources (e) Involves all relevant stakeholders, including the country's major utilities, the regulatory body for security and radiation safety, other relevant government agencies, legislative representatives and other decision makers.
Examples of how the condition may be demonstrated	(1) The charter establishing the NEPIO and to whom it reports (2) Evidence that the roles and responsibilities of the NEPIO are known by all its members and by other government ministries (3) A document defining objectives and timescales and an adequate scope of investigations (4) A clear description of how the NEPIO operates in terms of funding, planning, reporting, scope of studies and use of consultants (5) Evidence that the NEPIO has adequate skills to address all issues either directly or through commissioning specialist studies (6) Evidence of relevant interactions between the head of NEPIO and appropriate ministries, such as those responsible for energy and the environment
Observations	
Evidence	
EVALUATION: **Significant actions needed ☐** **Minor actions needed ☐** **No actions needed ☐**	

1. National position **Condition 1.3. National strategy defined**	**Phase 1**
Summary of the condition to be demonstrated	A comprehensive report, defining and justifying the national strategy for nuclear power, including: (a) An analysis of energy demand and energy alternatives; (b) An evaluation of the impacts of nuclear power on the national economy, for example gross domestic product and employment; (c) A preliminary technology assessment to identify technologies that are consistent with national expectations; (d) Consideration of siting possibilities and grid capacity; (e) Consideration of financing options, ownership options and operator responsibilities; (f) Consideration of long term costs and obligations relating to spent fuel, radioactive waste and decommissioning; (g) Consideration of the human resource needs and external support needs of the regulatory body and the owner/operator; (h) Recognition that there remains a non-zero possibility of a severe accident and the need to deal with the consequences of such an accident will need to be addressed; (i) Consideration of the demands of each of the infrastructure issues and a plan for how they will be met in the next phase of development. **Note:** Any pre-feasibility study conducted during Phase 1 can provide a significant input to the comprehensive report, although it is important that the report fully address all 19 infrastructure issues.
Examples of how the condition may be demonstrated	(1) List of the studies that are feeding into the report(s) (2) Current status and conclusions (3) Contents list for the report(s) (4) Executive summary of the report(s) (5) Evidence of ministerial review of the report(s)
Observations	
Evidence	
EVALUATION: **Significant actions needed ☐** **Minor actions needed ☐** **No actions needed ☐**	

A.2. Example summary form

1. National position	**Phase 1**
Condition	**Status**
1.1. Long term commitment made and importance of safety, security and non-proliferation recognized	Minor actions needed
1.2. The NEPIO established	No actions needed
1.3. National strategy defined	No actions needed
2. Nuclear safety	**Phase 1**
Condition	**Status**
2.1. Key requirements of nuclear safety understood	Minor actions needed
2.2. Support through international cooperation initiated	No actions needed
3. Management	**Phase 1**
Condition	**Status**
3.1. Need for appropriate leadership and management systems recognized	Minor actions needed
4. Funding and financing	**Phase 1**
Condition	**Status**
4.1. Strategies for funding established	Significant actions needed
4.2. Potential strategies for financing identified	No actions needed

A.3. Action plan pro forma

1. National position					
1.1. Long term commitment made and importance of safety, security and non-proliferation recognized					
Ref. number	**Observations / recommendations**	**Action**	**Responsible organization**	**Due date**	**Status**
1.1.1.					
1.1.2.					
1.1.3.					
1.2. The NEPIO established					
1.2.1.					
1.2.2.					
1.3. National strategy defined					
1.3.1.					

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B: UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE (UNECE) DOCUMENTS

CONVENTION ON ENVIRONMENTAL IMPACT ASSESSMENT IN A TRANSBOUNDARY CONTEXT ("ESPOO CONVENTION")

Adopted in Espoo, Finland on 25 February 1991,
as amended on 27 February 2001 and on 4 June 2004
Entered into force on 10 September 1997, 26 August 2014 and 23 October 2017, respectively

The Parties to this Convention,

Aware of the interrelationship between economic activities and their environmental consequences,

Affirming the need to ensure environmentally sound and sustainable development,

Determined to enhance international co-operation in assessing environmental impact in particular in a transboundary context,

Mindful of the need and importance to develop anticipatory policies and of preventing, mitigating and monitoring significant adverse environmental impact in general and more specifically in a transboundary context,

Recalling the relevant provisions of the Charter of the united Nations, the Declaration of the Stockholm Conference on the Human Environment, the Final Act of the Conference on Security and Co-operation in Europe (CSCE) and the Concluding Documents of the Madrid and Vienna Meetings of Representatives of the Participating States of the CSCE,

Commending the ongoing activities of States to ensure that, through their national legal and administrative provisions and their national policies, environmental impact assessment is carried out,

Conscious of the need to give explicit consideration to environmental factors at an early stage in the decision-making process by applying environmental impact assessment, at all appropriate administrative levels, as a necessary tool to improve the quality of information presented to decision makers so that environmentally sound decisions can be made paying careful attention to minimizing significant adverse impact, particularly in a transboundary context,

Mindful of the efforts of international organizations to promote the use of environmental impact assessment both at the national and international levels, and taking into account work on environmental impact assessment carried out under the auspices of the United Nations Economic Commission for Europe, in particular results achieved by the Seminar on Environmental Impact Assessment (September 1987, Warsaw, Poland) as well as noting the Goals and Principles on environmental impact assessment adopted by the Governing Council of the united Nations Environment Programme, and the Ministerial Declaration on Sustainable Development (May 1990, Bergen, Norway),

Have agreed as follows:

Article 1. Definitions

For the purposes of this Convention,

(i) "Parties" means, unless the text otherwise indicates, the Contracting Parties to this Convention;

(ii) "Party of origin" means the Contracting Party or Parties to this Convention under whose jurisdiction a proposed activity is envisaged to take place;

(iii) "Affected Party" means the Contracting Party or Parties to this Convention likely to be affected by the transboundary impact of a proposed activity;

(iv) "Concerned Parties" means the Party of origin and the affected Party of an environmental impact assessment pursuant to this Convention;

(v) "Proposed activity" means any activity or any major change to an activity subject to a decision of a competent authority in accordance with an applicable national procedure;

(vi) "Environmental impact assessment" means a national procedure for evaluating the likely impact of a proposed activity on the environment);

(vii) "Impact" means any effect caused by a proposed activity on the environment including human health and safety, flora, fauna, soil, air, water, climate, landscape and historical monuments or other physical structures or the interaction among these factors» it also includes effects on cultural heritage or socio-economic conditions resulting from alterations to those factors;

(viii) "Transboundary impact" means any impact, not exclusively of a global nature, within an area under the jurisdiction of a Party caused by a proposed activity the physical origin of which is situated wholly or in part within the area under the jurisdiction of another Party;

(ix) "Competent authority" means the national authority or authorities designated by a Party as responsible for performing the tasks covered by this Convention and/or the authority or authorities entrusted by a Party with decision-making powers regarding a proposed activity;

(x) "The Public" means one or more natural or legal persons and, in accordance with national legislation or practice, their associations, organizations or groups.

Article 2. General provisions

1. The Parties shall, either individually or jointly, take all appropriate and effective measures to prevent, reduce and control significant adverse transboundary environmental impact from proposed activities.

2. Each Party shall take the necessary legal, administrative or other measures to implement the provisions of this Convention, including, with respect to proposed activities listed in Appendix I that are likely to cause significant adverse transboundary impact, the establishment of an environmental impact assessment procedure that permits public participation and preparation of the environmental impact assessment documentation described in Appendix II.

3. The Party of origin shall ensure that in accordance with the provisions of this Convention an environmental impact assessment is undertaken prior to a decision to authorize or undertake a proposed activity listed in Appendix I that is likely to cause a significant adverse transboundary impact.

4. The Party of origin shall, consistent with the provisions of this Convention, ensure that affected Parties are notified of a proposed activity listed in Appendix I that is likely to cause a significant adverse transboundary impact.

5. Concerned Parties shall, at the initiative of any such Party, enter into discussions on whether one or more proposed activities not listed in Appendix I is or are likely to cause a significant adverse transboundary impact and thus should be treated as if it or they were so listed. Where those Parties so agree, the activity or activities shall be thus treated. General guidance for identifying criteria to

determine significant adverse impact is set forth in Appendix III.

6. The Party of origin shall provide, in accordance with the provisions of this Convention, an opportunity to the public in the areas likely to be affected to participate in relevant environmental impact assessment procedures regarding proposed activities and shall ensure that the opportunity provided to the public of the affected Party is equivalent to that provided to the public of the Party of origin.

7. Environmental impact assessments as required by this Convention shall, as a minimum requirement, be undertaken at the project level of the proposed activity. To the extent appropriate, the Parties shall endeavour to apply the principles of environmental impact assessment to policies, plans and programmes.

8. The provisions of this Convention shall not affect the right of Parties to implement national laws, regulations, administrative provisions or accepted legal practices protecting information the supply of which would be prejudicial to industrial and commercial secrecy or national security.

9. The provisions of this Convention shall not affect the right of particular Parties to implement, by bilateral or multilateral agreement where appropriate, more stringent measures than those of this Convention.

10. The provisions of this Convention shall not prejudice any obligations of the Parties under international law with regard to activities having or likely to have a transboundary impact.

11. If the Party of origin intends to carry out a procedure for the purposes of determining the content of the environmental impact assessment documentation, the affected Party should to the extent appropriate be given the opportunity to participate in this procedure.

Article 3. Notification

1. For a proposed activity listed in Appendix I that is likely to cause a significant adverse transboundary impact, the Party of origin shall, for the purposes of ensuring adequate and effective consultations under Article 5, notify any Party which it considers may be an affected Party as early as possible and no later than when informing its own public about that proposed activity.

2. This notification shall contain, inter alia:

   (a) Information on the proposed activity, including any available information on its possible transboundary impact;

   (b) Information on the nature of the possible decision, and

   (c) An indication of a reasonable time within which a response under paragraph 3 of this Article is required, taking into account the nature of the proposed activity, and may include the information set out in paragraph 5 of this Article.

3. The affected Party shall respond to the Party of origin within the time specified in the notification, acknowledging receipt of the notification, and shall indicate whether it intends to participate in the environmental impact assessment procedure.

4. If the affected Party indicates that it does not intend to participate in the environmental impact assessment

procedure, or if it does not respond within the time specified in the notification, the provisions in paragraphs 5, 6, 7 and 8 of this Article and in Articles 4 to 7 will not apply. In such circumstances the right of a Party of origin to determine whether to carry out an environmental impact assessment on the basis of its national law and practice is not prejudiced.

5. Upon receipt of a response from the affected Party indicating its desire to participate in the environmental impact assessment procedure, the Party of origin shall, if it has not already done so, provide to the affected Party:

   (a) Relevant information regarding the environmental impact assessment procedure, including an indication of the time schedule for transmittal of comments, and

   (b) Relevant information on the proposed activity and its possible significant adverse transboundary impact.

6. The affected Party shall, at the request of the Party of origin, provide the latter with reasonably obtainable information relating to the potentially affected environment under the jurisdiction of the affected Party, where such information is necessary for the preparation of the environmental impact assessment documentation. The information shall be furnished promptly and, as appropriate, through a joint body where one exists.

7. When a Party considers that it would be affected by a significant adverse transboundary impact of a proposed activity listed in Appendix I, and when no notification has taken place in accordance with paragraph 1 of this Article, the concerned Parties shall, at the request of the affected Party, exchange sufficient information for the purposes of holding discussions on whether there is likely to be a significant adverse transboundary impact. If those Parties agree that there is likely to be a significant adverse transboundary impact, the provisions of this Convention shall apply accordingly. If those Parties cannot agree whether there is likely to be a significant adverse transboundary impact, any such Party may submit that question to an inquiry commission in accordance with the provisions of Appendix IV to advise on the likelihood of significant adverse transboundary impact, unless they agree on another method of settling this question.

8. The concerned Parties shall ensure that the public of the affected Party in the areas likely to be affected be informed of, and be provided with possibilities for making comments or objections on, the proposed activity, and for the transmittal of these comments or objections to the competent authority of the Party of origin, either directly to this authority or, where appropriate, through the Party of origin.

Article 4. Preparation of the environmental impact assessment documentation

1. The environmental impact assessment documentation to be submitted to the competent authority of the Party of origin shall contain, as a minimum, the information described in Appendix II.

2. The Party of origin shall furnish the affected Party, as appropriate through a joint body where one exists, with the environmental impact assessment documentation. The concerned Parties shall arrange for distribution of the documentation to the authorities and the public of the affected Party in the areas likely to be affected and for the submission of comments to the

competent authority of the Party of origin, either directly to this authority or, where appropriate, through the Party of origin within a reasonable time before the final decision is taken on the proposed activity.

Article 5. Consultations on the basis of the environmental impact assessment documentation

The Party of origin shall, after completion of the environmental impact assessment documentation, without undue delay enter into consultations with the affected Party concerning, inter alia, the potential transboundary impact of the proposed activity and measures to reduce or eliminate its impact. Consultations may relate to:

(a) Possible alternatives to the proposed activity, including the no-action alternative and possible measures to mitigate significant adverse transboundary impact and to monitor the effects of such measures at the expense of the Party of origin,

(b) Other forms of possible mutual assistance in reducing any significant adverse transboundary impact of the proposed activity; and

(c) Any other appropriate matters relating to the proposed activity.

The Parties shall agree, at the commencement of such consultations, on a reasonable time-frame for the duration of the consultation period. Any such consultations may be conducted through an appropriate joint body, where one exists.

Article 6. Final decision

1. The Parties shall ensure that, in the final decision on the proposed activity, due account is taken of the outcome of the environmental impact assessment, including the environmental impact assessment documentation, as well as the comments thereon received pursuant to Article 3, paragraph 8 and Article 4, paragraph 2, and the outcome of the consultations as referred to in Article 5.

2. The Party of origin shall provide to the affected Party the final decision on the proposed activity along with the reasons and considerations on which it was based.

3. If additional information on the significant transboundary impact of a proposed activity, which was not available at the time a decision was made with respect to that activity and which could have materially affected the decision, becomes available to a concerned Party before work on that activity commences, that Party shall immediately inform the other concerned Party or Parties. If one of the concerned Parties so requests, consultations shall be held as to whether the decision needs to be revised.

Article 7. Post-project analysis

1. The concerned Parties, at the request of any such Party, shall determine whether, and if so to what extent, a post-project analysis shall be carried out, taking into account the likely significant adverse transboundary impact of the activity for which an environmental impact assessment has been undertaken pursuant to this Convention. Any post-project analysis undertaken shall include, in particular, the surveillance of the activity and the determination of any adverse transboundary impact. Such surveillance and determination may be undertaken with a view to achieving the objectives listed in Appendix V.

2. When, as a result of post-project analysis, the Party of origin or the affected Party has reasonable grounds for concluding that there is a

significant adverse transboundary impact or factors have been discovered which may result in such an impact, it shall immediately inform the other Party. The concerned Parties shall then consult on necessary measures to reduce or eliminate the impact.

Article 8. Bilateral and multilateral co-operation

The Parties may continue existing or enter into new bilateral or multilateral agreements or other arrangements in order to implement their obligations under this Convention and under any of its protocols to which they are a Party. Such agreements or other arrangements may be based on the elements listed in Appendix VI.

Article 9. Research programmes

The Parties shall give special consideration to the setting up, or intensification of, specific research programmes aimed at:

(a) improving existing qualitative and quantitative methods for assessing the impacts of proposed activities,

(b) Achieving a better understanding of cause-effect relationships and their role in integrated environmental management,

(c) Analysing and monitoring the efficient implementation of decisions on proposed activities with the intention of minimizing or preventing impacts,

(d) Developing methods to stimulate creative approaches in the search for environmentally sound alternatives to proposed activities, production and consumption patterns,

(e) Developing methodologies for the application of the principles of environmental impact assessment at the macro-economic level.

The results of the programmes listed above shall be exchanged by the Parties.

Article 10. Status of the appendices

The Appendices attached to this Convention form an integral part of the Convention.

Article 11. Meeting of parties

1. The Parties shall meet, so far as possible, in connection with the annual sessions of the Senior Advisers to ECE Governments on Environmental and Water Problems. The first meeting of the Parties shall be convened not later than one year after the date of the entry into force of this Convention. Thereafter, meetings of the Parties shall be held at such other times as may be deemed necessary by a meeting of the Parties, or at the written request of any Party; provided that, within six months of the request being communicated to them by the secretariat, it is supported by at least One third of the Parties.

2. The Parties shall keep under continuous review the implementation of this Convention, and, with this purpose in mind, shall:

   (a) Review the policies and methodological approaches to environmental impact assessment by the Parties with a view to further improving environmental impact assessment procedures in a transboundary context;

   (b) Exchange information regarding experience gained in concluding and implementing bilateral and multilateral agreements or other arrangements regarding the use of environmental impact assessment in a transboundary context to which one or more of the Parties are party;

(c) Seek, where appropriate, the services and cooperation of competent bodies having expertise pertinent to the achievement of the purposes of this Convention;

(d) At their first meeting, consider and by consensus adopt rules of procedure for their meetings;

(e) Consider and, where necessary, adopt proposals for amendments to this Convention;

(f) Consider and undertake any additional action that may be required for the achievement of the purposes of this Convention;

(g) Prepare, where appropriate, protocols to this Convention;

(h) Establish such subsidiary bodies as they consider necessary for the implementation of this Convention.

Article 12. Right to vote

1. Each Party to this Convention shall have one vote.

2. Except as provided for in paragraph 1 of this Article, regional economic integration organizations, in matters within their competence, shall exercise their right to vote with a number of votes equal to the number of their member States which are Parties to this Convention. Such organizations shall not exercise their right to vote if their member States exercise theirs, and vice versa.

Article 13. Secretariat

The Executive Secretary of the Economic Commission for Europe shall carry out the following secretariat functions:

(a) The convening and preparing of meetings of the Parties,

(b) The transmission of reports and other information received in accordance with the provisions of this Convention to the Parties, and

(c) The performance of other functions as may be provided for in this Convention or as may be determined by the Parties.

Article 14. Amendments to the Convention

1. Any Party may propose amendments to this Convention.

2. Proposed amendments shall be submitted in writing to the secretariat, which shall communicate them to all Parties. The proposed amendments shall be discussed at the next meeting of the Parties, provided these proposals have been circulated by the secretariat to the Parties at least ninety days in advance.

3. The Parties shall make every effort to reach agreement on any proposed amendment to this Convention by consensus. If all efforts at consensus have been exhausted, and no agreement reached, the amendment shall as a last resort be adopted by a three-fourths majority vote of the Parties present and voting at the session.

4. Amendments to this Convention adopted in accordance with paragraph 3 of this article shall be submitted by the Depositary to all Parties for ratification, approval or acceptance. They shall enter into force for Parties having ratified, approved or accepted them on the ninetieth day after the receipt by the Depositary of notification of their ratification, approval or acceptance by at least three fourths of the number of Parties at the time of their adoption. Thereafter they shall enter into force for any other Party on the ninetieth day after that Party deposits its

instrument of ratification, approval or acceptance of the amendments.

5. For the purpose of this Article, "Parties present and voting" means Parties present and casting an affirmative or negative vote.

6. The voting procedure set forth in paragraph 3 of this Article is not intended to constitute a precedent for future agreements negotiated within the Economic Commission for Europe.

Article 14 bis. Review of compliance

1. The Parties shall review compliance with the provisions of this Convention on the basis of the compliance procedure, as a non-adversarial and assistance-oriented procedure adopted by the Meeting of the Parties. The review shall be based on, but not limited to, regular reporting by the Parties. The Meeting of Parties shall decide on the frequency of regular reporting required by the Parties and the information to be included in those regular reports.

2. The compliance procedure shall be available for application to any protocol adopted under this Convention.

Article 15. Settlement of disputes

1. If a dispute arises between two or more Parties about the interpretation or application of this Convention, they shall seek a solution by negotiation or by any other method of dispute settlement acceptable to the parties to the dispute.

2. When signing, ratifying, accepting, approving or acceding to this Convention, or at any time thereafter, a Party may declare in writing to the Depositary that for a dispute not resolved in accordance with paragraph 1 of this Article, it accepts one or both of the following means of dispute settlement as compulsory in relation to any Party accepting the same obligation:

   (a) Submission of the dispute to the International Court of Justice,

   (b) Arbitration in accordance with the procedure set out in Appendix VII.

3. If the parties to the dispute have accepted both means of dispute settlement referred to in paragraph 2 of this Article, the dispute may be submitted only to the International Court of Justice, unless the parties agree otherwise.

Article 16. Signature

This Convention shall be open for signature at Espoo (Finland) from 25 February to 1 March 1991 and thereafter at United Nations Headquarters in New York until 2 September 1991 by States members of the Economic Commission for Europe as well as States having consultative status with the Economic Commission for Europe pursuant to paragraph 8 of the Economic and Social Council resolution 36 (IV) of 28 March 1947, and by regional economic integration organizations constituted by sovereign States members of the Economic Commission for Europe to which their member States have transferred competence in respect of matters governed by this Convention, including the competence to enter into treaties in respect of these matters.

Article 17. Ratification, acceptance, approval and accession

1. This Convention shall be subject to ratification, acceptance or approval by signatory States and regional economic integration organizations.

2. This Convention shall be open for accession as from 3 September 1991 by the States and organizations referred to in Article 16.

3. Any other State, not referred to in paragraph 2 of this article, that is a Member of the United Nations may accede to the Convention upon approval by the Meeting of the Parties. The Meeting of the Parties shall not consider or approve any request for accession by such a State until this paragraph has entered into force for all the States and organizations that were Parties to the Convention on 27 February 2001.

4. The instruments of ratification, acceptance, approval or accession shall be deposited with the Secretary-General of the United Nations, who shall perform the functions of Depositary.

5. Any organization referred to in Article 16 which becomes a Party to this Convention without any of its member States being a Party shall be bound by all the obligations under this Convention. In the case of such organizations, one or more of whose member States is a Party to this Convention, the organization and its member States shall decide on their respective responsibilities for the performance of their obligations under this Convention. In such cases, the organization and the member States shall not be entitled to exercise rights under -this Convention concurrently.

6. In their instruments of ratification, acceptance, approval or accession, the regional economic integration organizations referred to in Article 16 shall declare the extent of their competence with respect to the matters governed by this Convention. These organizations shall also inform the Depositary of any relevant modification to the extent of their competence.

7. Any State or organization that ratifies, accepts or approves this Convention shall be deemed simultaneously to ratify, accept or approve the amendment to the Convention set out in decision II/14 taken at the second session of the Meeting of the Parties.

Article 18. Entry into force

1. This Convention shall enter into force on the ninetieth day after the date of deposit of the sixteenth instrument of ratification, acceptance, approval or accession.

2. For the purposes of paragraph 1 of this Article, any instrument deposited by a regional economic integration organization shall not be counted as additional to those deposited by States members of such an organization.

3. For each State or organization referred to in Article 16 which ratifies, accepts or approves this Convention or accedes thereto after the deposit of the sixteenth instrument of ratification, acceptance, approval or accession, this Convention shall enter into force on the ninetieth day after the date of deposit by such State or organization of its instrument of ratification, acceptance, approval or accession.

Article 19. Withdrawal

At any time after four years from the date on which this Convention has come into force with respect to a Party, that Party may withdraw from this Convention by giving written notification to the Depositary. Any such withdrawal shall take effect on the ninetieth day after the date of its receipt by the Depositary. Any such withdrawal shall not affect the application of Articles 3 to 6 of this Convention to a proposed activity in respect of which a notification has been made pursuant to Article 3, paragraph 1, or a request has been made pursuant to Article 3, paragraph 7, before such withdrawal took effect.

Article 20. Authentic texts

The original of this Convention, of which the English, French and Russian texts are equally authentic, shall be deposited with the Secretary-General of the United Nations.

IN WITNESS WHEREOF the undersigned, being duly authorized thereto, have signed this Convention.

DONE at Espoo (Finland), this twenty-fifth day of February one thousand nine hundred and ninety-one.

Appendix I

LIST OF ACTIVITIES

1. Crude oil refineries (excluding undertakings manufacturing only lubricants from crude oil) and installations for the gasification and liquefaction of 500 metric tons or more of coal or bituminous shale per day.

2. (a) Thermal power stations and other combustion installations with a heat output of 300 megawatts or more, and

   (b) Nuclear power stations and other nuclear reactors[40], including the dismantling or decommissioning of such power stations or reactors (except research installations for the production and conversion of fissionable and fertile materials, whose maximum power does not exceed 1 kilowatt continuous thermal load).

3. (a) Installations for the reprocessing of irradiated nuclear fuel;

   (b) Installations designed:

   - For the production or enrichment of nuclear fuel;
   - For the processing of irradiated nuclear fuel or high-level radioactive waste;
   - For the final disposal of irradiated nuclear fuel;
   - Solely for the final disposal of radioactive waste; or
   - Solely for the storage (planned for more than 10 years) of irradiated nuclear fuels or radioactive waste in a different site than the production site

4. Major installations for the initial smelting of cast iron and steel and for the production of nonferrous metals.

5. Installations for the extraction of asbestos and for the processing and transformation of asbestos and products containing asbestos: for asbestos-cement products, with an annual production of more than 20,000 metric tons finished product; for friction material, with an annual production of more than 50 metric tons finished product; and for other asbestos utilization of more than 200 metric tons per year.

6. Integrated chemical installations.

7. (a) Construction of motorways, express roads[41] and lines for long-distance railway

[40] For the purposes of this Convention, nuclear power stations and other nuclear reactors cease to be such an installation when all nuclear fuel and other radioactively contaminated elements have been removed permanently from the installation site.

[41] For the purposes of this Convention:
- "Motorway" means a road specially designed and built for motor traffic, which does not serve properties bordering on it, and which:
(a) Is provided, except at special points or temporarily, with separate carriageways for the two directions of traffic, separated from each other by a dividing strip not intended for traffic or, exceptionally, by other means;
(b) Does not cross at level with any road, railway or tramway track, or footpath; and
(c) Is specially signposted as a motorway.
- "Express road" means a road reserved for motor traffic accessible only from interchanges or controlled junctions and on which, in particular, stopping and parking are prohibited on the running carriageway(s).

traffic and of airports[42] with a basic runway length of 2,100 metres or more;

(b) Construction of a new road of four or more lanes, or realignment and/or widening of an existing road of two lanes or less so as to provide four or more lanes, where such new road, or realigned and/or widened section of road, would be 10 km or more in a continuous length.

8. Large-diameter pipelines for the transport of oil, gas or chemicals.

9. Trading ports and also inland waterways and ports for inland-waterway traffic which permit the passage of vessels of over 1,350 metric tons.

10. (a) Waste-disposal installations for the incineration, chemical treatment or landfill of toxic and dangerous wastes;

(b) Waste-disposal installations for the incineration or chemical treatment of non-hazardous waste with a capacity exceeding 100 metric tons per day.

11. Large dams and reservoirs.

12. Groundwater abstraction activities or artificial groundwater recharge schemes where the annual volume of water to be abstracted or recharged amounts to 10 million cubic metres or more.

13. Pulp, paper and board manufacturing of 200 air-dried metric tons or more per day.

14. Major quarries, mining, on-site extraction and processing of metal ores or coal.

15. Offshore hydrocarbon production. Extraction of petroleum and natural gas for commercial purposes where the amount extracted exceeds 500 metric tons/day in the case of petroleum and 500 000 cubic metres/day in the case of gas.

16. Major storage facilities for petroleum, petrochemical and chemical products.

17. Deforestation of large areas.

18. (a) Works for the transfer of water resources between river basins where this transfer aims at preventing possible shortages of water and where the amount of water transferred exceeds 100 million cubic metres/year; and

(b) In all other cases, works for the transfer of water resources between river basins where the multi-annual average flow of the basin of abstraction exceeds 2 000 million cubic metres/year and where the amount of water transferred exceeds 5 per cent of this flow. In both cases transfers of piped drinking water are excluded.

19. Waste-water treatment plants with a capacity exceeding 150 000 population equivalent.

20. Installations for the intensive rearing of poultry or pigs with more than:

- 85 000 places for broilers;
- 60 000 places for hens;
- 3 000 places for production pigs (over 30 kg); or
- 900 places for sows.

21. Construction of overhead electrical power lines with a voltage of 220 kV or more and a length of more than 15 km.

22. Major installations for the harnessing of wind power for energy production (wind farms).

Appendix II

CONTENT OF THE ENVIRONMENTAL IMPACT ASSESSMENT DOCUMENTATION

Information to be included in the environmental impact assessment

[42] For the purposes of this Convention, "airport" means an airport which complies with the definition in the 1944 Chicago Convention setting up the International Civil Aviation Organization (annex 14).

documentation shall, as a minimum, contain, in accordance with Article 4:

(a) A description of the proposed activity and its purpose,

(b) A description, where appropriate, of reasonable alternatives (for example, locational or technological) to the proposed activity and also the no-action alternative,

(c) A description of the environment likely to be significantly affected by the proposed activity and its alternatives,

(d) A description of the potential environmental impact of the proposed activity and its alternatives and an estimation of its significance,

(e) A description of mitigation measures to keep adverse environmental impact to a minimum,

(f) An explicit indication of predictive methods and underlying assumptions as well as the relevant environmental data used,

(g) An identification of gaps in knowledge and uncertainties encountered in compiling the required information,

(h) Where appropriate, an outline for monitoring and management programmes and any plans for post-project analysis, and

(i) A non-technical summary including a visual presentation as appropriate (maps, graphs, etc.).

Appendix III

GENERAL CRITERIA TO ASSIST IN THE DETERMINATION OF THE ENVIRONMENTAL SIGNIFICANCE OF ACTIVITIES NOT LISTED IN APPENDIX I

1. In considering proposed activities to which Article 2, paragraph 5, applies, the concerned Parties may consider whether the activity is likely to have a significant adverse transboundary impact in particular by virtue of one or more of the following criteria:

   (a) Size: proposed activities which are large for the type of the activity,

   (b) Location: proposed activities which are located in or close to an area of special environmental sensitivity or importance (such as wetlands designated under the Ramsar Convention, national parks, nature reserves, sites of special scientific interest, or sites of archaeological, cultural or historical importance), also, proposed activities in locations where the characteristics of proposed development would be likely to have significant effects on the population,

   (c) Effects: proposed activities with particularly complex and potentially adverse effects, including those giving rise to serious effects on humans or on valued species or organisms, those which threaten the existing or potential use of an affected area and those causing additional loading which cannot be sustained by the carrying capacity of the environment.

2. The concerned Parties shall consider for this purpose proposed activities which are located close to an international frontier as well as more remote proposed activities which could give rise to significant transboundary effects far removed from the site of development.

Appendix IV

INQUIRY PROCEDURE

1. The requesting Party or Parties shall notify the secretariat that it or they submit(s) the question of whether a proposed activity listed in Appendix I is likely to have a significant adverse transboundary impact to an inquiry commission established in accordance with the provisions of this Appendix. This notification shall state the subject-matter of the inquiry. The secretariat shall notify immediately all Parties to this Convention of this submission.

2. The inquiry commission shall consist of three members. Both the requesting party and the other party to the inquiry procedure shall appoint a scientific or technical expert, and the two experts so appointed shall designate by common agreement the third expert/ who shall be the president of the inquiry commission. The latter shall not be a national of one of the parties to the inquiry procedure, nor have his or her usual place of residence in the territory of one of these parties, nor be employed by any of them, nor have dealt with the matter in any other capacity.

3. If the president of the inquiry commission has not been designated within two months of the appointment of the second expert, the Executive Secretary of the Economic Commission for Europe shall, at the request of either party, designate the president within a further two-month period.

4. If one of the parties to the inquiry procedure does not appoint an expert within one month of its receipt of the notification by the secretariat, the other party may inform the Executive Secretary of the Economic Commission for Europe, who shall designate the president of the inquiry commission within a further two-month period. Upon designation, the president of the inquiry commission shall request the party which has not appointed an expert to do so within one month. After such a period, the president shall inform the Executive Secretary of the Economic Commission for Europe, who shall make this appointment within a further two-month period.

5. The inquiry commission shall adopt its own rules of procedure.

6. The inquiry commission may take all appropriate measures in order to carry out its functions.

7. The parties to the inquiry procedure shall facilitate the work of the inquiry commission and, in particular, using all means at their disposal, shall:

   (a) Provide it with all relevant documents, facilities and information, and

   (b) Enable it, where necessary, to call witnesses or experts and receive their evidence.

8. The parties and the experts shall protect the confidentiality of any information they receive in confidence during the work of the inquiry commission.

9. If one of the parties to the inquiry procedure does not appear before the inquiry commission or fails to present its case/ the other party may request the inquiry commission to continue the proceedings and to complete its work. Absence of a party or failure of a party to present its case shall not constitute a bar to the continuation and completion of the work of the inquiry commission.

10. Unless the inquiry commission determines otherwise because of the

particular circumstances of the matter, the expenses of the inquiry commission, including the remuneration of its members, shall be borne by the parties to the inquiry procedure in equal shares. The inquiry commission shall keep a record of all its expenses, and shall furnish a final statement thereof to the parties.

11. Any Party having an interest of a factual nature in the subject-matter of the inquiry procedure, and which may be affected by an opinion in the matter, may intervene in the proceedings with the consent of the inquiry commission.

12. The decisions of the inquiry commission on matters of procedure shall be taken by majority vote of its members. The final opinion of the inquiry commission shall reflect the view of the majority of its members and shall include any dissenting view.

13. The inquiry commission shall present its final opinion within two months of the date on which it was established unless it finds it necessary to extend this time limit for a period which should not exceed two months.

14. The final opinion of the inquiry commission shall be based on accepted scientific principles. The final opinion shall be transmitted by the inquiry commission to the parties to the inquiry procedure and to the secretariat.

Appendix V

POST-PROJECT ANALYSIS

Objectives include:

(a) Monitoring compliance with the conditions as set out in the authorization or approval of the activity and the effectiveness of mitigation measures,

(b) Review of an impact for proper management and in order to cope with uncertainties,

(c) Verification of past predictions in order to transfer experience to future activities of the same type.

Appendix VI

ELEMENTS FOR BILATERAL AND MULTILATERAL CO-OPERATION

1. Concerned Parties may set up, where appropriate, institutional arrangements or enlarge the mandate of existing institutional arrangements within the framework of bilateral and multilateral agreements in order to give full effect to this Convention.

2. Bilateral and multilateral agreements or other arrangements may include:

   (a) Any additional requirements for the implementation of this Convention, taking into account the specific conditions of the subregion concerned,

   (b) Institutional, administrative and other arrangements, to be made on a reciprocal and equivalent basis,

   (c) Harmonization of their policies and measures for the protection of the environment in order to attain the greatest possible similarity in standards and methods related to the implementation of environmental impact assessment,

   (d) Developing, improving, and/or harmonizing methods for the identification, measurement, prediction and assessment of impacts, and for post-project analysis,

   (e) Developing and/or improving methods and programmes for the

collection, analysis, storage and timely dissemination of comparable data regarding environmental quality in order to provide input into environmental impact assessment,

(f) The establishment of threshold levels and more specified criteria for defining the significance of transboundary impacts related to the location, nature or size of proposed activities, for which environmental impact assessment in accordance with the provisions of this Convention shall be applied» and the establishment of critical loads of transboundary pollution,

(g) Undertaking, where appropriate, joint environmental impact assessment, development of joint monitoring programmes, intercalibration of monitoring devices and harmonization of methodologies with a view to rendering the data and information obtained compatible.

3. Paragraphs 1 and 2 may be applied, mutatis mutandis, to any protocol to the Convention.

Appendix VII

ARBITRATION

1. The claimant Party or Parties shall notify the secretariat that the Parties have agreed to submit the dispute to arbitration pursuant to Article 15, paragraph 2, of this Convention. The notification shall state the subject-matter of arbitration and include, in particular, the Articles of this Convention, the interpretation or application of which are at issue. The secretariat shall forward the information received to all Parties to this Convention.

2. The arbitral tribunal shall consist of three members. Both the claimant Party or Parties and the other Party or Parties to the dispute shall appoint an arbitrator, and the two arbitrators so appointed shall designate by common agreement the third arbitrator, who shall be the president of the arbitral tribunal. The latter shall not be a national of one of the parties to the dispute, nor have his or her usual place of residence in the territory of one of these parties, nor be employed by any of them, nor have dealt with the case in any other capacity.

3. If the president of the arbitral tribunal has not been designated within two months of the appointment of the second arbitrator, the Executive Secretary of the Economic Commission for Europe shall, at the request of either party to the dispute, designate the president within a further two-month period.

4. If one of the parties to the dispute does not appoint an arbitrator within two months of the receipt of the request, the other party may inform the Executive Secretary of the Economic Commission for Europe, who shall designate the president of the arbitral tribunal within a further two-month period. Upon designation, the president of the arbitral tribunal shall request the party which has not appointed an arbitrator to do so within two months. After such a period, the president shall inform the Executive Secretary of the Economic Commission for Europe, who shall make this appointment within a further two-month period.

5. The arbitral tribunal shall render its decision in accordance with international law and in accordance with the provisions of this Convention.

6. Any arbitral tribunal constituted under the provisions set out herein shall draw up its own rules of procedure.

7. The decisions of the arbitral tribunal, both on procedure and on substance, shall be taken by majority vote of its members.

8. The tribunal may take all appropriate measures in order to establish the facts.

9. The parties to the dispute shall facilitate the work of the arbitral tribunal and, in particular, using all means at their disposal, shall:

   (a) Provide it with all relevant documents, facilities and Information, and

   (b) Enable it, where necessary, to call witnesses or experts and receive their evidence.

10. The parties and the arbitrators shall protect the confidentiality of any information they receive in confidence during the proceedings of the arbitral tribunal.

11. The arbitral tribunal may, at the request of one of the parties, recommend interim measures of protection.

12. If one of the parties to the dispute does not appear before the arbitral tribunal or fails to defend its case, the other party may request the tribunal to continue the proceedings and to render its final decision. Absence of a party or failure of a party to defend its case shall not constitute a bar to the proceedings. Before rendering its final decision, the arbitral tribunal must satisfy itself that the claim is well founded in fact and law.

13. The arbitral tribunal may hear and determine counter-claims arising directly out of the subject-matter of the dispute.

14. Unless the arbitral tribunal determines otherwise because of the particular circumstances of the case, the expenses of the tribunal, including the remuneration of its members, shall be borne by the parties to the dispute in equal shares. The tribunal shall keep a record of all its expenses, and shall furnish a final statement thereof to the parties.

15. Any Party to this Convention having an interest of a legal nature in the subject-matter of the dispute, and which may be affected by a decision in the case, may intervene in the proceedings with the consent of the tribunal.

16. The arbitral tribunal shall render its award within five months of the date on which it is established unless it finds it necessary to extend the time limit for a period which should not exceed five months.

17. The award of the arbitral tribunal shall be accompanied by a statement of reasons. It shall be final and binding upon all parties to the dispute. The award will be transmitted by the arbitral tribunal to the parties to the dispute and to the secretariat. The secretariat will forward the information received to all Parties to this Convention.

18. Any dispute which may arise between the parties concerning the interpretation or execution of the award may be submitted by either party to the arbitral tribunal which made the award or, if the latter cannot be seized thereof, to another tribunal constituted for this purpose in the same manner as the first.

GOOD PRACTICE RECOMMENDATIONS ON THE APPLICATION OF THE CONVENTION TO NUCLEAR ENERGY-RELATED ACTIVITIES ("GOOD PRACTICE RECOMMENDATIONS")

CONVENTION ON ENVIRONMENTAL IMPACT ASSESSMENT IN A TRANSBOUNDARY CONTEXT (ESPOO CONVENTION)

SUMMARY

The present *Good Practice Recommendations on the Application of the Convention to Nuclear Energy-related Activities* describe existing good practice regarding the application of transboundary environmental impact assessment procedures in the field of nuclear energy. Their aim is to assist countries in the consistent practical application of the United Nations Economic Commission for Europe (ECE) Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) in the field of nuclear energy by illustrating good practice and sharing experiences. They also aim at facilitating exchange of information.

The good practice recommendations build on information and responses to a survey provided by national experts on environmental impact assessment and focal points to the Espoo Convention, in most cases in consultation with national nuclear experts. The publication was prepared by consultants to the ECE secretariat under the supervision of an editorial group consisting of representatives of Parties and a non-governmental organization.[43] The preparation of the recommendations was requested by the Meeting of the Parties to the Convention (through decision VI/7),[44] and foreseen in the workplan for the implementation of the Convention and the Protocol for the period 2014–2017.[45]

The Working Group on Environmental Impact Assessment and Strategic Environmental Assessment agreed on draft good practice recommendations at its sixth meeting (Geneva, 7–10 November 2016) and requested the editorial group to include a selection of good practice examples provided by Parties, which were subsequently reviewed by the Bureau.

At its seventh session (Minsk, 13–16 June 2017), the Meeting of the Parties to the Convention endorsed the good practice recommendations through its decision VII/6 and recommended that the Parties take their contents into account when implementing and applying the Convention. Parties were also invited to distribute them to authorities and relevant stakeholders. The recommendations were also proposed to be used in the capacity-building activities included in the workplan.

The Meeting of the Parties requested the secretariat to arrange for the publication of the good practice recommendations, including in an annex practical examples provided by Parties on their application of the Convention to nuclear energy- related activities that had been made available in an informal document.[46]

[43] The members of the editorial group represented Austria, Belarus, the European Commission, Finland, France, Germany, the Netherlands, Poland, Ukraine and the European ECO Forum.

[44] See ECE/MP.EIA/20/Add.1-ECE/MP.EIA/SEA/4/Add.1.

[45] See ECE/MP.EIA/20/Add.3-ECE/MP.EIA/SEA/4/Add.3, decisions VI/3–II/3, annex I.

[46] See ECE/MP.EIA/2017/INF.6, available from http://www.unece.org/index.php?id=45098#/ (under the "Informal documents" tab).

I. INTRODUCTION

1. In 2014, at its sixth session (Geneva, 2–5 June 2014), the Meeting of the Parties to the United Nations Economic Commission for Europe (ECE) Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention), through its decisions VI/3[47] and VI/7,[48] requested the development of good practice recommendations on the application of the Convention to nuclear energy-related activities for consideration at its next session in 2017.

2. The Good Practice Recommendations on the Application of the Convention to Nuclear Energy-related Activities contained herein describe existing good practice on the application of transboundary environmental impact assessment (EIA) procedures in the field of nuclear energy. Their objective is to facilitate the exchange of information and assist countries in the consistent practical application of the Convention by illustrating good practice and sharing experiences.

3. The present recommendations were prepared by consultants to the Convention secretariat (Environment Agency Austria), under the supervision of an editorial group established by the Meeting of the Parties,[49] and taking into account the comments by the Working Group on Environmental Impact Assessment and Strategic Environmental Assessment at its fifth and sixth meetings (Geneva, 11–15 April and 7–10 November 2016, respectively).[50] The Bureau reviewed the good practice examples contained in the present document at its meeting on 23 and 24 February 2017.

4. The recommendations incorporate information and responses to a survey provided by national EIA experts and focal points to the Espoo Convention, in most cases in consultation with national nuclear experts. The survey was designed to gather information and to identify existing good practice, but also challenges and experiences in the application of the Convention to nuclear energy-related activities relating to issues specified in the terms of reference adopted by the Working Group at its fourth meeting (Geneva, 26-28 May, 2015).[51]

5. Furthermore, the recommendations build on existing guidance documents on the application of the Espoo Convention and other relevant material, such as selected opinions of the Implementation Committee. They have also been supplemented with good practice examples provided by countries that illustrate the successful application of the Convention to nuclear energy-related activities. On 3 and 4 August 2016, the editorial group held a meeting in Vienna to complement the information and good practice examples gathered and to further refine the draft text of the recommendations. In early 2017, as requested by the Working Group, the editorial group worked electronically to produce a balanced selection of good practice examples for incorporation in the document. Other examples of existing practices provided by Parties on their application of the Convention to nuclear energy-related activities can

[47] See ECE/MP.EIA/20/Add.3–ECE/MP.EIA/SEA/4/Add.3.
[48] See ECE/MP.EIA/20/Add.1–ECE/MP.EIA/SEA/4/Add.1.
[49] The editorial group consisted of one to two representatives from each of the following Parties: Austria, Belarus, Finland, France, Germany, the Netherlands, Poland, Ukraine and the European Union. It also included a representative from the non-governmental organization European ECO Forum, in accordance with the workplan.
[50] See ECE/MP.EIA/WG.2/2016/2, paras. 47–52, and ECE/MP.EIA/WG.2/2016/4, paras. 42–45.
[51] See ECE/MP.EIA/WG.2/2015/3.

be accessed from the Convention website.

6. In line with its terms of reference,[49] the Good Practice Recommendations address the following procedural steps under the Convention: screening; notification; environmental impact assessment documentation; public participation; consultation; examination of the information gathered and final decision; and post-project analysis. The present document covers the above steps in separate sections. Each section contains:

a) A description of the relevant provisions of the Convention;

b) A summary of approaches reported by respondents that reflect the most common statements and comments provided, but also point to the existence of different views and approaches among Parties to the Convention;

c) Good practice examples provided by Parties.[52] Even if the examples are limited in number, they nevertheless provide valuable insights into the practical experiences with the application of the Convention;

d) Good practice recommendations that derive from the corresponding summary of approaches, good practice examples and experiences of the Parties, and which also reflect the relevant decisions of the Meeting of the Parties to the Convention and in some cases the relevant opinions of the Implementation Committee (as referred to in footnotes).

7. The good practice recommendations in this document summarize practice as reported by some Parties. They do not create any obligations and are without prejudice to existing obligations set out in the Convention.

8. The document has been prepared with the financial assistance of Austria, Germany and the European Union in the framework of the "Greening the Economies in the Eastern Neighbourhood" (EaP GREEN) programme. The EaP GREEN programme is coordinated by the Organization for Economic Cooperation and Development and implemented by ECE, the United Nations Environment Programme and the United Nations Industrial Development Organization. The views expressed herein can in no way be taken to reflect the official opinion of the European Union, ECE or the other implementing organizations.

II. SCREENING

A. Introduction

9. The purpose of screening under the Convention is to determine whether a proposed activity or a major change to an activity listed in appendix I to the Convention is likely to cause a significant adverse transboundary impact. That is, screening will have to determine whether proposed nuclear activities, and also major changes to existing ones, subject to a decision of a competent authority (such as upgrades or extensions), fall under the scope of the Convention. In addition, if the proposed activity is not listed in appendix I, but both the Party of origin and the potential affected Party(ies) agree that it is likely to cause a significant transboundary impact and should be treated as if it were listed, the activity will also fall under the Convention.

[52] Please note that each of the good practice examples solely reflects the perspective of the country that provided the example, and highlights the practical experience of either the Party of origin or the affected Party.

B. Summarized approaches

10. Most of the national legislation of the Parties to the Convention already fully covers the nuclear energy-related activities and installations listed in paragraphs 2 (b) and 3 of the revised appendix I contained in the second amendment to the Convention.[53]

11. There are no standardized procedures in place for determining whether a proposed nuclear energy-related activity is subject to the Convention, but screening rather depends on the type of nuclear energy-related activities. Some responses refer to criteria such as distance or public perception for determining whether an activity is likely to cause significant transboundary impacts.

12. Licences and time limits for nuclear energy-related activities vary among countries. Some licences are issued with a time limit while others are not, sometimes also depending on the type of activity.

13. Based on their national legislation or practice, some Parties also take into account the likelihood of a significant adverse transboundary impact from accidents beyond the design base when determining the applicability of the Convention.

14. It should be noted that, in one specific case, the Meeting of the Parties endorsed "the findings of the Implementation Committee that the extension of the lifetime of the nuclear power plant, subject of the proceedings, after the initial licence had expired, should be considered as a proposed activity under article 1, paragraph (v), of the Convention".[54]

C. Good practice examples

BOX 1 - SCREENING, SWEDEN (as Party of origin)

Shutdown and service operations for the Ringhals Nuclear Power Plant reactors I and II

Sweden considered that the shutdown and service operations for two of the four reactors at the Ringhals nuclear power plant (NPP) did not entail any significant transboundary environmental impacts. However, Sweden decided in December 2015 to inform the nearest countries, Denmark and Norway, of the process that had been initiated in relation to the EIA. As part of the information, Sweden enclosed the same background information that had been sent to its Government agencies and made publicly available in Sweden.

BOX 2 - SCREENING, GERMANY (as Party of origin)

Nuclear power plant Isar-1 (decommissioning)

In the as of yet uncompleted approval procedure for the decommissioning of the Isar-1 NPP, Germany and the European Commission in their evaluation came to the conclusion that the project did not have significant adverse transboundary impacts. Austria nevertheless requested to be notified, and, on the basis of the documents provided to it, requested to participate in the environmental impact assessment regarding the project. The authorities designated by Austria and the Austrian public were subsequently involved in the EIA process as of 2014. Austrian representatives attended a public hearing held on 22 July 2014. In addition, a separate meeting for consultations with the Austrian authorities was organized on 4 November 2014.

[53] ECE/MP.EIA/6, annex VII, appendix.
[54] ECE/MP.EIA/20/Add.1-ECE/MP.EIA/SEA/4/Add.1, decision VI/2, para. 68.

D. Good practice recommendations

15. **Major change**. The criteria and considerations for identifying a "major change" to nuclear energy-related activities are to be determined on a case-by-case basis.

16. **Early information builds trust.** Given the nature of nuclear energy-related activities (involving the potentially wide scope of severe impacts, great public concern and national interests) it could be considered good practice if a Party of origin informed potentially affected Parties about its screening procedures through formal or informal exchange of information at an early stage, potentially giving a possibility to comment.

17. **Consideration of the risk of major accidents.** Parties of origin are invited to consider the risk of major accidents and/or disasters which are relevant to the project when determining the likelihood of significant transboundary impacts.

18. **Upgrade works during the life cycle.** If upgrade works during the life cycle are planned, Parties are to be aware that these works may fall under "major change" causing significant transboundary impacts.

19. **Exchange of experiences.** The exchange of experiences among Parties on screening procedures in a transboundary procedure has proven to be beneficial.

III. NOTIFICATION

A. Introduction

20. Notification requires the determination of the potentially affected Parties to be notified under the Convention. For a proposed nuclear energy-related activity listed in appendix I that is likely to cause a significant adverse transboundary impact, the Party of origin is required, for the purposes of ensuring adequate and effective consultations under article 5, to notify any Party which it considers may be an affected Party as early as possible and no later than when informing its own public about that proposed activity.

21. Regarding the content of the notification, article 3 of the Convention lists: (a) information on the proposed activity, including any available information on its possible transboundary impact; (b) the nature of the possible decision; and (c) an indication of a reasonable time within which a response is required, taking into account the nature of the proposed activity.

B. Summarized approaches

22. Parties of origin apply different criteria to determine the potentially affected Parties from nuclear energy- related activities. Some Parties choose, for example, criteria based on the normal operation of a planned installation, while some other Parties consider also design base and beyond design base accidents. In addition to official notifications, Parties of origin sometimes also informally inform a broader range of Parties not necessarily potentially affected about proposed nuclear energy-related activities. Parties that consider themselves as potentially affected sometimes proactively request to be notified of a project when significant adverse impacts cannot be excluded from their point of view.

23. In accordance with the obligation to notify any potentially affected Party as early as possible, several Parties of origin inform the potentially affected Parties at the scoping stage, allowing them to take part in the scoping procedure.

24. Apart from the technical characteristics of the proposed activity and information on its possible transboundary impact, information about the Party of origin's permitting system and decision-making procedure is often regarded as particularly helpful in facilitating the notification process.

25. The time frames for affected Parties within which they should respond whether they intend to participate in the transboundary EIA procedure mostly vary between one to three months, also depending on the nature of the proposed nuclear activity. In practice, the competent authorities of several Parties of origin are willing to extend the deadlines specified in the notification, if requested by the affected Party.

26. In case of differing national languages between the Party of origin and the affected Party, notifications are mostly sent in English, while some countries are also notified in Russian. The material intended for the affected Party's public (especially the non-technical summary) is mostly translated into the respective national language.

27. Several Parties have bilateral agreements in place, which determine in advance specific forms (e.g., adjusted template) to be used for notification, i.e., specifying issues such as required contents, time frames, language and translation, or mechanisms to enable equal treatment of the public in both countries.

C. Good practice examples

BOX 3 - NOTIFICATION, POLAND (as Party of origin)

First nuclear power plant in Poland

The transboundary EIA procedure with respect to the planned construction of the first NPP in Poland was initiated in 2015. At the scoping stage, immediately after the receipt of the relevant information from the developer, Poland sent 13 official notifications (to its neighbours, the Baltic Sea region countries and, as a result of an SEA for the Polish NPP Programme, to Austria) in three languages (English, as a lingua franca, and German and Lithuanian owing to requirements in the respective bilateral agreements). In addition to the official notifications, Poland informed 13 further countries located up to 1,000 kilometres from the potential site of the NPP (corresponding to the distance of a possible impact in case of an accident beyond the design basis). All the 13 officially notified countries indicated their wish to take part in the EIA procedure as affected Parties, and two of the informally informed countries asked for an official notification. As a result, countries were notified and commented on the scope of the EIA report (almost all Parties responded within the given time frame).

The early involvement of the affected Parties and also the provision of information to a broader range of Parties have advantages that can facilitate the entire procedure. First of all, early involvement of the affected Parties makes it possible to establish effective and optimal time frames and costs for the EIA procedure, and prevents late participation of affected Parties on request (at the final stage of EIA). Broad input from affected Parties at the scoping stage helps developing adequate and comprehensive EIA documentation based on exhaustive analyses and investigations. Moreover, early and broad involvement of the affected Parties helps to achieve a high degree of transparency of the procedure.

BOX 4 - NOTIFICATION, AUSTRIA (as affected Party)

Hungary Paks II nuclear power plant

Notification was carried out at the beginning of the EIA procedure in 2015 for the construction

of two new nuclear units at the Paks NPP. Hungary notified Austria in the scoping phase. Hungary sent Austria the necessary information on the scoping procedure (e.g., duration of the public participation in Hungary) in order to give the Austrian public equivalent possibilities to participate. The scoping document was translated into German by Hungary. Hungary prolonged the time limit for Austria to deliver its comments. The communication between the Parties was carried out electronically, and the related information was provided on websites and in paper form.

From the Austrian point of view, the early notification allowed Austria to voice its concerns and request information to be considered in the environmental documentation in due time. The information regarding the scoping procedure given by Hungary and the translation of the document by the Hungarian Party enabled Austria to initiate the public participation procedure without delay. Hungary was flexible and supportive regarding time limits for sending Austrian comments. The cooperation was efficient also owing to the use of electronic means.

D. Good practice recommendations

28. **Wide notification.** Given the great public concern and national interests involved when it comes to nuclear energy-related activities, a wide notification, i.e., beyond neighbouring Parties, could prevent later misunderstandings and potential disputes. In this context, willingness to involve Parties that were at first not notified but proactively requested notification in accordance with article 3, paragraph 7, of the Convention could prevent potential disagreements later on.[55]

29. **Responsibilities associated with the notification.** Information on the project has to be provided in sufficient quality in order to help the affected Party to decide whether it wishes to participate in the transboundary procedure. The translation of the notification documentation by the Party of origin into the language of the affected Party should be provided beforehand; this supports the initiation of the participation procedure and helps to keep it within the given time frames. If no previous cooperation in applying the Convention exists between the Party of origin and the affected Party, the practicalities connected with notification (e.g., the length and timing of the public hearing and the languages — bilingual or trilingual — used by the affected Party) should be agreed in advance between the points of contact for notification.

30. **Early notification.** In accordance with article 3, paragraph 1, of the Convention affected Parties must be notified as early as possible, and no later than when the Party of origin's own public is informed about the proposed activity. Notification might otherwise come too late to influence key aspects of the documentation, and therefore not meet the needs of the affected Parties.[56] Informal contacts in advance of the official notification could also facilitate the later procedures (provided that, to avoid misunderstandings, it is made clear whether these contacts represent a formal notification or an informal prior information notice). Moreover, it would be useful for the affected Party to be informed whether and when the Party of origin's public is informed.

[55] See also relevant opinions of the Implementation Committee: MP.EIA/WG.1/2003/3, para. 8; and ECE/MP.EIA/WG.1/2006/4, paras. 13 (a)-(d), ECE/MP.EIA/WG.1/2007/3, para. 13, and ECE/MP.EIA/WG.1/2007/4, para. 28 (cf. decision IV/2, annex III).

[56] See also opinions of the Implementation Committee: ECE/MP.EIA/WG.1/2006/4, paras. 13 (a)-(d), ECE/MP.EIA/WG.1/2007/3, para. 13, and ECE/ MP.EIA/WG.1/2007/4, para. 28 (cf. decision IV/2, annex III).

31. **Reasonable time frame.** It is recommended to provide affected Parties with reasonable time frames to respond to a notification (i.e., to indicate whether they intend to participate in the transboundary EIA procedure) that also take into account different forms of administrative structures in the Parties, such as federal structures. This could assure an adequate involvement of all national and subnational authorities.[57]

32. **Timely response.** It is recommended that affected Parties respond as early as possible within the time frame specified by the Party of origin, so as to allow the Party of origin to proceed with the next steps. A swift response is particularly recommended if the affected Party has already been accorded an extended time frame to respond.[58]

33. **Information about the Party of origin's permitting system and decision-making procedure.** Aside from the information specified in article 3, paragraph 2, the notification could already include preliminary time frames for subsequent steps in the transboundary EIA procedure (e.g., using the format for notification available on the Convention website)[59] to allow the affected Party to prepare for the necessary steps. Information on the national development consent procedures following the EIA procedure could be given, explaining in particular how the outcome of the EIA will be taken into account in the subsequent procedures and, respectively, the final decision.

34. **Availability of documents.** The information could be provided through a range of means, including at least electronically. Large data sets should be placed on existing websites providing that their respective link is accurately described. These websites should not be changed during the commenting period without informing the notified Parties about any modifications to the web links.[60]

35. **Bilateral agreements.** Parties, in particular neighbouring countries, could develop bilateral agreements to facilitate the implementation of their obligations under the Convention, including regarding the notification procedure, which could also cover nuclear energy-related activities. Such agreements may address, for example, the timing of notification, the means and language of communication, the format and contents of the notification and the time frames for the response (decision whether to participate in the transboundary procedure).[61]

36. **Point of contact.** The notification should always be sent (at least in copy) to the point of contact for notification in the affected Party[62] unless otherwise provided for in bilateral or multilateral agreements. In case of changes in the contact details for its point of contact and/or focal point, the Party should also inform the

[57] See Implementation Committee's opinions referred to in footnote 53 above; see also decision V/4, para.7 and ECE/MP.EIA/IC/2010/2, para. 20.
[58] See footnote 53 above.
[59] http://www.unece.org/env/eia/notification.html.
[60] See footnote 53 above, decision V/4, para. 8 (a), cf. ECE/MP.EIA/IC/2010/2, para. 43, and ECE/MP.EIA/IC/2012/6, annex I, para. 33.
[61] See the Implementation Committee's opinions referred to in footnote 53 above; and ECE/MP.EIA/IC/2009/2, para. 24, ECE/MP.EIA/2011/4, para. 47, ECE/MP.EIA/IC/2010/2, paras. 21 and 43, and ECE/MP.EIA/IC/2010/4, para. 29.
[62] A list of points of contact for notification nominated in accordance with decision I/3 (see ECE/MP.EIA/2, annex III) is available at: http://www. unece.org/env/eia/points_of_contact.html. See also relevant opinions of the Implementation Committee, referred to in footnotes 53 and 57 above.

Convention secretariat about these changes.

IV. ENVIRONMENTAL IMPACT ASSESSMENT DOCUMENTATION

A. Introduction

37. The environmental impact assessment documentation to be submitted to the competent authority of the Party of origin must contain, as a minimum, the information described in appendix II to the Convention. The Party of origin is required to provide the affected Party (in cases where one exists through a joint body) with the environmental impact assessment documentation. The concerned Parties arrange for distribution of the documentation to the authorities and the public of the affected Party in the areas likely to be affected and for the submission of comments to the competent authority of the Party of origin, either directly to this authority or, where appropriate, through the Party of origin within a reasonable time before the final decision is taken on the proposed activity.

B. Summarized approaches

38. Concerning the level of detail of the EIA documentation that would allow for a good understanding of its contents, several Parties highlight the usefulness of carrying out a scoping procedure with early participation of the affected Parties, or at least including scoping documents in the notification and a comprehensible non-technical summary. In general, affected Parties require information to be detailed enough to be able to assess the potential significant transboundary impacts.

39. Some Parties indicate that the EIA documentation should address specific issues, such as the assessment of the likelihood and impacts of design base accidents, and sometimes also beyond design base accident scenarios; the evaluation of and prevention and mitigation measures for transboundary impacts during normal operation of a nuclear power plant; and information about safety procedures in cases of accidents. Safety aspects to protect human health and the environment are commonly regarded to be one of the most important and the most discussed issues in relation to nuclear energy-related activities.

40. In accordance with article 4 and appendix II to the Convention Parties also include in the EIA documentation a description of alternative scenarios and provide in detail reasonable alternatives, for example in terms of location and technology, to the proposed activity, considering also the no-action alternative. Alternative means of energy production or balancing demand and supply are national issues of the Party of origin and are therefore more adequately addressed at the political and strategic level.

41. Due to Parties' differing legislation and practice regarding the relevant procedural stage for the EIA, the timing of the preparation of the EIA documentation varies among countries. In this respect, ensuring in parallel an early notification and an adequate level of technical detail in the accompanying EIA documentation remains challenging.

42. For the proper dissemination of the EIA documentation to the affected Party's public, mostly electronic formats, including web pages, are used, although some Parties also provide hard copies in addition.

C. Good practice examples

BOX 5 - EIA DOCUMENTATION, FINLAND (as Party of origin)

Fennovoima Nuclear Power Plant (2014)

In 2014, the EIA report of Finland regarding the Fennovoima NPP dealt also with safety issues, including severe accidents which fall under the International Nuclear Event Scale (INES) levels 6 or 7 with a significant "source term" (i.e., the release to the atmosphere of radioactive matter). Finland submitted in addition a supplementary report with more detailed information as part of the EIA documentation material.

Good Practice Recommendations on the Application of the Convention to Nuclear Energy-related Activities

BOX 6 - EIA DOCUMENTATION, SLOVAKIA (as Party of origin)

New Jaslovské Bohunice Nuclear Power Plant

Slovakia notified Austria about the planned construction of a new NPP in Jaslovské Bohunice. Austria participated in the respective transboundary EIA procedure from March 2014 until June 2016. The EIA report was issued in August 2015. In addition to all the basic information about the project, the site, the current environment, etc., the report also contained an assessment of the transboundary radiological impacts of the operation of the new NPP for both normal operation and under accident conditions. The inclusion in the documentation of an assessment of the project's impacts in case of a severe accident was much appreciated by the Austrian public, since this addressed an important safety issue of concern to it. The Slovakian authority issued the final EIA statement on the NPP in April 2016.

D. Good practice recommendations

43. **Provision of preliminary information in the scoping documents.** Carrying out a scoping procedure with the early participation of the affected Party or Parties, and/or including scoping documents in the notification, could facilitate the good understanding of the contents of the EIA documentation and consequently simplify the consultation procedures.[63]

44. **Comprehensible non-technical summary.** Since the non-technical summary is a key element for informing the public, its content should be drafted in clear, simple, i.e., non-technical, language[64] and provided as a separate document or at least as a separate chapter of the EIA documentation.

45. **Translation of documentation.** It is recommended that, as a minimum, the non-technical summary and those parts of the EIA documentation that are necessary to provide an opportunity to the public of the affected Party to participate (e.g., transboundary impacts) are translated into the national language of the affected Party (principle of equivalence[65] and polluter pays principle).[66] In case of more than one national language, the concerned Parties should agree into which language the documentation should be translated, giving preference to one which is used in both Parties.

46. **Details about the reactor type.** The EIA documentation should contain

[63] See also ECE/MP.EIA/2011/4, ECE/MP.EIA/WG.1/2006/4, para. 18, decision IV/2, annex III, para. 29, and ECE/MP.EIA/IC/2009/4, para. 26.
[64] See also ECE/MP.EIA/IC/2009/2, para. 16.
[65] Article 2, paragraph 6, of the Convention.
[66] See also decision V/4, para. 6 (c), cf. ECE/MP.EIA/IC/2010/2, para. 35, and ECE/MP.EIA/IC/2010/4, paras. 19 (c) and 20; and ECE/MP.EIA/IC/2010/2, para. 35; and decision V/4, para. 6 (f), cf. ECE/MP.EIA/IC/2010/2, para. 35.

details about the reactor type or, if not possible at that stage, a sufficient level of information on all reactor types under consideration.

47. **Relevant information.** The EIA documentation should identify and assess all impacts of a nuclear energy-related activity throughout the whole life cycle, taking also into consideration its impacts on climate and risks.[67]

48. **Descriptions of alternatives.** Alternatives regarding the location and technology of the proposed activity and also the no-action alternative should be described in a comparable and transparent manner.[68]

49. **Risk and accidents.** In order to assess the transboundary impact of the proposed activity on the environment, including on human health and safety, it is recommended to use any relevant information available such as, for example, information obtained through a risk assessment carried out pursuant to other relevant assessment procedures in line with the national legislation and/or regulatory requirements or obtained through other reliable and significant sources.

V. PUBLIC PARTICIPATION

A. Introduction

50. Under the Convention, the public of the affected Party has the right to make comments on and to express objections to proposed activities (art. 3, para. 8, and art. 4, para. 2). The Parties concerned need to ensure that opportunities provided to the public of the affected Party are equivalent to those of the Party of origin (art. 2, para. 6).

B. Summarized approaches

51. For most Parties to the Convention, the environment ministries are the competent authorities for coordinating transboundary assessment procedures and ensuring that authorities and the public in the areas likely to be affected are provided with possibilities to comment on the proposed activities.

52. The developer of nuclear-related activities is mostly referred to as being responsible for the preparation of the EIA documentation and for contributing to the organization of public participation procedures by the public authorities. Depending on the countries, the developer may also be in charge of co-organizing the public hearing with the public authorities, including the related translation and interpretation services, and the evaluation of the comments received during the procedure.

53. With respect to the start and stages of public participation in the transboundary EIA procedures, most Parties of origin in practice involve the public from the notification stage onwards. In several countries the public is generally kept informed about the process. The relevant information from a Party of origin is also shared with the public in affected Parties.

54. When notifying their affected public, the authorities of the Parties of origin and affected Parties already rely strongly on digital communication and dissemination, although in many countries the (additional) use of printed media, such as newspapers,

[67] See part A of the Geneva Declaration (see ECE/MP.EIA/20.Add.3–ECE/MP.EIA/SEA/4.Add.3), adopted by the Meeting of the Parties to the Convention at its sixth session (Geneva, 2–5 June 2014).
[68] See also ECE/MP.EIA/IC/2009/2, para. 39, ECE/MP.EIA/IC/2010/2, para. 33, and ECE/MP.EIA/IC/2013/2, annex, para. 54.

official bulletins or billposting at the project location, are still a standard.

55. Among affected Parties, approaches vary on how their public's comments reach the Party of origin: some competent authorities collect the comments and submit them with their own comments to the Party of origin; and in other affected Parties the public is free to send comments directly to the Party of origin, for which purpose it is useful to indicate an official office e-mail address in the notification.

56. For some Parties, English or Russian is used as the lingua franca into which at least the non-technical summary is translated, but several Parties of origin also offer translation of additional parts of the documentation and/or translation into the language of the affected Party for informing the public. Apart from a few exceptions, translation costs are normally borne by the competent authorities or the project developer in the Party of origin according to the polluter pays principle.

57. For affected Parties, translation of documents in good quality is essential, together with sound (simultaneous) interpreting services during public meetings, even though it sometimes remains difficult to ensure them both. Inadequate translation is often attributed to the technical nature of the terminology involved, but also to a lack of resources (in the Party of origin).

58. The time frame during which comments are collected after the publication of the related notice for the public to comment varies significantly — from two weeks to three months — among Parties, and sometimes also within the same country for different activities.

59. Public hearings are widely seen as the most appropriate format for public engagement, since the bulk of the comments from the public can be addressed through a direct exchange. The comments provided during the hearings are usually documented in the minutes. These minutes, or a summary of the public comments received during the EIA procedure, are either included in the EIA report and/or the competent authority's official EIA statement, in the EIA documentation, or made available separately on the website of the competent authorities.

60. In general, the most common issues of concern and high interest for the public are human health and safety, particularly in the case of an accident. Another frequent issue of public concern is the quality of the documentation (e.g., its translation or its overly technical contents).

61. Key elements of a good public participation process from the affected Parties' point of view, include: (a) early information about the project; (b) clear and transparent EIA documentation and a proper translation of its relevant parts into the language of the affected Party; (c) online availability of the documentation; (d) a sufficient time frame for commenting by the affected public; (e) sufficient opportunities to participate in public hearings in the territory of the Party of origin and/or the affected Party; (f) an informative presentation of the activity and its transboundary impacts during the public hearing, together with high quality interpretation services; and, lastly (g) the subsequent feedback from the Party of origin on how the comments by the public have been taken into account.

C. Good practice examples

BOX 7 - PUBLIC PARTICIPATION, HUNGARY (as Party of origin)

Paks II Nuclear Power Plant

At the beginning of the EIA procedure for the construction of two new nuclear units of the Paks NPP, in 2015, Hungary notified all those countries that had indicated their interest in participating in the EIA procedure during the preliminary consultation of 2013. In 2015-2016, Hungary carried out a transboundary EIA with nine countries (Austria, Croatia, Czechia, Germany, Serbia, Slovenia, Slovakia, Romania and Ukraine). The full EIA documentation was made available in the Hungarian and English languages. Moreover, its chapter on transboundary effects and the non-technical summary were translated into the Croatian, Czech, Romanian, German, Serbian, Slovak, Slovenian and Ukrainian languages as well. All translations were arranged by the proponent, and the full documentation was made available online during the entire procedure. Hungary organized public hearings in the territory of all the affected Parties, as required, without limiting them in any sense. Indeed, if an affected Party so required, Hungary organized up to three public hearings in three different cities (in Romania), or a two-day-long public hearing (in Germany). Public hearings started after the usual working hours in the afternoons to increase the participation. A dedicated e-mail address was introduced to receive transboundary comments in the procedure in order to offer transparency and equal opportunities to the public of all participating Parties.

BOX 8 - PUBLIC PARTICIPATION, BULGARIA (as Party of origin)

Kozloduy Nuclear Power Plant

In Bulgaria, public participation consists of public hearings and oral and written possibilities for statements and views on the EIA documentation. Its timing and the duration respect a reasonable time frame that is agreed with the affected Party. Translation-related issues, including which documents or parts of documents to translate and which languages to translate them into, and quality assurance of the translations are agreed with the affected Party. The documentation on the outcomes, reports or minutes of the public hearings to be made available after the procedure are agreed with the affected Party. The competent authorities both in the Party of origin and in the affected Party and the developer take part in the organization and the conduct of the public participation procedure. Bulgaria considers as good practice the public consultations and hearings conducted in Romanian organized with the Romanian Ministry of Environment, Waters and Forests with respect to EIA procedures for the following planned activities:

(a) “Facility for Treatment and Conditioning of Radioactive Waste with a High Volume Reduction Factor at Kozloduy Nuclear Power Plant Facility (HVRF)”: the public hearing was conducted in the town of Bechet, Romania, on 15 October 2013;

(b) “Construction of new nuclear power of the latest generation of NPP, Kozloduy of Site 2”: the public hearings were conducted in the towns of Dabuleni, Craiova and Bucharest, Romania, on 18, 19 and 20 November 2014, respectively.

D. Good practice recommendations

62. **Early and timely public information.** Early and timely information about a project, when all options are open, allows for the effective involvement of the public in the EIA process.

63. **Organization of public participation for affected Parties.** The Parties of origin should provide the affected Parties with all relevant information in a timely manner to allow for the organization of public participation (e.g., making information available on the Internet or through the authorities, organizing public hearings,

etc.). Sufficient time for the organization of participation before the public participation starts, but also for the follow-up to the public participation procedures (e.g., collecting comments), is necessary.

64. **Reasonable and equal time frames for the public to express its opinion.** The time frames during which comments are collected should be sufficiently long to allow for high-quality public contributions.[69] These time frames should allow equal opportunity for the public of the Parties of origin and the public of the affected Parties to participate.

65. **Open and transparent process.** The Party of origin should allow the affected public access to the EIA documentation and any other information deemed useful to be provided to facilitate an open and transparent public participation process. In case of any relevant updates to the EIA documentation or changes in the public participation process in the Party of origin, the affected Party should be informed in order to take subsequent steps (principle of equivalence).[70]

66. **Public hearing.** If the Party of origin organizes a public hearing on its territory, the public of the affected country should be invited in sufficient time before the hearing. Adequate interpretation services should be provided. For practical reasons it may be more useful to organize an additional public hearing on the territory of the affected Party. The respective authorities of the affected Party and the Party of origin should preferably collaborate on organizational matters and agree on prior clarification of related financial issues.

67. **Direct feedback from the public of the affected Party.** The Party of origin should be aware that in some affected Parties the comments from the public are sent directly to the Party of origin and are not collected by the competent authorities of the affected Party.

VI. CONSULTATION

A. Introduction

68. In accordance with article 5, the Party of origin is required, after completion of the environmental impact assessment documentation, without undue delay to enter into consultations with the affected Party concerning, inter alia, the potential transboundary impact of the proposed activity and measures to reduce or eliminate its impact.

B. Summarized approaches

69. Consultations between the authorities involved in a transboundary EIA procedure are commonly carried out at least in written form, however, without excluding additional possibilities for question-and-answer sessions or meetings (e.g., expert meetings). The extent of interaction also depends on the complexity or significance of the respective project and the (informal) agreements between the Parties forerunning the consultations.

70. Regarding the timing and duration, the average length of consultation periods among the Parties is between one and two months. However, depending on the complexity of the nuclear energy-related project concerned, in practice there also exist cases where

[69] See also decision V/4, para. 6 (c), cf. ECE/MP.EIA/IC/2010/2, para. 35, and ECE/MP.EIA/IC/2010/4, paras. 19 (c) and 20.
[70] Ibid.

consultations have taken up to six months. Consultation meetings are commonly scheduled to last one day.

71. Consultations that are carried out on the basis of the completed and publicly available EIA documentation usually focus on further information, (written) comments and questions (e.g., on nuclear safety issues) requested by the affected Party and answers by the Party of origin. Organizational issues are often discussed and agreed between the Parties on a case-by-case basis before the date of a consultation meeting.

72. Financial costs regarding a consultation meeting (e.g., the venue or interpretation), aside from the related travel expenses and accommodation, are mostly paid by the Party that hosts the meeting, independently of whether that is the Party of origin or the affected Party.

73. When it comes to the outcomes of the consultations and their use, some Parties of origin forward them to the affected Parties while others do not disseminate them separately, but only include them in the publicly available final version of the EIA report, which then is a basis for the outcomes to be at least considered in the final decision on the activity. For some Parties of origin the outcome of the EIA procedure is a binding basis for all subsequent proceedings, such as licence applications by the developer.

C. Good practice examples

BOX 9 - CONSULTATION, SWEDEN (as Party of origin)

Interim storage, encapsulation and final disposal of spent nuclear fuel

Sweden notified the countries around the Baltic Sea in December 2005 of its project for the interim storage, encapsulation and final disposal of spent nuclear fuel. Five countries wished to participate in the process and three wished to receive further information on the process. The consultation began in 2008, and focused on the formulation and content of the forthcoming EIA. Sweden also expressed its interest in holding a consultation meeting. The consultation continued in February 2016 after the location of the final repository had been chosen, and a final EIA documentation had been assembled in conjunction with the submission of licence applications. All the countries received the consultation material in English and Swedish and the countries that took part in the process also received the non-technical summary in the country's own language. Given the long period of time that had passed since the first consultation in 2008, Sweden invited all the countries around the Baltic Sea to a half-day joint consultation meeting, which six countries participated in. Five of the countries then took part in a one-day site visit to the Swedish Nuclear Fuel and Waste Management Company's plants in Forsmark. These events helped to eliminate uncertainties ahead of gathering written comments from the affected Parties. Early and regular communication between the developer and the competent authority made it possible to prepare and translate suitable background information, and to plan and arrange the consultation with a meeting and site visit in a suitable and appreciated form.

BOX 10 - CONSULTATION, AUSTRIA (as affected Party)

Mochovce Nuclear Power Plant

The transboundary EIA procedure with Slovakia on the project "Nuclear Power Plant Mochovce 3 and 4" was initiated in early 2009. Two public hearings were conducted in Slovakia and in Austria, subsequent to the receipt and the completion of the public inspection of the screening and the EIA documentation. The public comments and expert statements gathered were sent to the Slovakian authority for consideration. Therefore, during the subsequent bilateral

consultations further questions and subjects could be discussed. Other results of the consultations included an agreement to hold further bilateral technical expert workshops on various specific safety questions regarding the project. This agreement was also included in the final EIA statement. Since then, two such expert workshops have taken place within the framework of a "dialogue on safety issues". The final EIA statement on the project, which was released by the Slovakian authority in early 2010, foresees the continuance of the bilateral dialogue on safety issues.

D. Good practice recommendations

74. **Timely and transparent information.** The full and completed EIA documentation should be made available to the affected Parties well ahead of the consultations among the authorities of the concerned Parties. New or additional information becoming available at a later stage in the EIA procedure may initiate additional consultations.[71]

75. **Openness for a serious dialogue.** Proactive willingness by Parties of origin to address and take seriously the most important issues from the affected Party's point of view should be at the core of in depth- discussions during consultations.

76. **Thorough evaluation of all comments of affected Parties prior to the consultation meetings.** A thorough evaluation of all available comments allows all Parties concerned to properly prepare for the consultation meetings, which ensures the efficiency and the quality of the meetings. Affected Parties should submit questions to be addressed during the consultations in sufficient time before the consultation meeting to permit better preparation and facilitate discussions.

77. **Duration of the consultation period.** The duration of the consultation period should be long enough to allow consultations on all relevant issues. More than one consultation meeting may be necessary, or it might be agreed that additional written answers can be provided after the meeting.

78. **Well-planned consultation meetings.** Planning the consultation well may involve, inter alia, agreeing on the agenda, proper translation and interpretation in case of differing national languages and the prior clarification of related financial issues, and providing the minutes. The relevant authorities and experts of the Party of origin have to be present and translation issues have to be clarified beforehand. Question- and-answer sessions allow for detailed discussions, including on additional issues which may arise during the consultations.[72]

VII. EXAMINATION OF THE INFORMATION GATHERED AND THE FINAL DECISION

A. Introduction

79. The Party of origin must provide to the affected Party the final decision on the proposed activity along with the reasons and considerations on which it was based.

B. Summarized approaches

80. In general, the result of the EIA process (including comments received from public participation and through consultation) has to be taken into due account and constitutes a (binding) basis for the final decision on the proposed activity by the responsible State administration. In some

[71] See also ECE/MP.EIA/IC/2013/2, annex, para. 52, and ECE/MP.EIA/IC/2009/2, para. 25.
[72] See also decision IV/2, annex III, para. 32, and ECE/MP.EIA/WG.1/2006/4, para. 17; and ECE/MP.EIA/8, section 2.9, and ECE/MP.EIA/IC/2009/2, para. 24.

countries, the outcome of the EIA procedure is a self-standing decision that is binding with respect to the subsequent development consent, while in other countries in which the EIA is part of the development consent procedure the final decision is the development consent.

81. All information gathered through the public participation and the consultation procedures are taken into due account in the final decision, and reasons have to be given if certain aspects examined in the EIA procedure will not be incorporated or otherwise addressed in the final decision.

82. Financial costs connected with the dissemination of the final decision and the subsequent information are mostly paid by the Party of origin. If the affected Party needs a translation of the final decision, the bearing of the related costs has to be decided between the Party of origin and the affected Party. In some cases such details have been predetermined in bilateral agreements.

83. When it comes to issues with regard to the rights to appeal against the final decision by foreign citizens, approaches vary.

84. Not enough information was made available concerning the usage of the International Atomic Energy Agency's Site and External Events Design (SEED) review service in information gathering and decision-making.[73]

C. Good practice examples

BOX 11 - INFORMATION GATHERED AND FINAL DECISION, AUSTRIA (as affected Party)

Examination of the information gathered and final decision in general

As a rule, during the consultations under the Convention, Austria, as the affected Party, agrees with the Party of origin on a deadline for the submission of its "final expert statement". This final statement evaluates the information available (e.g., environmental documentation, the public participation and consultation) and gives concrete recommendations aiming at reducing possible negative impacts of the project. This final statement has to be taken into consideration by the competent authority of the Party of origin when preparing its final decision on the proposed activity. The final expert statements are supposed to support not only the Austrian public and authorities, but also to contribute to a discussion based on scientific arguments among the Parties concerned.

BOX 12 - INFORMATION GATHERED AND FINAL DECISION, ROMANIA (as Party of origin)

Cernavoda Nuclear Power Plant

After the public consultation procedure and bilateral expert consultations with Romania regarding the Cernavoda NPP in 2008, Austria submitted a final expert statement to Romania for further consideration in the EIA and decision-making procedure. The final expert statement evaluated and considered the environmental report, comments from the public and the outcome of the bilateral consultations. It contained various conclusions and recommendations aiming at mitigating and minimizing negative transboundary impacts of the project to be taken into consideration within the subsequent EIA and other permitting procedures. Romania reacted on a voluntary basis in written form regarding the final expert statement before the EIA decision was issued. the response of Romania to the final expert statement of Austria enabled Austria to see how Romania dealt with the final recommendations, which gave more transparency to the procedure.

[73] See ECE/MP.EIA/20/Add.3–ECE/MP.EIA/SEA/4/Add.3, declaration, paras. A10 and A11.

D. Good practice recommendations

85. **Defining the final decision.** The final decision resulting from the EIA procedure does not always correspond to the licence related to the nuclear activity, but must be complemented by another act, as determined by the respective national laws. It is recommended that the Party of origin clarifies in time (e.g., during notification) its legislation and practice regarding the final decision. A final decision could mean, e.g., one or more decisions of the competent authority or authorities giving a permit to construct a nuclear power plant.[74]

86. **Submitting the final decision.** Once issued, the final decision along with the reasons and considerations on which it was based, should be sent to the affected Parties in a timely manner to be made publicly available. The final decision should be made available in any lingua franca or in another language as agreed by both affected Parties and the Party of origin or, in case of the existence of a bilateral agreement, in the language required by that agreement, and should be provided in an electronic format.[75]

87. **Addressing the point of contact.** The final decision must always be sent to the point of contact for notification of the affected Party under the Convention.

88. **Information on the right to appeal.** The Party of origin should provide information in the final decision about the right to appeal for the public in the Party of origin and for citizens of affected Parties, clearly explaining the process and the timing to appeal.[76]

89. **Feedback on comments by the public.** The documentation attached to the decision should explicitly describe how the public comments were taken into account. If the Party of origin submits a report on, e.g., a public meeting held in the country of an affected Party, those parts concerning the affected Party should be translated.[77]

VIII. POST-PROJECT ANALYSIS

A. Introduction

90. The concerned Parties, at the request of any such Party, determine whether, and if so to what extent, a post-project analysis has to be carried out, taking into account the likely significant adverse transboundary impact of the activity for which an environmental impact assessment has been undertaken pursuant to this Convention. Post-project analysis undertaken includes, in particular, the monitoring of the activity and the determination of any adverse transboundary impact. Such monitoring and determination may be undertaken with a view to achieving the objectives listed in appendix V.

B. Summarized approaches

91. Not all Parties carry out post-project analyses in accordance with article 7. However several environmental aspects of nuclear facilities are to be monitored over the time of construction, operation and decommissioning. These monitoring and reporting activities are governed and determined by laws and procedures that are separate from the Convention procedures.

92. Some Parties agree on monitoring and reporting mechanisms (including their

[74] See also ECE/MP.EIA/10, decision IV/2, annex I, para. 61; and decision V/4, para. 6 (i), cf. ECE/MP.EIA/IC/2009/2, para. 21.
[75] See also ECE/MP.EIA/2011/4, para. 51.
[76] Ibid.
[77] See also decision V/4, para. 6 (g), cf. ECE/MP.EIA/IC/2010/2, para. 40.

scope and timing), during the bilateral consultation process or, depending on the final decision, at a later stage.

93. The bearing of financial costs related to post-project analysis is to be agreed between the concerned Parties; however, related approaches vary.

94. Concerning access to information by the public of the Party of origin and by that of the affected Parties related to post-project analysis, not enough information was yet made available.

C. Good practice examples

95. No good practice examples were selected with regard to post-project analysis.

D. Good practice recommendations

96. **Agreeing on monitoring and reporting mechanisms.** The concerned Parties could agree on monitoring and reporting mechanisms during consultations. The Party of origin could send relevant monitoring reports for information and to be commented by the affected Parties.

Annex

PRACTICAL EXAMPLES ON THE APPLICATION OF THE CONVENTION TO NUCLEAR ENERGY-RELATED ACTIVITIES

I. Screening

BOX 1 - BULGARIA (as Party of origin)

Bulgaria either considers construction and operation as a single activity or as a series of activities, depending on the kind of activity planned. On the one hand, a planned decommissioning may require a separate assessment (for example, the decommissioning of Units 1–4 of the Kozloduy nuclear power plant (NPP), which were constructed from 1970 onwards, thus prior to the entry into force of the Convention and the national EIA legislation). On the other hand, for planned facilities for treatment and conditioning of radioactive waste with a high volume reduction factor (i.e., at Kozloduy NPP) or for the construction of a new NPP of the latest generation (i.e., Kozloduy, Site 2), an assessment was carried out for the construction and operation of the new installations, covering the full life cycle, extending from the choice of materials to the activities of decommissioning.

BOX 2 - HUNGARY (as Party of origin)

Paks II Nuclear Power Plant

Hungary carried out a transboundary EIA procedure of the planned construction of two new nuclear units at the Paks NPP during the period 2015–2016. In 2013, in the scoping phase, it had initiated a preliminary consultation with 30 countries, offering them the possibility to participate in the EIA procedure, with a view to evaluating how many countries would be interested in taking part. Two years after the actual start of the EIA procedure, official notifications were sent only to those countries that had indicated their interest in participating in the transboundary procedure based on the preliminary consultation. This early notification was a unique approach. However, for Hungary it proved very useful in the planning of the subsequent transboundary EIA procedure.

II. Notification

BOX 3 - BULGARIA (as Party of origin)

In accordance with its Environmental Protection Act Bulgaria notifies the affected Parties at the earliest stage of a development proposal, but not later than the date of notification of its own public. For example, Bulgaria notified Romania and Austria about the investment proposal for the construction of new nuclear power NPP of the latest generation (Kozloduy Site 2), in English, according them three weeks to respond as to

whether they wished to participate in the transboundary EIA procedure.

BOX 4 - FINLAND (as Party of origin)

Early notification, well before the start of the public commenting period

At the end of June 2016 Germany and eight other Parties received a notification from Finland concerning the Fennovoima Ltd encapsulation plant and the final disposal facility for spent nuclear fuel. The announcement was sent on the same day that the EIA programme was made public in Finland, two months in advance of the start of the public commenting period in September. Countries were offered a translation of the EIA documentation in due time before the set time period to comment. For Germany, as an affected Party, the early notification prior to the launching of the commenting period in the Party of origin was very useful. It provided the authorities of the affected Party with sufficient time to coordinate with each other, in particular as in this case more than one activity was subject to notification and thus there was more than one responsible authority in the affected Party. In addition, the time could be well used to prepare for the public participation, in particular for the internal administrative procedures (combined with the several responsible authorities), which were time consuming and would otherwise have shortened the time frame for the public in the affected Party to comment, constituting a disadvantage compared with the public in the Party of origin.

BOX 5 - SLOVAKIA (as Party of origin)

Enlargement of the repository for radioactive waste in Mochovce

In 2011, Slovakia notified Austria concerning the planned enlargement of the repository for radioactive waste in Mochovce in the scoping phase, when the national EIA procedure was initiated. The notification documentation was provided in both the Slovak and the German languages and included the announcement of the project, preliminary documentation (in both languages) and an enquiry about whether Austria intended to participate in a transboundary EIA procedure. At the request of Austria, Slovakia agreed to extend the deadline for responding. The email communication between the contact points from Austria and Slovakia was conducted in English.

III. Environmental impact assessment documentation

BOX 6 - AUSTRIA (as affected Party)

Fennovoima Nuclear Power Plant

In the period 2008–2011, Austria took part in the transboundary EIA procedure regarding the construction of a new nuclear power plant in Finland. Austria was able to comment the EIA report, which dealt also with safety issues, including severe accidents, and also the supplementary report containing more detailed information. Austria considers this experience to be an example of good practice. The EIA report described all the necessary effects caused by a proposed activity on the environment, including on human health and safety, and the full documentation was made available in English, with a summary paper in German and in eight other languages within the Baltic Sea subregion.

BOX 7 - BULGARIA (as Party of origin)

Bulgaria provided the terms of reference, the non-technical summary and the EIA report to Romania and Austria in English for its investment proposal for the “Construction of new nuclear power of the latest generation of NPP, Kozloduy”. Bulgaria sent the non-technical summary and the EIA report’s chapter on transboundary assessment to Romania in the Romanian language and to Austria in German.

IV. Public participation

BOX 8 - AUSTRIA (as affected Party)

Paks II Nuclear Power Plant

In 2015, Hungary as a Party of origin offered proactively to hold a public hearing in Austria as part of the transboundary EIA regarding its planned construction of an NPP (Paks II). This public hearing was organized by Austria with the full support of Hungary. At the hearing all the necessary Hungarian experts were present and the whole delegation agreed to stay as long as needed to properly answer all the questions raised by the public.

BOX 9 - AUSTRIA (as affected Party)

New units to Jaslovské Bohunice Nuclear Power Plant

During the transboundary EIA procedure that started in 2014 regarding the planned construction by Slovakia of new NPP units, Austria organized a public hearing to complement the public participation requirements, after its public had already been given the opportunity to provide comments on the project and its documentation. The hearing was prepared in close cooperation with the contact point of the Party of origin, and with the involvement of the project developer regarding the preparations and timetable. The preparatory work began approximately two months before the hearing, which was successfully conducted in Vienna on 18 November 2015. All technical equipment was provided by the affected Party.

BOX 10 - BELARUS (as Party of origin)

Ostrovets Nuclear Power Plant

During public hearings on the Belarussian NPP project, held in Ostrovets, Belarus, in August 2013, the Belarusian side provided the Lithuanian public with entry visas without consular fees, health insurance and bus transfers to the venue from the territory of the affected party (Lithuania) for free.

BOX 11 - FINLAND (as Party of origin)

Fennovoima Nuclear Power Plant (2014) – response to public interest in the affected Party, Sweden

During the 2013-2014 transboundary EIA procedure regarding the Fennovoima Oy NPP in Finland, a strong interest arose in northern Sweden towards the planned new NPP. The authorities in Finland and Sweden decided therefore to organize an ad hoc public meeting in Luleå, the capital of the Swedish province of Norrland, during the commenting period for the EIA documentation. This allowed interaction between the public and authorities in Sweden with the Finnish competent authorities responsible for EIA and Espoo Convention matters, as well as the permitting and radiation safety authorities, and the developer.

BOX 12 - GERMANY (as affected Party)

Jaslovské Bohunice Nuclear Power Plant

The public hearing for the Jaslovské Bohunice NPP in Slovakia was scheduled for 23 September 2015, with the public participation for that project taking place in the German state of Bavaria between 18 September and 17 October 2015. However, the Bavarian government had only been informed about the procedure by the Slovakian Government by means of a letter dated 7 September 2015. Since the Bavarian public could not participate in the public hearing due to such late notice, the competent authority (Bavarian State Ministry for the Environment and Consumer Protection) asked for a public meeting to be held in Bavaria later on. This was accepted by the Slovakian Government as a voluntary service to the Bavarian public. As a result, the public hearing was held in Munich on 25 November 2015.

V. Consultation

BOX 13 - ROMANIA (as Party of origin)

Cernavoda Nuclear Power Plant

Consultations regarding the Cernavoda NPP took place between the Romanian and Austrian environmental authorities under article 5 of the Convention in March 2008. During these consultations, after visiting the project site, the Austrian Party requested details regarding certain information contained in the EIA documentation. The topics discussed included the current state of the work on Units 3 and 4, the reactor core, seismic risk, reactor containment and the nuclear safety assessment. The consultations were attended by representatives of the Austrian and Romanian environment ministries, the Romanian National Commission for Nuclear Activity Control, "Nuclearelectrica" S.A. National Company, the Environment Agency Austria and the Austrian Institute for Applied Ecology.

VI. Examination of the information gathered and final decision

BOX 14 - FINLAND (as Party of origin)

Answering affected Party's questions and concerns

In Finland, a transboundary EIA is carried out before the Government takes a so-called "decision in principle"(or "a political licence") on a new facility. During the EIA procedure on the Fennovoima NPP, Finland sent to Austria not only the statement of the competent authority for EIA, but also additional information and a report which answered the questions of Austria including also with regard to worst-case severe accident scenarios. Later on Finland submitted its decision in principle. Besides proactively providing Austria with all relevant information and documents, Finland considered the comments and concerns made by Austria in a transparent way.

VII. Post project analysis

BOX 15 - BELARUS (as Party of origin)

Ostrovets Nuclear Power Plant

In 2013, Belarus invited all the countries that had been involved in the transboundary EIA for the Ostrovets NPP to participate in a post-project analysis (PPA). In 2014, Belarus prepared a draft of the PPA programme and discussed it with Austria, Latvia, Lithuania, Poland and Ukraine. The programme is designed for the whole operating period of the Belarusian NPP. Belarus informed these countries that, during the performance of the PPA, the programme could be adjusted according to reasoned proposals from the parties involved. In 2014, Belarus suggested to Lithuania, as the most concerned Party, to establish a joint body for the PPA.

PROTOCOL ON STRATEGIC ENVIRONMENTAL ASSESSMENT TO THE CONVENTION ON ENVIRONMENTAL IMPACT ASSESSMENT IN A TRANSBOUNDARY CONTEXT ("KYIV PROTOCOL")

Adopted in Kyiv, Ukraine on 21 May 2003
Entered into force on 11 July 2010

The Parties to this Protocol,

Recognizing the importance of integrating environmental, including health, considerations into the preparation and adoption of plans and programmes and, to the extent appropriate, policies and legislation,

Committing themselves to promoting sustainable development and therefore basing themselves on the conclusions of the United Nations Conference on Environment and Development (Rio de Janeiro, Brazil, 1992), in particular principles 4 and 10 of the Rio Declaration on Environment and Development and Agenda 21, as well as the outcome of the third Ministerial Conference on Environment and Health (London, 1999) and the World Summit on Sustainable Development (Johannesburg, South Africa, 2002),

Bearing in mind the Convention on Environmental Impact Assessment in a Transboundary Context, done at Espoo, Finland, on 25 February 1991, and decision II/9 of its Parties at Sofia on 26 and 27 February 2001, in which it was decided to prepare a legally binding protocol on strategic environmental assessment,

Recognizing that strategic environmental assessment should have an important role in the preparation and adoption of plans, programmes, and, to the extent appropriate, policies and legislation, and that the wider application of the principles of environmental impact assessment to plans, programmes, policies and legislation will further strengthen the systematic analysis of their significant environmental effects,

Acknowledging the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, done at Aarhus, Denmark, on 25 June 1998, and taking note of the relevant paragraphs of the Lucca Declaration, adopted at the first meeting of its Parties,

Conscious, therefore, of the importance of providing for public participation in strategic environmental assessment,

Acknowledging the benefits to the health and wellbeing of present and future generations that will follow if the need to protect and improve people's health is taken into account as an integral part of strategic environmental assessment, and recognizing the work led by the World Health Organization in this respect,

Mindful of the need for and importance of enhancing international cooperation in assessing the transboundary environmental, including health, effects of proposed plans and programmes, and, to the extent appropriate, policies and legislation,

Have agreed as follows:

Article 1. Objective

The objective of this Protocol is to provide for a high level of protection of the environment, including health, by:

(a) Ensuring that environmental, including health, considerations are thoroughly taken into account in the development of plans and programmes;

(b) Contributing to the consideration of environmental, including health,

concerns in the preparation of policies and legislation;

(c) Establishing clear, transparent and effective procedures for strategic environmental assessment;

(d) Providing for public participation in strategic environmental assessment; and

(e) Integrating by these means environmental, including health, concerns into measures and instruments designed to further sustainable development.

Article 2. Definitions

For the purposes of this Protocol,

1. "Convention" means the Convention on Environmental Impact Assessment in a Transboundary Context

2. "Party" means, unless the text indicates otherwise, a Contracting Party to this Protocol.

3. "Party of origin" means a Party or Parties to this Protocol within whose jurisdiction the preparation of a plan or programme is envisaged.

4. "Affected Party" means a Party or Parties to this Protocol likely to be affected by the transboundary environmental, including health, effects of a plan or programme.

5. "Plans and programmes" means plans and programmes and any modifications to them that are:

   (a) Required by legislative, regulatory or administrative provisions; and

   (b) Subject to preparation and/or adoption by an authority or prepared by an authority for adoption, through a formal procedure, by a parliament or a government.

6. "Strategic environmental assessment" means the evaluation of the likely environmental, including health effects, which comprises the determination of the scope of an environmental report and its preparation, the carrying out of public participation and consultations, and the taking into account of the environmental report and the results of the public participation and consultations in a plan or programme.

7. "Environmental, including health, effect" means any effect on the environment, including human health, flora, fauna, biodiversity, soil, climate, air, water, landscape, natural sites, material assets, cultural heritage and the interaction among these factors.

8. "The public" means one or more natural or legal persons and, in accordance with national legislation or practice, their associations, organizations or groups.

Article 3. General provisions

1. Each Party shall take the necessary legislative, regulatory and other appropriate measures to implement the provisions of this Protocol within a clear, transparent framework.

2. Each Party shall endeavour to ensure that officials and authorities assist and provide guidance to the public in matters covered by this Protocol.

3. Each Party shall provide for appropriate recognition of and support to associations, organizations or groups promoting environmental, including health, protection in the context of this Protocol.

4. The provisions of this Protocol shall not affect the right of a Party to maintain or introduce additional measures in relation to issues covered by this Protocol.

5. Each Party shall promote the objectives of this Protocol in relevant international decision-making processes and within the framework of relevant international organizations.

6. Each Party shall ensure that persons exercising their rights in conformity with the provisions of this Protocol shall not be penalized, persecuted or harassed in any way for their involvement. This provision shall not affect the powers of national courts to award reasonable costs in judicial proceedings.

7. Within the scope of the relevant provisions of this Protocol, the public shall be able to exercise its rights without discrimination as to citizenship, nationality or domicile and, in the case of a legal person, without discrimination as to where it has its registered seat or an effective centre of its activities.

Article 4. Field of application concerning plans and programmes

1. Each Party shall ensure that a strategic environmental assessment is carried out for plans and programmes referred to in paragraphs 2, 3 and 4 which are likely to have significant environmental, including health, effects.

2. A strategic environmental assessment shall be carried out for plans and programmes which are prepared for agriculture, forestry, fisheries, energy, industry including mining, transport, regional development, waste management, water management, telecommunications, tourism, town and country planning or land use, and which set the framework for future development consent for projects listed in annex I and any other project listed in annex II that requires an environmental impact assessment under national legislation.

3. For plans and programmes other than those subject to paragraph 2 which set the framework for future development consent of projects, a strategic environmental assessment shall be carried out where a Party so determines according to article 5, paragraph 1.

4. For plans and programmes referred to in paragraph 2 which determine the use of small areas at local level and for minor modifications to plans and programmes referred to in paragraph 2, a strategic environmental assessment shall be carried out only where a Party so determines according to article 5, paragraph 1.

5. The following plans and programmes are not subject to this Protocol:

   (a) Plans and programmes whose sole purpose is to serve national defence or civil emergencies;

   (b) Financial or budget plans and programmes.

Article 5. Screening

1. Each Party shall determine whether plans and programmes referred to in article 4, paragraphs 3 and 4, are likely to have significant environmental, including health, effects either through a case-by-case examination or by specifying types of plans and programmes or by combining both approaches. For this purpose each Party shall in all cases take into account the criteria set out in annex III.

2. Each Party shall ensure that the environmental and health authorities referred to in article 9, paragraph 1, are consulted when applying the procedures referred to in paragraph 1 above.

3. To the extent appropriate, each Party shall endeavor to provide

opportunities for the participation of the public concerned in the screening of plans and programmes under this article.

4. Each Party shall ensure timely public availability of the conclusions pursuant to paragraph 1, including the reasons for not requiring a strategic environmental assessment, whether by public notices or by other appropriate means, such as electronic media.

Article 6. Scoping

1. Each Party shall establish arrangements for the determination of the relevant information to be included in the environmental report in accordance with article 7, paragraph 2.

2. Each Party shall ensure that the environmental and health authorities referred to in article 9, paragraph 1, are consulted when determining the relevant information to be included in the environmental report.

3. To the extent appropriate, each Party shall endeavor to provide opportunities for the participation of the public concerned when determining the relevant information to be included in the environmental report.

Article 7. Environmental report

1. For plans and programmes subject to strategic environmental assessment, each Party shall ensure that an environmental report is prepared.

2. The environmental report shall, in accordance with the determination under article 6, identify, describe and evaluate the likely significant environmental, including health, effects of implementing the plan or programme and its reasonable alternatives. The report shall contain such information specified in annex IV as may reasonably be required, taking into account:

   (a) Current knowledge and methods of assessment;

   (b) The contents and the level of detail of the plan or programme and its stage in the decision-making process;

   (c) The interests of the public; and

   (d) The information needs of the decision-making body.

3. Each Party shall ensure that environmental reports are of sufficient quality to meet the requirements of this Protocol.

Article 8. Public participation

1. Each Party shall ensure early, timely and effective opportunities for public participation, when all options are open, in the strategic environmental assessment of plans and programmes.

2. Each Party, using electronic media or other appropriate means, shall ensure the timely public availability of the draft plan or programme and the environmental report.

3. Each Party shall ensure that the public concerned, including relevant non-governmental organizations, is identified for the purposes of paragraphs 1 and 4.

4. Each Party shall ensure that the public referred to in paragraph 3 has the opportunity to express its opinion on the draft plan or programme and the environmental report within a reasonable time frame.

5. Each Party shall ensure that the detailed arrangements for informing the public and consulting the public

concerned are determined and made publicly available. For this purpose, each Party shall take into account to the extent appropriate the elements listed in annex V.

Article 9. Consultation with environmental and health authorities

1. Each Party shall designate the authorities to be consulted which, by reason of their specific environmental or health responsibilities, are likely to be concerned by the environmental, including health, effects of the implementation of the plan or programme.

2. The draft plan or programme and the environmental report shall be made available to the authorities referred to in paragraph 1.

3. Each Party shall ensure that the authorities referred to in paragraph 1 are given, in an early, timely and effective manner, the opportunity to express their opinion on the draft plan or programme and the environmental report.

4. Each Party shall determine the detailed arrangements for informing and consulting the environmental and health authorities referred to in paragraph 1.

Article 10. Transboundary consultations

1. Where a Party of origin considers that the implementation of a plan or programme is likely to have significant transboundary environmental, including health, effects or where a Party likely to be significantly affected so requests, the Party of origin shall as early as possible before the adoption of the plan or programme notify the affected Party.

2. This notification shall contain, inter alia:

   (a) The draft plan or programme and the environmental report including information on its possible transboundary environmental, including health, effects; and

   (b) Information regarding the decision-making procedure, including an indication of a reasonable time schedule for the transmission of comments.

3. The affected Party shall, within the time specified in the notification, indicate to the Party of origin whether it wishes to enter into consultations before the adoption of the plan or programme and, if it so indicates, the Parties concerned shall enter into consultations concerning the likely transboundary environmental, including health, effects of implementing the plan or programme and the measures envisaged to prevent, reduce or mitigate adverse effects.

4. Where such consultations take place, the Parties concerned shall agree on detailed arrangements to ensure that the public concerned and the authorities referred to in article 9, paragraph 1, in the affected Party are informed and given an opportunity to forward their opinion on the draft plan or programme and the environmental report within a reasonable time frame.

Article 11. Decision

1. Each Party shall ensure that when a plan or programme is adopted due account is taken of:

   (a) The conclusions of the environmental report;

   (b) The measures to prevent, reduce or mitigate the adverse effects identified in the environmental report; and

(c) The comments received in accordance with articles 8 to 10.

2. Each Party shall ensure that, when a plan or programme is adopted, the public, the authorities referred to in article 9, paragraph 1, and the Parties consulted according to article 10 are informed, and that the plan or programme is made available to them together with a statement summarizing how the environmental, including health, considerations have been integrated into it, how the comments received in accordance with articles 8 to 10 have been taken into account and the reasons for adopting it in the light of the reasonable alternatives considered.

Article 12. Monitoring

1. Each Party shall monitor the significant environmental, including health, effects of the implementation of the plans and programmes, adopted under article 11 in order, inter alia, to identify, at an early stage, unforeseen adverse effects and to be able to undertake appropriate remedial action.

2. The results of the monitoring undertaken shall be made available, in accordance with national legislation, to the authorities referred to in article 9, paragraph 1, and to the public.

Article 13. Policies and legislation

1. Each Party shall endeavour to ensure that environmental, including health, concerns are considered and integrated to the extent appropriate in the preparation of its proposals for policies and legislation that are likely to have significant effects on the environment, including health.

2. In applying paragraph 1, each Party shall consider the appropriate principles and elements of this Protocol.

3. Each Party shall determine, where appropriate, the practical arrangements for the consideration and integration of environmental, including health, concerns in accordance with paragraph 1, taking into account the need for transparency in decision-making.

4. Each Party shall report to the Meeting of the Parties to the Convention serving as the Meeting of the Parties to this Protocol on its application of this article.

Article 14. The Meeting of the Parties to the Convention serving as the Meeting of the Parties to the Protocol

1. The Meeting of the Parties to the Convention shall serve as the Meeting of the Parties to this Protocol. The first meeting of the Parties to the Convention serving as the Meeting of the Parties to this Protocol shall be convened not later than one year after the date of entry into force of this Protocol, and in conjunction with a meeting of the Parties to the Convention, if a meeting of the latter is scheduled within that period. Subsequent meetings of the Parties to the Convention serving as the Meeting of the Parties to this Protocol shall be held in conjunction with meetings of the Parties to the Convention, unless otherwise decided by the Meeting of the Parties to the Convention serving as the Meeting of the Parties to this Protocol.

2. Parties to the Convention which are not Parties to this Protocol may participate as observers in the proceedings of any session of the Meeting of the Parties to the Convention serving as the Meeting of the Parties to this Protocol. When the Meeting of the Parties to the

Convention serves as the Meeting of the Parties to this Protocol, decisions under this Protocol shall be taken only by the Parties to this Protocol.

3. When the Meeting of the Parties to the Convention serves as the Meeting of the Parties to this Protocol, any member of the Bureau of the Meeting of the Parties representing a Party to the Convention that is not, at that time, a Party to this Protocol shall be replaced by another member to be elected by and from amongst the Parties to this Protocol.

4. The Meeting of the Parties to the Convention serving as the Meeting of the Parties to this Protocol shall keep under regular review the implementation of this Protocol and, for this purpose, shall:

   (a) Review policies for and methodological approaches to strategic environmental assessment with a view to further improving the procedures provided for under this Protocol;

   (b) Exchange information regarding experience gained in strategic environmental assessment and in the implementation of this Protocol;

   (c) Seek, where appropriate, the services and cooperation of competent bodies having expertise pertinent to the achievement of the purposes of this Protocol;

   (d) Establish such subsidiary bodies as it considers necessary for the implementation of this Protocol;

   (e) Where necessary, consider and adopt proposals for amendments to this Protocol; and

   (f) Consider and undertake any additional action, including action to be carried out jointly under this Protocol and the Convention, that may be required for the achievement of the purposes of this Protocol.

5. The rules of procedure of the Meeting of the Parties to the Convention shall be applied mutatis mutandis under this Protocol, except as may otherwise be decided by consensus by the Meeting of the Parties serving as the Meeting of the Parties to this Protocol.

6. At its first meeting, the Meeting of the Parties to the Convention serving as the Meeting of the Parties to this Protocol shall consider and adopt the modalities for applying the procedure for the review of compliance with the Convention to this Protocol.

7. Each Party shall, at intervals to be determined by the Meeting of the Parties to the Convention serving as the Meeting of the Parties to this Protocol, report to the Meeting of the Parties to the Convention serving as the Meeting of the Parties to the Protocol on measures that it has taken to implement the Protocol.

Article 15. Relationship to other international agreements

The relevant provisions of this Protocol shall apply without prejudice to the UNECE Conventions on Environmental Impact Assessment in a Transboundary Context and on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters.

Article 16. Right to vote

1. Except as provided for in paragraph 2 below, each Party to this Protocol shall have one vote.

2. Regional economic integration organizations, in matters within their competence, shall exercise their right to vote with a number of votes equal to the number of their member States which are Parties to this Protocol. Such organizations shall not exercise their right to vote if their member States exercise theirs, and vice versa.

Article 17. Secretariat

The secretariat established by article 13 of the Convention shall serve as the secretariat of this Protocol and article 13, paragraphs (a) to (c), of the Convention on the functions of the secretariat shall apply mutatis mutandis to this Protocol.

Article 18. Annexes

The annexes to this Protocol shall constitute an integral part thereof.

Article 19. Amendments to the Protocol

1. Any Party may propose amendments to this Protocol.

2. Subject to paragraph 3, the procedure for proposing, adopting and the entry into force of amendments to the Convention laid down in paragraphs 2 to 5 of article 14 of the Convention shall apply, mutatis mutandis, to amendments to this Protocol.

3. For the purpose of this Protocol, the three fourths of the Parties required for an amendment to enter into force for Parties having ratified, approved or accepted it, shall be calculated on the basis of the number of Parties at the time of the adoption of the amendment.

Article 20. Settlement of disputes

The provisions on the settlement of disputes of article 15 of the Convention shall apply mutatis mutandis to this Protocol.

Article 21. Signature

This Protocol shall be open for signature at Kiev (Ukraine) from 21 to 23 May 2003 and thereafter at United Nations Headquarters in New York until 31 December 2003, by States members of the Economic Commission for Europe as well as States having consultative status with the Economic Commission for Europe pursuant to paragraphs 8 and 11 of Economic and Social Council resolution 36 (IV) of 28 March 1947, and by regional economic integration organizations constituted by sovereign States members of the Economic Commission for Europe to which their member States have transferred competence over matters governed by this Protocol, including the competence to enter into treaties in respect of these matters.

Article 22. Depositary

The Secretary-General of the United Nations shall act as the Depositary of this Protocol.

Article 23. Ratification, acceptance, approval and accession

1. This Protocol shall be subject to ratification, acceptance or approval by signatory States and regional economic integration organizations referred to in article 21.

2. This Protocol shall be open for accession as from 1 January 2004 by the States and regional economic integration organizations referred to in article 21.

3. Any other State, not referred to in paragraph 2 above, that is a Member of the United Nations may accede to the Protocol upon approval by the Meeting of the Parties to the Convention serving as the Meeting of the Parties to the Protocol.

4. Any regional economic integration organization referred to in article 21 which becomes a Party to this Protocol without any of its member States

being a Party shall be bound by all the obligations under this Protocol. If one or more of such an organization's member States is a Party to this Protocol, the organization and its member States shall decide on their respective responsibilities for the performance of their obligations under this Protocol. In such cases, the organization and its member States shall not be entitled to exercise rights under this Protocol concurrently.

5. In their instruments of ratification, acceptance, approval or accession, the regional economic integration organizations referred to in article 21 shall declare the extent of their competence with respect to the matters governed by this Protocol. These organizations shall also inform the Depositary of any relevant modification to the extent of their competence.

Article 24. Entry into force

1. This Protocol shall enter into force on the ninetieth day after the date of deposit of the sixteenth instrument of ratification, acceptance, approval or accession.

2. For the purposes of paragraph 1 above, any instrument deposited by a regional economic integration organization referred to in article 21 shall not be counted as additional to those deposited by States members of such an organization.

3. For each State or regional economic integration organization referred to in article 21 which ratifies, accepts or approves this Protocol or accedes thereto after the deposit of the sixteenth instrument of ratification, acceptance, approval or accession, the Protocol shall enter into force on the ninetieth day after the date of deposit by such State or organization of its instrument of ratification, acceptance, approval or accession.

4. This Protocol shall apply to plans, programmes, policies and legislation for which the first formal preparatory act is subsequent to the date on which this Protocol enters into force. Where the Party under whose jurisdiction the preparation of a plan, programme, policy or legislation is envisaged is one for which paragraph 3 applies, this Protocol shall apply to plans, programmes, policies and legislation for which the first formal preparatory act is subsequent to the date on which this Protocol comes into force for that Party.

Article 25. Withdrawal

At any time after four years from the date on which this Protocol has come into force with respect to a Party, that Party may withdraw from the Protocol by giving written notification to the Depositary. Any such withdrawal shall take effect on the ninetieth day after the date of its receipt by the Depositary. Any such withdrawal shall not affect the application of articles 5 to 9, 11 and 13 with respect to a strategic environmental assessment under this Protocol which has already been started, or the application of article 10 with respect to a notification or request which has already been made, before such withdrawal takes effect.

Article 26. Authentic texts

The original of this Protocol, of which the English, French and Russian texts are equally authentic, shall be deposited with the Secretary-General of the United Nations.

IN WITNESS WHEREOF the undersigned, being duly authorized thereto, have signed this Protocol.

DONE at Kiev (Ukraine), this twenty-first day of May, two thousand and three.

Annex I

LIST OF PROJECTS AS REFERRED TO IN ARTICLE 4, PARAGRAPH 2

1. Crude oil refineries (excluding undertakings manufacturing only lubricants from crude oil) and installations for the gasification and liquefaction of 500 metric tons or more of coal or bituminous shale per day.

2. Thermal power stations and other combustion installations with a heat output of 300 megawatts or more and nuclear power stations and other nuclear reactors (except research installations for the production and conversion of fissionable and fertile materials, whose maximum power does not exceed 1 kilowatt continuous thermal load).

3. Installations solely designed for the production or enrichment of nuclear fuels, for the reprocessing of irradiated nuclear fuels or for the storage, disposal and processing of radioactive waste.

4. Major installations for the initial smelting of cast-iron and steel and for the production of non-ferrous metals.

5. Installations for the extraction of asbestos and for the processing and transformation of asbestos and products containing asbestos: for asbestos-cement products, with an annual production of more than 20,000 metric tons of finished product; for friction material, with an annual production of more than 50 metric tons of finished product; and for other asbestos utilization of more than 200 metric tons per year.

6. Integrated chemical installations.

7. Construction of motorways, express roads* and lines for long-distance railway traffic and of airports** with a basic runway length of 2,100 metres or more.

8. Large-diameter oil and gas pipelines.

9. Trading ports and also inland waterways and ports for inland-waterway traffic which permit the passage of vessels of over 1,350 metric tons.

10. Waste-disposal installations for the incineration, chemical treatment or landfill of toxic and dangerous wastes.

11. Large dams and reservoirs.

12. Groundwater abstraction activities in cases where the annual volume of water to be abstracted amounts to 10 million cubic metres or more.

13. Pulp and paper manufacturing of 200 air-dried metric tons or more per day.

14. Major mining, on-site extraction and processing of metal ores or coal.

15. Offshore hydrocarbon production.

16. Major storage facilities for petroleum, petrochemical and chemical products.

17. Deforestation of large areas.

*/ For the purposes of this Protocol:
- "Motorway" means a road specially designed and built for motor traffic, which does not serve properties bordering on it, and which: (a) Is provided, except at special points or temporarily, with separate carriageways for the two directions of traffic, separated from each other by a dividing strip not intended for traffic or, exceptionally, by other means; (b) Does not cross at level with any road, railway or tramway track, or footpath; and (c) Is specially sign posted as a motorway.
- "Express road" means a road reserved for motor traffic accessible only from interchanges or controlled junctions and on which, in particular, stopping and parking are prohibited on the running carriageway(s).
**/ For the purposes of this Protocol, "airport" means an airport which complies with the definition in the 1944 Chicago Convention setting up the International Civil Aviation Organization (Annex 14).

Annex II

ANY OTHER PROJECTS REFERRED TO IN ARTICLE 4, PARAGRAPH 2

1. Projects for the restructuring of rural land holdings.

2. Projects for the use of uncultivated land or seminatural areas for intensive agricultural purposes.

3. Water management projects for agriculture, including irrigation and land drainage projects.

4. Intensive livestock installations (including poultry).

5. Initial afforestation and deforestation for the purposes of conversion to another type of land use.

6. Intensive fish farming.

7. Nuclear power stations and other nuclear reactors* including the dismantling or decommissioning of such power stations or reactors (except research installations for the production and conversion of fissionable and fertile materials whose maximum power does not exceed 1 kilowatt continuous thermal load), as far as not included in annex I.

8. Construction of overhead electrical power lines with a voltage of 220 kilovolts or more and a length of 15 kilometres or more and other projects for the transmission of electrical energy by overhead cables.

9. Industrial installations for the production of electricity, steam and hot water.

10. Industrial installations for carrying gas, steam and hot water.

11. Surface storage of fossil fuels and natural gas.

12. Underground storage of combustible gases.

13. Industrial briquetting of coal and lignite.

14. Installations for hydroelectric energy production.

15. Installations for the harnessing of wind power for energy production (wind farms).

16. Installations, as far as not included in annex I, designed:

    - For the production or enrichment of nuclear fuel;

    - For the processing of irradiated nuclear fuel;

    - For the final disposal of irradiated nuclear fuel;

    - Solely for the final disposal of radioactive waste;

    - Solely for the storage (planned for more than 10 years) of irradiated nuclear fuels in a different site than the production site; or

    - For the processing and storage of radioactive waste.

17. Quarries, open cast mining and peat extraction, as far as not included in annex I.

18. Underground mining, as far as not included in annex I.

19. Extraction of minerals by marine or fluvial dredging.

20. Deep drillings (in particular geothermal drilling, drilling for the

* For the purposes of this Protocol, nuclear power stations and other nuclear reactors cease to be such an installation when all nuclear fuel and other radioactively contaminated elements have been removed permanently from the installation site.

storage of nuclear waste material, drilling for water supplies), with the exception of drillings for investigating the stability of the soil.

21. Surface industrial installations for the extraction of coal, petroleum, natural gas and ores, as well as bituminous shale.

22. Integrated works for the initial smelting of cast iron and steel, as far as not included in annex I.

23. Installations for the production of pig iron or steel (primary or secondary fusion) including continuous casting.

24. Installations for the processing of ferrous metals (hotrolling mills, smitheries with hammers, application of protective fused metal coats).

25. Ferrous metal foundries.

26. Installations for the production of non-ferrous crude metals from ore, concentrates or secondary raw materials by metallurgical, chemical or electrolytic processes, as far as not included in annex I.

27. Installations for the smelting, including the alloyage, of non-ferrous metals excluding precious metals, including recovered products (refining, foundry casting, etc.), as far as not included in annex I.

28. Installations for surface treatment of metals and plastic materials using an electrolytic or chemical process.

29. Manufacture and assembly of motor vehicles and manufacture of motor-vehicle engines.

30. Shipyards.

31. Installations for the construction and repair of aircraft.

32. Manufacture of railway equipment.

33. Swaging by explosives.

34. Installations for the roasting and sintering of metallic ores.

35. Coke ovens (dry coal distillation).

36. Installations for the manufacture of cement.

37. Installations for the manufacture of glass including glass fibre.

38. Installations for smelting mineral substances including the production of mineral fibres.

39. Manufacture of ceramic products by burning, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain.

40. Installations for the production of chemicals or treatment of intermediate products, as far as not included in annex I.

41. Production of pesticides and pharmaceutical products, paint and varnishes, elastomers and peroxides.

42. Installations for the storage of petroleum, petrochemical, or chemical products, as far as not included in annex I.

43. Manufacture of vegetable and animal oils and fats.

44. Packing and canning of animal and vegetable products.

45. Manufacture of dairy products.

46. Brewing and malting.

47. Confectionery and syrup manufacture.

48. Installations for the slaughter of animals.

49. Industrial starch manufacturing installations.

50. Fish-meal and fish-oil factories.

51. Sugar factories.

52. Industrial plants for the production of pulp, paper and board, as far as not included in annex I.

53. Plants for the pre treatment or dyeing of fibres or textiles.

54. Plants for the tanning of hides and skins.

55. Cellulose-processing and production installations.

56. Manufacture and treatment of elastomer-based products.

57. Installations for the manufacture of artificial mineral fibres.

58. Installations for the recovery or destruction of explosive substances.

59. Installations for the production of asbestos and the manufacture of asbestos products, as far as not included in annex I.

60. Knackers' yards.

61. Test benches for engines, turbines or reactors.

62. Permanent racing and test tracks for motorized vehicles.

63. Pipelines for transport of gas or oil, as far as not included in annex I.

64. Pipelines for transport of chemicals with a diameter of more than 800 mm and a length of more than 40 km.

65. Construction of railways and intermodal transshipment facilities, and of intermodal terminals, as far as not included in annex I.

66. Construction of tramways, elevated and underground railways, suspended lines or similar lines of a particular type used exclusively or mainly for passenger transport.

67. Construction of roads, including realignment and/or widening of any existing road, as far as not included in annex I.

68. Construction of harbours and port installations, including fishing harbours, as far as not included in annex I.

69. Construction of inland waterways and ports for inland-waterway traffic, as far as not included in annex I.

70. Trading ports, piers for loading and unloading connected to land and outside ports, as far as not included in annex I.

71. Canalization and flood-relief works.

72. Construction of airports** and airfields, as far as not included in annex I.

73. Waste-disposal installations (including landfill), as far as not included in annex I.

74. Installations for the incineration or chemical treatment of non-hazardous waste.

75. Storage of scrap iron, including scrap vehicles.

76. Sludge deposition sites.

** For the purposes of this Protocol, "airport" means an airport which complies with the definition in the 1944 Chicago Convention setting up the International Civil Aviation Organization (annex 14).

77. Groundwater abstraction or artificial groundwater recharge, as far as not included in annex I.

78. Works for the transfer of water resources between river basins.

79. Waste-water treatment plants.

80. Dams and other installations designed for the holding back or for the long-term or permanent storage of water, as far as not included in annex I.

81. Coastal work to combat erosion and maritime works capable of altering the coast through the construction, for example, of dykes, moles, jetties and other sea defence works, excluding the maintenance and reconstruction of such works.

82. Installations of long-distance aqueducts.

83. Ski runs, ski lifts and cable cars and associated developments.

84. Marinas.

85. Holiday villages and hotel complexes outside urban areas and associated developments.

86. Permanent campsites and caravan sites.

87. Theme parks.

88. Industrial estate development projects.

89. Urban development projects, including the construction of shopping centres and car parks.

90. Reclamation of land from the sea.

Annex III

CRITERIA FOR DETERMINING OF THE LIKELY SIGNIFICANT ENVIRONMENTAL, INCLUDING HEALTH, EFFECTS REFERRED TO IN ARTICLE 5, PARAGRAPH 1

1. The relevance of the plan or programme to the integration of environmental, including health, considerations in particular with a view to promoting sustainable development.

2. The degree to which the plan or programme sets a framework for projects and other activities, either with regard to location, nature, size and operating conditions or by allocating resources.

3. The degree to which the plan or programme influences other plans and programmes including those in a hierarchy.

4. Environmental, including health, problems relevant to the plan or programme.

5. The nature of the environmental, including health, effects such as probability, duration, frequency, reversibility, magnitude and extent (such as geographical area or size of population likely to be affected).

6. The risks to the environment, including health.

7. The transboundary nature of effects.

8. The degree to which the plan or programme will affect valuable or vulnerable areas including landscapes with a recognized national or international protection status.

Annex IV

INFORMATION REFERRED TO IN ARTICLE 7, PARAGRAPH 2

1. The contents and the main objectives of the plan or programme and its link with other plans or programmes.

2. The relevant aspects of the current state of the environment, including health, and the likely evolution thereof should the plan or programme not be implemented.

3. The characteristics of the environment, including health, in areas likely to be significantly affected.

4. The environmental, including health, problems which are relevant to the plan or programme.

5. The environmental, including health, objectives established at international, national and other levels which are relevant to the plan or programme, and the ways in which these objectives and other environmental, including health, considerations have been taken into account during its preparation.

6. The likely significant environmental, including health, effects* as defined in article 2, paragraph 7.

7. Measures to prevent, reduce or mitigate any significant adverse effects on the environment, including health, which may result from the implementation of the plan or programme.

8. An outline of the reasons for selecting the alternatives dealt with and a description of how the assessment was undertaken including difficulties encountered in providing the information to be included such as technical deficiencies or lack of knowledge.

9. Measures envisaged for monitoring environmental, including health, effects of the implementation of the plan or programme.

10. The likely significant transboundary environmental, including health, effects.

11. A non-technical summary of the information provided.

Annex V

INFORMATION REFERRED TO IN ARTICLE 8, PARAGRAPH 5

1. The proposed plan or programme and its nature.

2. The authority responsible for its adoption.

3. The envisaged procedure, including:

   (a) The commencement of the procedure;

   (b) The opportunities for the public to participate;

   (c) The time and venue of any envisaged public hearing;

   (d) The authority from which relevant information can be obtained and where the relevant information has been deposited for examination by the public;

   (e) The authority to which comments or questions can be submitted and the time schedule for the transmittal of comments or questions; and

* These effects should include secondary, cumulative, synergistic, short-, medium- and long-term, permanent and temporary, positive and negative effects.

(f) What environmental, including health, information relevant to the proposed plan or programme is available.

4. Whether the plan or programme is likely to be subject to a transboundary assessment procedure.

SIMPLIFIED RESOURCE MANUAL TO SUPPORT APPLICATION OF THE PROTOCOL ON STRATEGIC ENVIRONMENTAL ASSESSMENT ("SIMPLIFIED RESOURCE MANUAL FOR SEAS")

CHAPTER 1. INTRODUCTION

1.1 Simplified resource manual

This simplified version of the Resource Manual to Support Application of the Protocol on Strategic Environmental Assessment (ECE/MP.EIA/17) was developed following the decision of the Meeting of the Parties to the Protocol in June 2011 providing for "elaboration of a compact and simplified version of the Resource Manual that focuses on the practical application of the Protocol" (ECE/MP.EIA/SEA/2, decision I/3, para. 5).

The simplified manual is a short and concise version of the original Resource Manual, serving as an introduction to the Protocol and its practical application. The simplified manual aims to make the Protocol and its provisions better known and to provide guidance on the practical undertaking of strategic environmental assessment (SEA). In addition, it is hoped that it will encourage readers to explore the original Resource Manual for in-depth information on the Protocol and SEA.

1.2 Protocol on Strategic Environmental Assessment

The United Nations Economic Commission for Europe (ECE) Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) was adopted in Kyiv in May 2003. The Protocol entered into force in July 2010 and, as of the beginning of 2012, 22 States and the European Union are Parties to the Protocol[78].

The Protocol establishes a legal requirement to carry out an SEA for certain plans, programmes and, to the extent appropriate, policies and legislation. It applies to the development of plans and programmes irrespective of whether they are likely to have an impact on the territory of another State.

1.3 Strategic environmental assessment

SEA is generally defined as a systematic and anticipatory process, undertaken to analyse the environmental effects of proposed plans, programmes and other strategic actions and to integrate the findings into decision-making. In this simplified manual, the term "SEA" is defined in accordance with the Protocol on SEA as:

> *the evaluation of the likely environmental, including health, effects, which comprises the determination of the scope of an environmental report and its preparation, the carrying-out of public participation and consultations, and the taking into account of the environmental report and the results of the public participation and consultations in a plan or programme (art. 2, para. 6).*

CHAPTER 2. INTEGRATION OF STRATEGIC ENVIRONMENTAL ASSESSMENT INTO PLAN AND PROGRAMME MAKING

2.1 Plan and programme making, strategic environmental assessment and the links between them

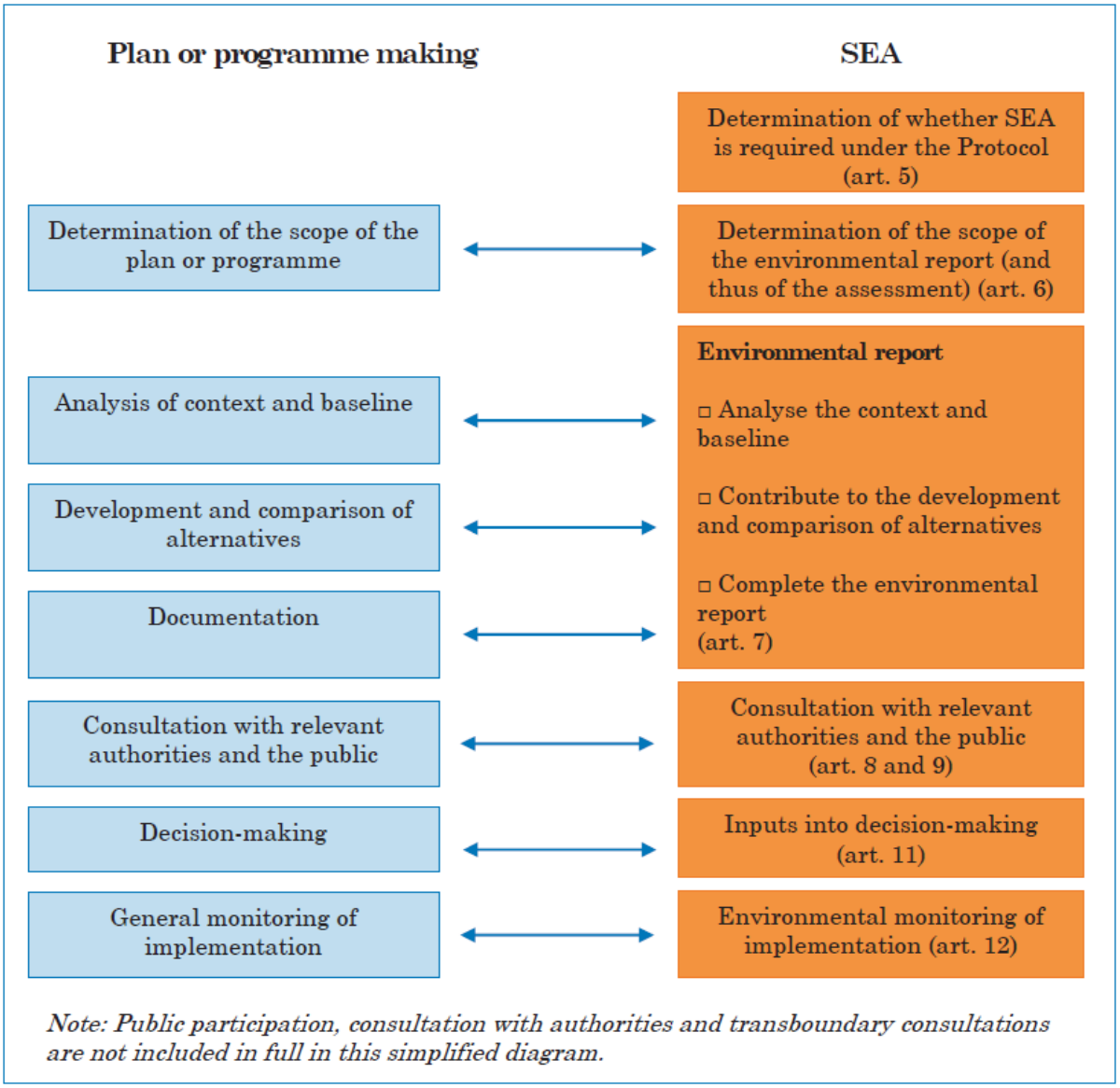
The goal in integrating SEA into plan and programme making is to provide early and effective inputs and so ensure that environmental considerations are thoroughly

[78] Regularly updated information providing the current status of ratification is available on the Protocol's web page on the ECE website (http://www.unece.org/env/eia/sea_protocol.html).

taken into account in the development of plans and programmes (Protocol, art. 1 (a)). SEA has to begin before the draft plan or programme is formulated if it is to comply with the provisions of the Protocol.

For SEA to be a proactive instrument that influences the development of the plan or programme, integrating or linking the process defined in Protocol with the general tasks in plan and programme making is necessary. The Protocol sets out a process for carrying out the SEA of plans and programmes in its articles 6 to 12. The elements defined in these articles can usually be linked with corresponding tasks in plan and programme making as illustrated in figure 1 below, though many plan- and programme-making processes do not employ such a clear sequence of tasks.

Figure 1
Corresponding tasks in plan or programme making and SEA



Note: Public participation, consultation with authorities and transboundary consultations are not included in full in this simplified diagram.

2.2 Practical approaches to integrating strategic environmental assessment into plan and programme making

Integration of SEA into the development of plans and programmes is based on practical reasons, which extend beyond the legal obligations for early and effective use of SEA in the plan or programme making. Generally speaking, SEA should:

- Be integrated into and customized to fit the logic of the plan -or programme-making process;
- **Be applied as early as possible in the decision-making process**, when all the alternatives and options remain open for consideration;
- **Enable effective consideration of environmental issues in the development of plans and programmes.** The capacity of SEA to facilitate the integration of environmental issues into plan or programme making largely depends of the timelines and form of SEA inputs into the plan or programme making;
- **Evaluate a reasonable range of alternatives**, recognizing that their scope will vary with the level of decision-making. Although not required by the Protocol, SEA could wherever possible and appropriate, identify the best practicable environmental option;
- Provide appropriate opportunities for the involvement of key stakeholders and the public, and assist in the identification of **both differing and coinciding or overlapping views and interests**. This could facilitate rational discussions and problem solving, as well as build trust between stakeholders;
- **Focus on the key issues** that matter in the relevant stages of the plan- or programme-making process. This will facilitate the process being undertaken in a timely, cost-effective and credible manner. Application of the Protocol requirements poses certain time demands, which can be minimized by careful organization of the SEA during the plan- or programme-making process. Additional costs may be limited if SEA is carried out in conjunction with the plan or programme making and builds on data gathering, analyses and consultation that may already occur within the plan- or programme-making process.

The above overview indicates how important it is to coordinate SEA properly with the development of the plan or programme. Either the SEA process can run in parallel to the development of the plan or programme, or the SEA experts and planning experts can work together as part of one team that develops the plan or programme. In either case, the integration of SEA into plan- or programme-making results in several benefits, such as reduced delays and saved resources. It allows for frequent consultations between the SEA team and the planning team, which facilitate early consideration of different viewpoints and minimize the risk of late surprises and conflicts. Consultations may, as deemed appropriate, also extend to relevant environmental and health authorities and to the public (concerned).

CHAPTER 3. DETERMINING WHETHER PLANS AND PROGRAMMES REQUIRE ASSESSMENT

3.1 Key provisions

To determine whether SEA is required under the Protocol, it is necessary to first determine whether the plan or programme being considered falls within the Protocol's **definition** of a plan or programme. Plans and programmes must be both "required by legislative, regulatory or administrative provisions" and "subject to preparation and/or adoption by an authority or prepared by an authority for adoption, through a formal

procedure, by a parliament or a government" (art. 2, para. 5).

Second, it is necessary to determine if a plan or programme is within **the field of application** of the Protocol, considering a set of criteria in article 4, paragraph 2, and annexes I and II. In addition, an SEA is required also for plans and programmes other than those subject to paragraph 2, which set the framework for future development content if it is so determined by screening (art. 4, para. 3). However, if the plan or programme referred to in paragraph 2 determines the use of a small area at a local level, or is a minor modification to a plan or programme (art. 4, para. 4), an SEA will be required only if it so determined by screening. Plans and programmes whose sole purpose is national defence or civil emergencies are not subject to SEA, nor are financial or budget plans or programmes (art. 4, para. 5).

The determination of significant effects (screening) may be done by a case-by- case examination, by specifying types of plans and programmes (i.e., listing types of plans and programmes always subject to SEA) or by a combination of the two approaches (art. 5, para. 1). Relevant environmental and health authorities must be consulted during any determination of significant effects (art. 5, para. 2), and the public may be provided with opportunities to participate (art. 5, para. 3).

Authorities have to make publicly available the outcome of any determination of significant effects, whether during preparation of lists of types of plans and programmes or during a case-by-case examination (art. 5, para. 4). The information to be made available comprises the outcome of the testing, i.e., whether the plan or programme, or plan or programme type, is to be subject to SEA and the reasons why an SEA is not required, if this is the conclusion.

3.2 Guide to determining whether strategic environmental assessment is required

Figure 2 below presents a flow chart for determining whether a particular plan or programme is subject to an SEA. It asks nine questions that are set out in the Protocol's field of application (art. 2, para. 5, and art. 4). A tenth question (determination of significant effects, art. 5) may be necessary to determine whether a plan or programme is subject to SEA through screening.

CHAPTER 4. ASSESSMENT OF PLANS AND PROGRAMMES

This chapter gives an overview of practical approaches to the carrying out of an SEA of a plan or programme in accordance with the Protocol.

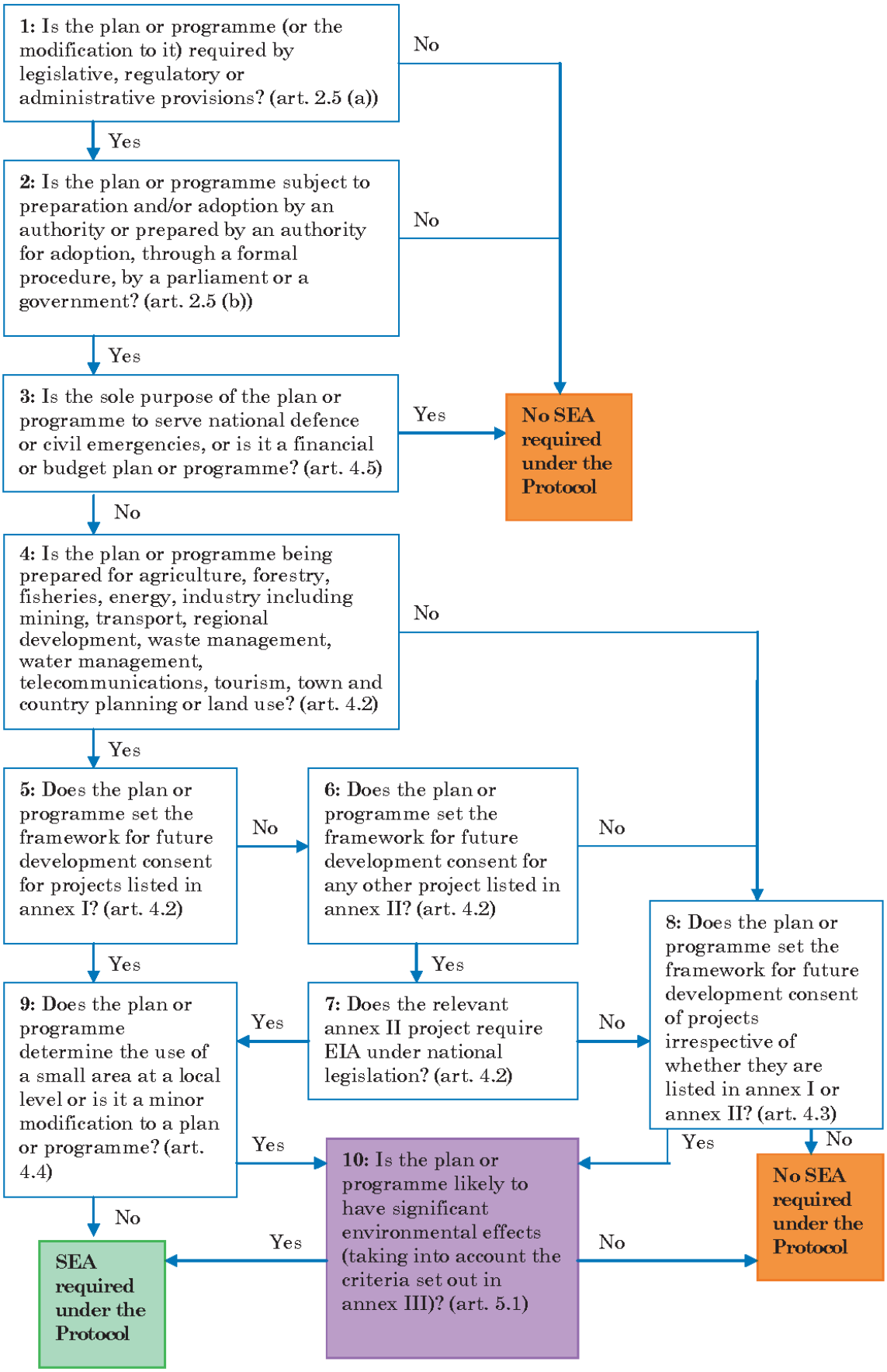
4.1 Scoping

Scoping (Protocol, art. 6) might be considered either as a separate element in the SEA process or as a first step in preparing the environmental report. Regardless of the chosen approach, scoping and preparation of the environmental report should preferably be an iterative process.

Key provisions

Scoping defines the information content in terms of both the topics to be considered and the depth or detail of the information to be presented on each topic. The information to be included in the environmental report has to be **relevant** (art. 6, para. 1) and, in accordance with the **criteria** listed in article 7, paragraph 2, environmental and health authorities must be consulted during scoping (art. 6, para. 2), and the public may be provided with opportunities to participate (art. 6, para. 3).

Figure 2
Is the plan or programme subject to SEA?



Determination of the scope

Determination of the scope is the first step of the SEA process to be carried out for a plan or programme subject to SEA. Table 1 below identifies mandatory tasks as well as extra, optional tasks promoting good practice. It should be noted that the mandatory tasks are mandatory within the SEA as a whole to fulfil the obligations of the Protocol; however they may not necessarily be mandatory in the step indicated.

Scoping identifies and determines the important issues that need to be assessed and included into the environmental report. For example, it may be relevant to identify the geographical coverage, time periods and environmental aspects to be considered. To identify such aspects, it may also be necessary to recognize the objectives of the plan or programme, relevant environmental problems, environmental objectives and how other plans and programmes might relate to the objectives of the plan or programme. Moreover, it is recommended to begin the consideration of alternatives already during scoping.

Table 1
Scoping

Mandatory tasks	Extra, optional tasks

• Determine relevant information to be included in the environmental report (art. 7, para. 1).
  ○ Describe the contents of the plan or programme (annex IV, para. 1).
  ○ Identify main objectives of the plan or programme (annex IV, para. 1).
  ○ Identify other relevant plans and programmes and explain how they interact with the plan or programme (annex IV, para. 1).
  ○ Gather information on environmental, including health, problems relevant to the plan or programme (annex IV, para. 4).
  ○ Identify environmental, including health, objectives relevant to the plan or programme (annex IV, para. 5) and analyse how these relate to the proposed objectives of the plan or programme.
  ○ Outline reasons for selecting the alternatives dealt with (annex IV, para. 8).
• Identify environmental and health authorities to be consulted (art. 9, para. 1).
• Consult authorities on information to be included in environmental report (art. 6, para. 2).
	• Identify relevant policies and explain how they interact with the plan or programme.
	• Identify likely effects to be assessed.
	• Identify the concerned public to participate, including relevant non-governmental organizations (NGOs) (art. 8, para. 3).
	• Provide for public participation in determining the relevant information to be included in environmental report (art. 6, para. 3).
	• Notify and consult affected Parties as appropriate.

Scoping normally moves from a long list of concerns to a short list of potentially significant issues. Methods available for scoping are numerous, including:

- Policy and legal reviews, which help determine the environmental and health objectives and targets that are relevant to the plan or programme;
- Collective expert judgements, which can determine – based on personal experience and case comparisons – possible impacts that should be considered within an SEA;
- Checklists, which offer a simple way of identifying whether certain issues are relevant to a proposal and help to avoid overlooking potential issues.

Scoping includes consultation with the authorities and, optionally, public participation. If significant transboundary effects appear likely, it is suggested that informal transboundary consultations might be begun during scoping so as to streamline the process. Sections 4.3, 4.4 and 4.5 below provide information on how to carry out these consultations and provide for public participation, as appropriate.

There is no requirement in the Protocol to prepare a scoping report. However, it may be useful to record the outcome of the scoping as this would provide the outline of what is to be done when preparing the environmental report. Authorities may choose to make a scoping report publicly available as a matter of good practice.

Scoping need not be administratively distinct from the preparation of the environmental report. However, consultation with the authorities on the scope of the environmental report will always be required. It is not sufficient to integrate scoping into report preparation and to consult the authorities only once the report has been prepared.

4.2 Environmental Report

This section provides a description of how to go about preparing the environmental report in SEA under the Protocol, having completed scoping. However, as noted above, scoping and preparation of the environmental report should preferably be within an iterative process comprising the following steps:

- Scoping (see section 4.1 above);
- Analysis of the context and baseline;
- Contribution to the development of the plan or programme and its reasonable alternatives;
- Preparation of the environmental report;
- Consultation.

Key provisions

The **environmental report** has to be prepared for plans and programmes subject to SEA (art. 7). This includes consultation with the authorities, public participation and possibly transboundary notification and consultations.

The environmental report has to identify, describe and evaluate the likely significant environmental, including health, effects of implementing the plan or programme and its reasonable alternatives (art. 7, para. 2). The resulting report will be used by the decision maker and will normally describe the monitoring arrangements. The content of the report has to reflect the outcome of the scoping (art. 6), but will be based on the list in annex IV of the Protocol and take into account the four criteria specified (art. 7, para. 2). Finally, the environmental report must be of sufficient quality to meet the requirements of the Protocol (art. 7, para. 3).

Analysis of the context and baseline

The purpose of baseline analysis is to establish the reference point for assessing the effects of the plan or programme. Table 2 identifies mandatory tasks as well as extra, optional

tasks promoting good practice. Typically, it involves describing the current state of the environment and outlining its likely evolution without the plan or programme. The baseline analyses will usually rely on existing data. There are numerous tools that can be used to obtain data, such as:

- Surveys of local environmental quality, although they may be realistically applied in SEA only for very specific local plans and programmes;

- Progress reports on implementation of environmental policy objectives and standards can provide useful insights into obstacles or achievements in realizing already existing environmental objectives and targets.

Table 2
Analysis of the context and baseline

Mandatory tasks	Extra, optional tasks
• Gather information on current state of the environment, including health, and its likely evolution if the plan or programme is not implemented (annex IV, para. 2). • Gather information on characteristics of the environment, including health, in areas likely to be significantly affected (annex IV, para. 3).	• As appropriate, consult authorities and provide for public participation on context, objectives and baseline. • Informally notify and consult affected Parties as appropriate. • Describe methodology for identification of authorities and public concerned. • Specify quality of the information gathered and how up to date it is.

Contribution to the development of the plan or programme and its reasonable alternatives

Evaluation of the likely significant environmental, including health, effects is needed to analyse what are the likely environmental effects and how these can be taken into account in decision-making, to compare and evaluate the alternatives and to consider possible mitigation measures. The Protocol treats the draft plan or programme and the alternatives the same. It is therefore suggested that all alternatives are treated equally when assessing the effects – not as one plan or programme plus a number of alternatives, but as if there were just a number of alternatives. Thus is it also recommended to begin the consideration of alternatives already in scoping. Table 3 identifies mandatory tasks as well as extra, optional tasks promoting good practice when developing the plan or programme and its reasonable alternatives. The term “alternative” is not defined in the Protocol, but can be interpreted as:

- An alternative plan or programme to that originally proposed, perhaps meeting the same set of objectives;

- Alternative elements within a plan or programme, again perhaps meeting the same set of objectives.

Table 3
Contribution to the development of the plan or programme and its reasonable alternatives

Mandatory tasks	Extra, optional tasks
• Describe how the environmental, including health, objectives and other environmental, including health, considerations have been taken into account in preparing the plan or programme, including alternatives (annex IV, para. 5). • Assess alternatives by identifying, describing and evaluating likely significant environmental, including health, effects (art. 7, para. 2, and annex IV, paras. 6 and 10). • Describe assessment methodologies (annex IV, para. 8). • Propose measures to prevent, reduce or mitigate adverse environmental, including health, effects (annex IV, para. 7).	• Propose measures to enhance environmental benefits. • Provide inputs to the development of alternatives, to maximize their contribution to environmental objectives and to take into account other environmental considerations including adverse environmental effects. • Record how alternatives developed. • As appropriate, consult authorities and provide for public participation on alternatives. • Consult affected Parties as appropriate. • Describe why the methodologies selected were chosen and their limitations.

Types of alternatives might also include alternative locations, land uses, technologies, timing, development paths or even sets of objectives. The alternatives should include a "do-nothing" alternative. Although it is not mandatory, it might also be helpful to include the best practicable environmental option, which helps clarify the basis for choice. Key tools for the purpose of developing alternatives include:

- Collective expert judgement, which can determine or develop key alternatives, e.g., through workshops or conferences;
- Overlay maps and geographical information systems, which can help develop and optimize alternatives with clear spatial dimensions;
- Scenario building, which can outline future options that reflect the most uncertain and important driving forces affecting future development.

Irrespective of their origin, all these alternatives can be analysed and mutually compared in terms of their contribution to the attainment of relevant objectives of the plan or programme and of their specific impacts. Most common tools for analysing and comparing the alternatives are mainly the same as those listed above; however, matrices of impacts and conflicts or synergies, describing the main environmental impacts of proposed options or their main synergies or conflicts with the relevant environmental objectives, as well as trend analysis and extrapolation, may be used also.

The health effects of the alternatives should be assessed at least with regard to identifying the positive and negative effects of a plan or programme on relevant health determinants, and based on assessment, overall conclusions should be drawn on whether the plan or programme creates favourable conditions for a healthy population. It should be kept in mind that health effects vary from specific and direct effects to those which are subjective and linked to well-being and the quality of life.

Examples of questions that can help to identify the possible effects of plans and programmes on health can be found in the Resource Manual.

Prepare the environmental report

The environmental report should pull together all the information gathered during the process and should also include a non-technical summary. It should be of sufficient quality and should present complete and reliable information that will be adequate for the purposes of the Protocol. Table 4 identifies mandatory tasks as well as extra, optional tasks promoting good practice in this area.

Responsibility for assuring quality will depend on the institutional arrangements in a given country. The same authority that prepared the environmental report might also be responsible for assuring its quality. The body responsible for preparing guidelines might also take on the task of quality control, or an independent commission might be set up or an existing audit commission might have its mandate extended. The sample quality assurance checklist, provided in the Resource Manual (table A4.4), may be useful in verifying the SEA process is of sufficient quality.

Regardless of the institutional arrangements, the responsible body has to decide whether the environmental report is of sufficient quality, particularly measuring it against the requirements of article 7 and annex IV of the Protocol. If the report is not of sufficient quality, it might be amended or augmented, or part of the SEA repeated, depending on national SEA systems.

Table 4
Preparation of the environmental report

Mandatory tasks	Extra, optional tasks
• Propose monitoring arrangements (annex IV, para. 9). • Identify and describe any difficulties, limitations, uncertainties and risks in the assessment of alternatives, including those arising from gaps in data (annex IV, para. 8). • Prepare environmental report (art. 7, para. 1); the report may be structured following the paragraphs in the annex IV. • Summarize the information in a non-technical summary (annex IV, para. 11).	• In proposing monitoring arrangements, address data gaps and data quality or quantity issues. • Revise selected alternatives and environmental report as necessary. • Record how SEA influenced development of the plan or programme and alternatives. • Record interactions between planning and SEA teams. • Propose follow-up actions, including recommendations for other plans, programmes or projects.

Consult

Consultation and public participation must occur at this stage, with the authorities and the public concerned commenting on the report and the draft plan or programme alternatives. Their comments need to be taken into account in the decision on the plan or programme, and so should be recorded. Table 5 identifies mandatory tasks as well as extra, optional tasks promoting good practice for this stage. The following two sections, C and D, describe how to implement the Protocol's provisions on public participation and consultation with the authorities.

If likely transboundary effects have been determined, transboundary consultations must now be begun. An affected Party might also request that consultations take place (see section 4.5 below.).

Finally, the report and the plan or programme alternatives might be amended, if appropriate, to take account of the comments received before being submitted to the decision makers.

Table 5
Consultation

Mandatory tasks	Extra, optional tasks
• Identify the concerned public to participate, including relevant NGOs (if not already done) (art. 8, para. 3). • Make the environmental report available to the authorities and the public (art. 8, para. 2 and art. 9, para. 2). • Formally notify affected Parties as appropriate (art. 10). • Consult the authorities and provide for public participation on the environmental report and selected alternatives. • Consult affected Parties as appropriate. • Receive comments to be taken into due account in the decision.	• Describe consultation and public participation processes. • Record who comprised "the public" and "the public concerned".
• Formally submit to decision maker (art. 11).	

4.3 Public participation

Key provisions

Article 8 requires that there are early, timely and effective opportunities for public participation, when all options are open, in the SEA of plans and programmes (art. 8, para. 1). The timely public availability of the draft plan or programme and the environmental report is required (art. 8, para. 2).

The **public concerned**, including relevant NGOs, has to be identified (art. 8, para. 3). It is the public concerned, not the public in general, that must have the opportunity to express its opinion on the draft plan or programme and the environmental report within a reasonable time frame (art. 8, para 4). Detailed arrangements for informing the public and consulting the public concerned have to be determined and made publicly available (art. 8, para 5). These arrangements have to take into account the provisions listed in annex V.

In addition, the Protocol optionally provides for public participation in earlier stages, namely, in the determination of significant effects when determining whether SEA is required (art. 5), as well as in scoping (art. 6).

The Protocol provides a number of general rights for the public, in addition to rights to certain information and to consultation on the draft plan or programme and the environmental report. These general rights set out in article 3 include relevant assistance and guidance from officials and authorities, recognition of and support to relevant associations, organizations or groups and the right to exercise their rights under the Protocol.

Defining the public

The Protocol makes a distinction between "the public" (in general), which has the right to be informed, and "the public concerned", which has the opportunity to express its opinion on the draft plan or programme and the environmental report. According to the Protocol, the public means natural and legal person(s) and their associations, organizations and groups. The public concerned is not defined in the Protocol, except that it must include relevant NGOs; however, following the definition in the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention), it can be interpreted as the public affected or likely to be affected by, or having an interest in, the environmental decision-making. Certainly, the public concerned, including relevant NGOs, may vary from one plan or programme to another.

Practical considerations

The public participation process should serve the purposes of providing information, gathering comments and engaging the public concerned in collaborative problem- solving. The Protocol specifies that the opportunities for public participation be "when all options are open", i.e., at a stage when reasonable alternatives may be chosen to be put forward for adoption or submission to the legislative procedure.

Making information available to the general public may involve appropriate publicity arrangements and easy access to information, though only public availability is strictly required by the Protocol. Effective dissemination, to ensure that in particular the public concerned is informed, might be by public notice (e.g., in a newspaper) or individually (e.g., mailshot). The most common tools include printed materials inviting comments, surveys, consultations, public hearings, information hotlines and exhibitions.

A single public participation process serving the SEA plan- or programme-making purposes will simplify the procedure. The Protocol explicitly suggests use of electronic media as a means of ensuring timely public availability of documents. However, it should be ensured that important segments of the public such as the poor, the isolated and the elderly, who might not use the Internet, are not excluded.

Different time frames for public participation may be appropriate for different types or complexity of plan or programme, but care should be taken to allow enough time for opinions to be properly developed. Adequate time will also be needed for the planning authority to take these views into account before deciding on the plan or programme. Sometimes requests for more information may be made and the time frame for public participation may also need to take into account the time needed for the responsible authority to respond.[79]

4.4 Consultation with authorities

Key provisions

Article 9 of the Protocol requires that the environmental and health authorities have an early, timely and effective opportunity to express their opinion on the draft plan or programme and the environmental report (art. 9, para. 3). Which environmental and health authorities are to be consulted has to be determined (art. 9, para. 1), as do detailed arrangements for informing and consulting them (art. 9, para. 4).

The consultation with environmental and health authorities occurs at a number of stages in the SEA process: in determination of significant effects, if required while determining whether SEA is required (art. 5, para. 2); during scoping (art. 6, para. 2); and in the preparation of the environmental report (art. 9, para. 3).

Practical considerations

[79] Adapted from *Implementation of Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment*, European Commission, para. 7.10, hereafter referred to as the EC Guide.

The "authorities" covers formal governmental or public authorities, defined by administrative or legal requirements. They might include environmental or environmental health inspectorates (national, regional or local level), environmental or health research institutions performing a public task or units in government (national, regional or local) likely to be concerned by, or have expertise in, the effects of implementing the plan or programme in question[80].

Consultation of environmental and health authorities is at the core of the consideration of health within SEA. To facilitate the cooperation between the planners and health authorities, it would be useful if they share information and gradually reach a common understanding on:

- The health determinants and risk factors that are likely to be significantly affected by different types of plans and programmes and by the alternatives being considered;
- The causal linkages between changes in health determinants and risk factors, and the corresponding occurrence and extent of the likely health effects;
- The measures to prevent, reduce or mitigate any significant adverse effects on health;
- The arrangements for monitoring actual health effects during implementation of various plans and programmes.

The designation of the authorities can be done in a general way by including them in the legislation implementing the Protocol. For example, a national environmental inspectorate could be designated as an authority to be consulted in all cases, or in specified types of cases. Authorities can also be designated case by case, provided the implementing legislation is drafted so as to permit this type of designation[81].

4.5 Transboundary consultations

Key provisions

Article 10 provides for transboundary consultations when a proposed plan or programme in one country (the Party of origin) is likely to have significant environmental effects on the territory of another country (the affected Party).

The Party of origin has to notify the affected Party if it considers that implementation of the proposed plan or programme is likely to have significant transboundary environmental effects, or if so requested by another Party likely to be significantly affected (art. 10, para. 1). The first task is therefore to determine whether the plan or programme is likely to have significant transboundary environmental effects.

The Protocol does not indicate precisely when transboundary notification and consultations are to take place; it simply requires notification "as early as possible before the adoption of the plan or programme" (art. 10, para. 1). The notification has to include the draft plan or programme, the environmental report, including information on transboundary effects, and information on the decision-making procedure, including information on a time schedule for comments (art. 10, para. 2).

Consultations then follow if desired and indicated by the affected Party. The consultations have to address the likely transboundary environmental effects of implementing the plan or programme (art. 10, para. 3), the measures envisaged to prevent, reduce or mitigate adverse effects (art. 10, para. 3) and detailed arrangements for informing the **public concerned** and authorities in the affected Party, and for giving them the opportunity to forward their opinion

[80] EC Guide, para 7.11.
[81] EC Guide, paras 7.13—7.14

on the draft plan or programme and the environmental report (art. 10, para. 4).

The opinions of the public concerned and the environmental and health authorities in the affected Party have to be taken into due account, and they have to be informed of how their comments were taken into account (art. 11).

Practical considerations[82]

At the latest, transboundary effects may be identified during preparation of the environmental report, but, if identified earlier, then notification would best be begun earlier as well, during scoping; doing so may reduce delays in reaching the decision- making stage. However, a formal answer to the notification by the affected Party has to be given later, based on the environmental report and the draft plan and programme that have to be submitted after finalization by the Party of origin

The Protocol requires that reasonable time frames be provided for consultation in transboundary situations. Compared with non-transboundary situations, these will need to be enough for contact to be made between the Parties concerned, the identification of and consultation with the public and environmental and health authorities in the affected Party, and consideration of the resulting comments by the appropriate authorities in the Party of origin. Practical matters, such as the need to prepare translations, may also lengthen the process.

Once the transboundary mechanism is triggered, the concerned Parties have to agree on more detailed arrangements to ensure the necessary consultation with the public concerned and the environmental and health authorities in the affected Party.

Transboundary notification and consultations may be arranged purely on an ad hoc basis. However, with environmental impact assessment in a transboundary context (under the Espoo Convention), it has been found that the process can be accelerated and simplified through developing bilateral or multilateral agreements that provide a framework for transboundary consultations, specifying parameters including: contact points; a joint body; language considerations including translation arrangements; assigning costs; criteria of effect significance; public participation arrangements; and dispute settlement procedures. The Espoo Convention's "Guidelines on good practice and bilateral and multilateral agreements" (ECE/MP.EIA/6, annex IV, appendix) provide advice on these matters. Bilateral and multilateral agreements that have been set up in the framework of the Espoo Convention may, suitably modified to cover plans and programmes, provide a pattern for these arrangements.

4.6 Decision

Key provisions

The decision maker decides which, if any, of the alternative plans or programmes, or alternative elements within a plan or programme, to adopt (art. 11). And in adopting a plan or programme, the decision maker must take into account the conclusions of the environmental report, including the necessary measures to prevent, reduce or mitigate the adverse effects of the various plan or programme alternatives. The decision maker must also take into account opinions expressed by the relevant environmental and health authorities, the public concerned and any affected Parties (art. 11, para. 1).

Following adoption of a plan or programme, the relevant environmental and health authorities, the general public (not just the public concerned) and any affected Parties must be informed of that decision (art. 11, para. 2). The adopted plan or programme must be made available to them together with a statement summarizing:

[82] This section is based on paras 7.26—7.29 of the EC Guide.

How the environmental and health considerations (as presented in the environmental report) have been integrated into the adopted plan or programme;

- How their opinions (as expressed by the public concerned in the case of the public) have been taken into account;
- The reasons why the plan or programme has been adopted in the light of the reasonable alternatives considered.

Practical considerations

In adopting a plan or programme, the decision maker might wish to take into account, in particular:

- Its compatibility with the plan or programme objectives and environmental objectives;
- The residual environmental effects.

The procedures for informing the public and the contents of the information in the statement are compatible with the Aarhus Convention. No provision is made for confidentiality:

Authorities must provide sufficient information about the conditions under which the environmental information is available and how it can be obtained. The facilities for doing this include, for example, information publications, announcements in government publications or on government websites, television or radio public service announcements, or as part of environmental information catalogues that describe how relevant information can be obtained.6

4.7 Monitoring

Key provisions

Article 12 provides for the monitoring of the significant environmental effects of the implementation of the adopted plan or programme, but does not define how it should be carried out. The Protocol requires that monitoring results be made available to the relevant environmental and health authorities and to the public (art. 12, para. 2). The only explicit reason given for monitoring is to identify, among other things, unforeseen adverse effects and to enable remedial action to be taken (art. 12, para. 1).

Practical considerations

Monitoring has benefits other than those mentioned above and therefore monitoring might be used to:

- Check that the plan or programme is implemented as described, including the prescribed measures to prevent, reduce or mitigate adverse effects;
- Check that environmental conditions imposed by the authorities are being complied with;
- Compare predicted and actual effects, thus providing information on the implementation of the plan or programme;
- Provide experience to help improve future SEAs (i.e., as a quality control tool).

The nature of monitoring will vary between different types of plans and programmes. It is suggested that methods chosen should be those that are both available and suited to testing whether the assumptions and predictions made in the environmental assessment correspond with the environmental effects that occur when the plan or programme is implemented. A key consideration is also the ability of the methods to provide early warning of unforeseen adverse effects of the plan or programme so that timely remedial action can be taken. Though the requirement is to identify **unforeseen** adverse effects, the monitoring can be based on the relevant significant environmental effects as identified in the environmental report. The meaning of "unforeseen" might therefore refer to the unforeseen magnitude or intensity of a

foreseen effect, such as greater than expected changes in sulphur dioxide emissions arising from an energy sector plan. It would also be possible to include elements in the monitoring programme that might identify truly unforeseen effects. For example, occasional sampling of a broad range of environmental parameters might identify a change in a parameter that was not expected to be affected by the plan or programme.

The Protocol does not discuss what **remedial action** might be taken if an unforeseen adverse effect is observed. If it is decided to modify the plan or programme as a result, this may require a further SEA, if the requirements of articles 2 and 4 are met.

Finally, the significant effects to be monitored might include transboundary effects. The post-project analysis provision of the Espoo Convention (art. 7) might provide inspiration for how to monitor such effects. There is no requirement to share with the affected Party the results of any monitoring, but they should be in the public domain and the affected Party's assistance might well be required in setting up monitoring in its territory.

CHAPTER 5. POLICIES AND LEGISLATION

This chapter discusses the Protocol's article 13 on policies and legislation. The emphasis is on applying "principles and elements" of the Protocol, rather than an SEA process similar to that for plans and programmes.

5.1 Key provisions

Article 13 requires that Parties endeavour to ensure that environmental concerns are considered and integrated to the extent appropriate in the preparation of their proposals for policies and legislation, and that the appropriate principles and elements of the Protocol should be considered when doing so. It further states that each Party shall determine, where appropriate, the practical arrangements for the consideration and integration of concerns. As far as a Party applies article 13, practical arrangements should take into account the need for transparency in decision-making. Furthermore, Parties are requested by the article to report to the Meeting of the Parties on its application.

The Protocol does not offer a definition of "policies and legislation", though policies are generally considered to be strategic proposals at a higher or more general level than plans and programmes. However, article 13 states that the policies and legislation subject to it are those that are likely to have significant effects on the environment.

5.2 Possible approaches

The lack of a strict requirement for the SEA of policies and legislation gives the Parties the opportunity to approach the consideration and integration of the environment in policies and legislation more flexibly, undertaking pilot studies and gradually developing experience and skills.

However, two key features of the consideration and integration process are apparent in the Protocol – the need to **integrate** (art. 1 (b) and (e)) and to ensure **transparency** (art. 13, para. 3). Integration requires early initiation of the consideration and integration process within the policy- or legislation-making process. The combination of the objectives of the policy or legislation with wider environmental objectives would appear an effective starting point for integration.

Integration may be made more effective by:

- Starting early, before any irreversible decisions have been made;
- Including an advocate for the environment within the group developing the policy or legislation;
- Agreeing within the group and with decision makers how the consideration and integration process, including any environmental assessment, will be used;

- Tailoring the consideration and integration process to fit the policy- or legislation-making process and, in particular, its timetable;

- Using the principles and elements of environmental assessment to enhance discussion of environment concerns;

- Promoting transparency to provide support for the integration of environmental concerns.

Transparency may be achieved by various means, including, for example:

- Public information on the outcome and reasoning (i.e., why a policy or legislation has been adopted, taking environmental concerns into consideration);

- Public information at earlier stages of the policy- or legislation-making process or the consideration and integration process, including notification that such a process is beginning or has begun;

- Early consultation with environmental and health authorities on the results of an assessment of the possible environmental effects of the policy or legislation;

- Early public participation, involving not only relevant NGOs, but also the wider public and other Parties to the Protocol when appropriate.

Other elements to be considered might be those developed in articles 4 to 12 for plans and programmes (i.e., the “principles and elements” referred to in art. 13, para. 2), which include the field of application and the determination of significant effects, scoping and the environmental report, public participation, consultation with environmental and health authorities, and transboundary consultations, decision- making and monitoring.

CONVENTION ON ACCESS TO INFORMATION, PUBLIC PARTICIPATION IN DECISION-MAKING AND ACCESS TO JUSTICE IN ENVIRONMENTAL MATTERS ("AARHUS CONVENTION")

Adopted in Aarhus, Denmark on 25 June 1998
Entered into force on 30 October 2001

The Parties to this Convention,

Recalling principle l of the Stockholm Declaration on the Human Environment,

Recalling also principle 10 of the Rio Declaration on Environment and Development,

Recalling further General Assembly resolutions 37/7 of 28 October 1982 on the World Charter for Nature and 45/94 of 14 December 1990 on the need to ensure a healthy environment for the well-being of individuals,

Recalling the European Charter on Environment and Health adopted at the First European Conference on Environment and Health of the World Health Organization in Frankfurt-am-Main, Germany, on 8 December 1989,

Affirming the need to protect, preserve and improve the state of the environment and to ensure sustainable and environmentally sound development,

Recognizing that adequate protection of the environment is essential to human well-being and the enjoyment of basic human rights, including the right to life itself,

Recognizing also that every person has the right to live in an environment adequate to his or her health and well-being, and the duty, both individually and in association with others, to protect and improve the environment for the benefit of present and future generations,

Considering that, to be able to assert this right and observe this duty, citizens must have access to information, be entitled to participate in decision-making and have access to justice in environmental matters, and acknowledging in this regard that citizens may need assistance in order to exercise their rights,

Recognizing that, in the field of the environment, improved access to information and public participation in decision-making enhance the quality and the implementation of decisions, contribute to public awareness of environmental issues, give the public the opportunity to express its concerns and enable public authorities to take due account of such concerns,

Aiming thereby to further the accountability of and transparency in decision-making and to strengthen public support for decisions on the environment,

Recognizing the desirability of transparency in all branches of government and inviting legislative bodies to implement the principles of this Convention in their proceedings,

Recognizing also that the public needs to be aware of the procedures for participation in environmental decision-making, have free access to them and know how to use them,

Recognizing further the importance of the respective roles that individual citizens, non-governmental organizations and the private sector can play in environmental protection,

Desiring to promote environmental education to further the understanding of the environment and sustainable development and to encourage widespread public awareness of, and participation in, decisions affecting the environment and sustainable development,

Noting, in this context, the importance of making use of the media and of electronic or other, future forms of communication,

Recognizing the importance of fully integrating environmental considerations in governmental decision-making and the consequent need for public authorities to be in possession of accurate, comprehensive and up-to date environmental information,

Acknowledging that public authorities hold environmental information in the public interest, Concerned that effective judicial mechanisms should be accessible to the public, including organizations, so that its legitimate interests are protected and the law is enforced,

Noting the importance of adequate product information being provided to consumers to enable them to make informed environmental choices,

Recognizing the concern of the public about the deliberate release of genetically modified organisms into the environment and the need for increased transparency and greater public participation in decision-making in this field,

Convinced that the implementation of this Convention will contribute to strengthening democracy in the region of the United Nations Economic Commission for Europe (ECE),

Conscious of the role played in this respect by ECE and recalling, inter alia, the ECE Guidelines on Access to Environmental Information and Public Participation in Environmental Decision-making endorsed in the Ministerial Declaration adopted at the Third Ministerial Conference "Environment for Europe" in Sofia, Bulgaria, on 25 October 1995,

Bearing in mind the relevant provisions in the Convention on Environmental Impact Assessment in a Transboundary Context, done at Espoo, Finland, on 25 February 1991, and the Convention on the Transboundary Effects of Industrial Accidents and the Convention on the Protection and Use of Transboundary Watercourses and International Lakes, both done at Helsinki on 17 March 1992, and other regional conventions,

Conscious that the adoption of this Convention will have contributed to the further strengthening of the "Environment for Europe" process and to the results of the Fourth Ministerial Conference in Aarhus, Denmark, in June 1998,

Have agreed as follows:

Article 1. Objective

In order to contribute to the protection of the right of every person of present and future generations to live in an environment adequate to his or her health and well-being, each Party shall guarantee the rights of access to information, public participation in decision-making, and access to justice in environmental matters in accordance with the provisions of this Convention.

Article 2. Definitions

For the purposes of this Convention,

1. “Party” means, unless the text otherwise indicates, a Contracting Party to this Convention;

2. “Public authority” means:

   (a) Government at national, regional and other level;

   (b) Natural or legal persons performing public administrative functions under national law, including specific duties, activities or services in relation to the environment;

   (c) Any other natural or legal persons having public responsibilities or functions, or providing public services, in relation to the environment, under the control of a body or person falling within subparagraphs (a) or (b) above;

(d) The institutions of any regional economic integration organization referred to in article 17 which is a Party to this Convention.

This definition does not include bodies or institutions acting in a judicial or legislative capacity;

3. "Environmental information" means any information in written, visual, aural, electronic or any other material form on:

(a) The state of elements of the environment, such as air and atmosphere, water, soil, land, landscape and natural sites, biological diversity and its components, including genetically modified organisms, and the interaction among these elements;

(b) Factors, such as substances, energy, noise and radiation, and activities or measures, including administrative measures, environmental agreements, policies, legislation, plans and programmes, affecting or likely to affect the elements of the environment within the scope of subparagraph (a) above, and cost-benefit and other economic analyses and assumptions used in environmental decision-making;

(c) The state of human health and safety, conditions of human life, cultural sites and built structures, inasmuch as they are or may be affected by the state of the elements of the environment or, through these elements, by the factors, activities or measures referred to in subparagraph (b) above;

4. "The public" means one or more natural or legal persons, and, in accordance with national legislation or practice, their associations, organizations or groups;

5. "The public concerned" means the public affected or likely to be affected by, or having an interest in, the environmental decision-making; for the purposes of this definition, non-governmental organizations promoting environmental protection and meeting any requirements under national law shall be deemed to have an interest.

Article 3. General provisions

1. Each Party shall take the necessary legislative, regulatory and other measures, including measures to achieve compatibility between the provisions implementing the information, public participation and access-to-justice provisions in this Convention, as well as proper enforcement measures, to establish and maintain a clear, transparent and consistent framework to implement the provisions of this Convention.

2. Each Party shall endeavour to ensure that officials and authorities assist and provide guidance to the public in seeking access to information, in facilitating participation in decision-making and in seeking access to justice in environmental matters.

3. Each Party shall promote environmental education and environmental awareness among the public, especially on how to obtain access to information, to participate in decision-making and to obtain access to justice in environmental matters.

4. Each Party shall provide for appropriate recognition of and support to associations, organizations or groups promoting environmental protection and ensure that its national legal system is consistent with this obligation.

5. The provisions of this Convention shall not affect the right of a Party to maintain or introduce measures providing for broader access to information, more extensive public participation in decision-making and wider access to justice in environmental matters than required by this Convention.

6. This Convention shall not require any derogation from existing rights of access to information, public participation in decision-making and access to justice in environmental matters.

7. Each Party shall promote the application of the principles of this Convention in international environmental decision-making processes and within the framework of international organizations in matters relating to the environment.

8. Each Party shall ensure that persons exercising their rights in conformity with the provisions of this Convention shall not be penalized, persecuted or harassed in any way for their involvement. This provision shall not affect the powers of national courts to award reasonable costs in judicial proceedings.

9. Within the scope of the relevant provisions of this Convention, the public shall have access to information, have the possibility to participate in decision-making and have access to justice in environmental matters without discrimination as to citizenship, nationality or domicile and, in the case of a legal person, without discrimination as to where it has its registered seat or an effective centre of its activities.

Article 4. Access to environmental information

1. Each Party shall ensure that, subject to the following paragraphs of this article, public authorities, in response to a request for environmental information, make such information available to the public, within the framework of national legislation, including, where requested and subject to subparagraph (b) below, copies of the actual documentation containing or comprising such information:

   (a) Without an interest having to be stated;

   (b) In the form requested unless:

      (i) It is reasonable for the public authority to make it available in another form, in which case reasons shall be given for making it available in that form; or

      (ii) The information is already publicly available in another form.

2. The environmental information referred to in paragraph 1 above shall be made available as soon as possible and at the latest within one month after the request has been submitted, unless the volume and the complexity of the information justify an extension of this period up to two months after the request. The applicant shall be informed of any extension and of the reasons justifying it.

3. A request for environmental information may be refused if:

   (a) The public authority to which the request is addressed does not hold the environmental information requested;

(b) The request is manifestly unreasonable or formulated in too general a manner; or

(c) The request concerns material in the course of completion or concerns internal communications of public authorities where such an exemption is provided for in national law or customary practice, taking into account the public interest served by disclosure.

4. A request for environmental information may be refused if the disclosure would adversely affect:

(a) The confidentiality of the proceedings of public authorities, where such confidentiality is provided for under national law;

(b) International relations, national defence or public security;

(c) The course of justice, the ability of a person to receive a fair trial or the ability of a public authority to conduct an enquiry of a criminal or disciplinary nature;

(d) The confidentiality of commercial and industrial information, where such confidentiality is protected by law in order to protect a legitimate economic interest. Within this framework, information on emissions which is relevant for the protection of the environment shall be disclosed;

(e) Intellectual property rights;

(f) The confidentiality of personal data and/or files relating to a natural person where that person has not consented to the disclosure of the information to the public, where such confidentiality is provided for in national law;

(g) The interests of a third party which has supplied the information requested without that party being under or capable of being put under a legal obligation to do so, and where that party does not consent to the release of the material; or

(h) The environment to which the information relates, such as the breeding sites of rare species.

The aforementioned grounds for refusal shall be interpreted in a restrictive way, taking into account the public interest served by disclosure and taking into account whether the information requested relates to emissions into the environment.

5. Where a public authority does not hold the environmental information requested, this public authority shall, as promptly as possible, inform the applicant of the public authority to which it believes it is possible to apply for the information requested or transfer the request to that authority and inform the applicant accordingly.

6. Each Party shall ensure that, if information exempted from disclosure under paragraphs 3 (c) and 4 above can be separated out without prejudice to the confidentiality of the information exempted, public authorities make available the remainder of the environmental information that has been requested.

7. A refusal of a request shall be in writing if the request was in writing or the applicant so requests. A refusal shall state the reasons for the refusal and give information on access to the review procedure provided for in accordance with article 9. The refusal shall be made as soon as possible and at the latest within one month, unless the complexity of the information justifies an extension of this period up

to two months after the request. The applicant shall be informed of any extension and of the reasons justifying it.

8. Each Party may allow its public authorities to make a charge for supplying information, but such charge shall not exceed a reasonable amount. Public authorities intending to make such a charge for supplying information shall make available to applicants a schedule of charges which may be levied, indicating the circumstances in which they may be levied or waived and when the supply of information is conditional on the advance payment of such a charge.

Article 5. Collection and dissemination of environmental information

1. Each Party shall ensure that:

   (a) Public authorities possess and update environmental information which is relevant to their functions;

   (b) Mandatory systems are established so that there is an adequate flow of information to public authorities about proposed and existing activities which may significantly affect the environment;

   (c) In the event of any imminent threat to human health or the environment, whether caused by human activities or due to natural causes, all information which could enable the public to take measures to prevent or mitigate harm arising from the threat and is held by a public authority is disseminated immediately and without delay to members of the public who may be affected.

2. Each Party shall ensure that, within the framework of national legislation, the way in which public authorities make environmental information available to the public is transparent and that environmental information is effectively accessible, inter alia, by:

   (a) Providing sufficient information to the public about the type and scope of environmental information held by the relevant public authorities, the basic terms and conditions under which such information is made available and accessible, and the process by which it can be obtained;

   (b) Establishing and maintaining practical arrangements, such as:

      (i) Publicly accessible lists, registers or files;

      (ii) Requiring officials to support the public in seeking access to information under this Convention; and

      (iii) The identification of points of contact; and

   (c) Providing access to the environmental information contained in lists, registers or files as referred to in subparagraph (b) (i) above free of charge.

3. Each Party shall ensure that environmental information progressively becomes available in electronic databases which are easily accessible to the public through public telecommunications networks. Information accessible in this form should include:

   (a) Reports on the state of the environment, as referred to in paragraph 4 below;

   (b) Texts of legislation on or relating to the environment;

(c) As appropriate, policies, plans and programmes on or relating to the environment, and environmental agreements; and

(d) Other information, to the extent that the availability of such information in this form would facilitate the application of national law implementing this Convention, provided that such information is already available in electronic form.

4. Each Party shall, at regular intervals not exceeding three or four years, publish and disseminate a national report on the state of the environment, including information on the quality of the environment and information on pressures on the environment.

5. Each Party shall take measures within the framework of its legislation for the purpose of disseminating, inter alia:

(a) Legislation and policy documents such as documents on strategies, policies, programmes and action plans relating to the environment, and progress reports on their implementation, prepared at various levels of government;

(b) International treaties, conventions and agreements on environmental issues; and

(c) Other significant international documents on environmental issues, as appropriate.

6. Each Party shall encourage operators whose activities have a significant impact on the environment to inform the public regularly of the environmental impact of their activities and products, where appropriate within the framework of voluntary eco-labelling or eco-auditing schemes or by other means.

7. Each Party shall:

(a) Publish the facts and analyses of facts which it considers relevant and important in framing major environmental policy proposals;

(b) Publish, or otherwise make accessible, available explanatory material on its dealings with the public in matters falling within the scope of this Convention; and

(c) Provide in an appropriate form information on the performance of public functions or the provision of public services relating to the environment by government at all levels.

8. Each Party shall develop mechanisms with a view to ensuring that sufficient product information is made available to the public in a manner which enables consumers to make informed environmental choices.

9. Each Party shall take steps to establish progressively, taking into account international processes where appropriate, a coherent, nationwide system of pollution inventories or registers on a structured, computerized and publicly accessible database compiled through standardized reporting. Such a system may include inputs, releases and transfers of a specified range of substances and products, including water, energy and resource use, from a specified range of activities to environmental media and to on-site and offsite treatment and disposal sites.

10. Nothing in this article may prejudice the right of Parties to refuse to disclose certain environmental information in accordance with article 4, paragraphs 3 and 4.

Article 6. Public participation in decisions on specific activities

1. Each Party:

   (a) Shall apply the provisions of this article with respect to decisions on whether to permit proposed activities listed in annex I;

   (b) Shall, in accordance with its national law, also apply the provisions of this article to decisions on proposed activities not listed in annex I which may have a significant effect on the environment. To this end, Parties shall determine whether such a proposed activity is subject to these provisions; and

   (c) May decide, on a case-by-case basis if so provided under national law, not to apply the provisions of this article to proposed activities serving national defence purposes, if that Party deems that such application would have an adverse effect on these purposes.

2. The public concerned shall be informed, either by public notice or individually as appropriate, early in an environmental decision-making procedure, and in an adequate, timely and effective manner, inter alia, of:

   (a) The proposed activity and the application on which a decision will be taken;

   (b) The nature of possible decisions or the draft decision;

   (c) The public authority responsible for making the decision;

   (d) The envisaged procedure, including, as and when this information can be provided:

      (i) The commencement of the procedure;

      (ii) The opportunities for the public to participate;

      (iii) The time and venue of any envisaged public hearing;

      (iv) An indication of the public authority from which relevant information can be obtained and where the relevant information has been deposited for examination by the public;

      (v) An indication of the relevant public authority or any other official body to which comments or questions can be submitted and of the time schedule for transmittal of comments or questions; and

      (vi) An indication of what environmental information relevant to the proposed activity is available; and

   (e) The fact that the activity is subject to a national or transboundary environmental impact assessment procedure.

3. The public participation procedures shall include reasonable time-frames for the different phases, allowing sufficient time for informing the public in accordance with paragraph 2 above and for the public to prepare and participate effectively during the environmental decision-making.

4. Each Party shall provide for early public participation, when all options are open and effective public participation can take place.

5. Each Party should, where appropriate, encourage prospective applicants to identify the public concerned, to enter into discussions, and to provide information regarding the objectives

of their application before applying for a permit.

6. Each Party shall require the competent public authorities to give the public concerned access for examination, upon request where so required under national law, free of charge and as soon as it becomes available, to all information relevant to the decision-making referred to in this article that is available at the time of the public participation procedure, without prejudice to the right of Parties to refuse to disclose certain information in accordance with article 4, paragraphs 3 and 4. The relevant information shall include at least, and without prejudice to the provisions of article 4:

   (a) A description of the site and the physical and technical characteristics of the proposed activity, including an estimate of the expected residues and emissions;

   (b) A description of the significant effects of the proposed activity on the environment;

   (c) A description of the measures envisaged to prevent and/or reduce the effects, including emissions;

   (d) A non-technical summary of the above;

   (e) An outline of the main alternatives studied by the applicant; and

   (f) In accordance with national legislation, the main reports and advice issued to the public authority at the time when the public concerned shall be informed in accordance with paragraph 2 above.

7. Procedures for public participation shall allow the public to submit, in writing or, as appropriate, at a public hearing or inquiry with the applicant, any comments, information, analyses or opinions that it considers relevant to the proposed activity.

8. Each Party shall ensure that in the decision due account is taken of the outcome of the public participation.

9. Each Party shall ensure that, when the decision has been taken by the public authority, the public is promptly informed of the decision in accordance with the appropriate procedures. Each Party shall make accessible to the public the text of the decision along with the reasons and considerations on which the decision is based.

10. Each Party shall ensure that, when a public authority reconsiders or updates the operating conditions for an activity referred to in paragraph 1, the provisions of paragraphs 2 to 9 of this article are applied mutatis mutandis, and where appropriate.

11. Each Party shall, within the framework of its national law, apply, to the extent feasible and appropriate, provisions of this article to decisions on whether to permit the deliberate release of genetically modified organisms into the environment.

Article 7. Public participation concerning plans, programmes and policies relating to the environment

Each Party shall make appropriate practical and/or other provisions for the public to participate during the preparation of plans and programmes relating to the environment, within a transparent and fair framework, having provided the necessary information to the public. Within this framework, article 6, paragraphs 3, 4 and 8, shall be applied. The public which may participate shall be identified by the relevant public authority, taking into

account the objectives of this Convention. To the extent appropriate, each Party shall endeavour to provide opportunities for public participation in the preparation of policies relating to the environment.

Article 8. Public participation during the preparation of executive regulations and/or generally applicable legally binding normative instruments

Each Party shall strive to promote effective public participation at an appropriate stage, and while options are still open, during the preparation by public authorities of executive regulations and other generally applicable legally binding rules that may have a significant effect on the environment. To this end, the following steps should be taken:

(a) Time-frames sufficient for effective participation should be fixed;

(b) Draft rules should be published or otherwise made publicly available; and

(c) The public should be given the opportunity to comment, directly or through representative consultative bodies.

The result of the public participation shall be taken into account as far as possible.

Article 9. Access to justice

1. Each Party shall, within the framework of its national legislation, ensure that any person who considers that his or her request for information under article 4 has been ignored, wrongfully refused, whether in part or in full, inadequately answered, or otherwise not dealt with in accordance with the provisions of that article, has access to a review procedure before a court of law or another independent and impartial body established by law.

   In the circumstances where a Party provides for such a review by a court of law, it shall ensure that such a person also has access to an expeditious procedure established by law that is free of charge or inexpensive for reconsideration by a public authority or review by an independent and impartial body other than a court of law.

   Final decisions under this paragraph 1 shall be binding on the public authority holding the information. Reasons shall be stated in writing, at least where access to information is refused under this paragraph.

2. Each Party shall, within the framework of its national legislation, ensure that members of the public concerned

   (a) Having a sufficient interest or, alternatively,

   (b) Maintaining impairment of a right, where the administrative procedural law of a Party requires this as a precondition, have access to a review procedure before a court of law and/or another independent and impartial body established by law, to challenge the substantive and procedural legality of any decision, act or omission subject to the provisions of article 6 and, where so provided for under national law and without prejudice to paragraph 3 below, of other relevant provisions of this Convention.

   What constitutes a sufficient interest and impairment of a right shall be determined in accordance with the requirements of national law and consistently with the objective of giving the public concerned wide access to justice within the scope of this Convention. To this end, the interest of any non-governmental organization meeting the requirements referred to in article 2, paragraph 5, shall be deemed

sufficient for the purpose of subparagraph (a) above. Such organizations shall also be deemed to have rights capable of being impaired for the purpose of subparagraph (b) above.

The provisions of this paragraph 2 shall not exclude the possibility of a preliminary review procedure before an administrative authority and shall not affect the requirement of exhaustion of administrative review procedures prior to recourse to judicial review procedures, where such a requirement exists under national law.

3. In addition and without prejudice to the review procedures referred to in paragraphs 1 and 2 above, each Party shall ensure that, where they meet the criteria, if any, laid down in its national law, members of the public have access to administrative or judicial procedures to challenge acts and omissions by private persons and public authorities which contravene provisions of its national law relating to the environment.

4. In addition and without prejudice to paragraph 1 above, the procedures referred to in paragraphs 1, 2 and 3 above shall provide adequate and effective remedies, including injunctive relief as appropriate, and be fair, equitable, timely and not prohibitively expensive. Decisions under this article shall be given or recorded in writing. Decisions of courts, and whenever possible of other bodies, shall be publicly accessible.

5. In order to further the effectiveness of the provisions of this article, each Party shall ensure that information is provided to the public on access to administrative and judicial review procedures and shall consider the establishment of appropriate assistance mechanisms to remove or reduce financial and other barriers to access to justice.

Article 10. Meeting of the Parties

1. The first meeting of the Parties shall be convened no later than one year after the date of the entry into force of this Convention. Thereafter, an ordinary meeting of the Parties shall be held at least once every two years, unless otherwise decided by the Parties, or at the written request of any Party, provided that, within six months of the request being communicated to all Parties by the Executive Secretary of the Economic Commission for Europe, the said request is supported by at least one third of the Parties.

2. At their meetings, the Parties shall keep under continuous review the implementation of this Convention on the basis of regular reporting by the Parties, and, with this purpose in mind, shall:

   (i) Review the policies for and legal and methodological approaches to access to information, public participation in decision-making and access to justice in environmental matters, with a view to further improving them;

   (ii) Exchange information regarding experience gained in concluding and implementing bilateral and multilateral agreements or other arrangements having relevance to the purposes of this Convention and to which one or more of the Parties are a party;

   (iii) Seek, where appropriate, the services of relevant ECE bodies and other competent international bodies and specific committees in all aspects

pertinent to the achievement of the purposes of this Convention;

(iv) Establish any subsidiary bodies as they deem necessary;

(v) Prepare, where appropriate, protocols to this Convention;

(vi) Consider and adopt proposals for amendments to this Convention in accordance with the provisions of article 14;

(vii) Consider and undertake any additional action that may be required for the achievement of the purposes of this Convention;

(viii) At their first meeting, consider and by consensus adopt rules of procedure for their meetings and the meetings of subsidiary bodies;

(ix) At their first meeting, review their experience in implementing the provisions of article 5, paragraph 9, and consider what steps are necessary to develop further the system referred to in that paragraph, taking into account international processes and developments, including the elaboration of an appropriate instrument concerning pollution release and transfer registers or inventories which could be annexed to this Convention.

3. The Meeting of the Parties may, as necessary, consider establishing financial arrangements on a consensus basis.

4. The United Nations, its specialized agencies and the International Atomic Energy Agency, as well as any State or regional economic integration organization entitled under article 17 to sign this Convention but which is not a Party to this Convention, and any intergovernmental organization qualified in the fields to which this Convention relates, shall be entitled to participate as observers in the meetings of the Parties.

5. Any non-governmental organization, qualified in the fields to which this Convention relates, which has informed the Executive Secretary of the Economic Commission for Europe of its wish to be represented at a meeting of the Parties shall be entitled to participate as an observer unless at least one third of the Parties present in the meeting raise objections.

6. For the purposes of paragraphs 4 and 5 above, the rules of procedure referred to in paragraph 2 (h) above shall provide for practical arrangements for the admittance procedure and other relevant terms.

Article 11. Right to vote

1. Except as provided for in paragraph 2 below, each Party to this Convention shall have one vote.

2. Regional economic integration organizations, in matters within their competence, shall exercise their right to vote with a number of votes equal to the number of their member States which are Parties to this Convention. Such organizations shall not exercise their right to vote if their member States exercise theirs, and vice versa.

Article 12. Secretariat

The Executive Secretary of the Economic Commission for Europe shall carry out the following secretariat functions:

(a) The convening and preparing of meetings of the Parties;

(b) The transmission to the Parties of reports and other information received in accordance with the provisions of this Convention; and

(c) Such other functions as may be determined by the Parties.

Article 13. Annexes

The annexes to this Convention shall constitute an integral part thereof.

Article 14. Amendments to the Convention

1. Any Party may propose amendments to this Convention.

2. The text of any proposed amendment to this Convention shall be submitted in writing to the Executive Secretary of the Economic Commission for Europe, who shall communicate it to all Parties at least ninety days before the meeting of the Parties at which it is proposed for adoption.

3. The Parties shall make every effort to reach agreement on any proposed amendment to this Convention by consensus. If all efforts at consensus have been exhausted, and no agreement reached, the amendment shall as a last resort be adopted by a three-fourths majority vote of the Parties present and voting at the meeting.

4. Amendments to this Convention adopted in accordance with paragraph 3 above shall be communicated by the Depositary to all Parties for ratification, approval or acceptance. Amendments to this Convention other than those to an annex shall enter into force for Parties having ratified, approved or accepted them on the ninetieth day after the receipt by the Depositary of notification of their ratification, approval or acceptance by at least three fourths of these Parties. Thereafter they shall enter into force for any other Party on the ninetieth day after that Party deposits its instrument of ratification, approval or acceptance of the amendments.

5. Any Party that is unable to approve an amendment to an annex to this Convention shall so notify the Depositary in writing within twelve months from the date of the communication of the adoption. The Depositary shall without delay notify all Parties of any such notification received. A Party may at any time substitute an acceptance for its previous notification and, upon deposit of an instrument of acceptance with the Depositary, the amendments to such an annex shall become effective for that Party.

6. On the expiry of twelve months from the date of its communication by the Depositary as provided for in paragraph 4 above an amendment to an annex shall become effective for those Parties which have not submitted a notification to the Depositary in accordance with the provisions of paragraph 5 above, provided that not more than one third of the Parties have submitted such a notification.

7. For the purposes of this article, "Parties present and voting" means Parties present and casting an affirmative or negative vote.

Article 15. Review of compliance

The Meeting of the Parties shall establish, on a consensus basis, optional arrangements of a non-confrontational, non-judicial and consultative nature for reviewing compliance with the provisions of this Convention. These arrangements shall allow for appropriate public involvement and may include the option of considering communications from members of the public on matters related to this Convention.

Article 16. Settlement of disputes

1. If a dispute arises between two or more Parties about the interpretation or application of this Convention, they

shall seek a solution by negotiation or by any other means of dispute settlement acceptable to the parties to the dispute.

2. When signing, ratifying, accepting, approving or acceding to this Convention, or at any time thereafter, a Party may declare in writing to the Depositary that, for a dispute not resolved in accordance with paragraph 1 above, it accepts one or both of the following means of dispute settlement as compulsory in relation to any Party accepting the same obligation:

   (a) Submission of the dispute to the International Court of Justice;

   (b) Arbitration in accordance with the procedure set out in annex II.

3. If the parties to the dispute have accepted both means of dispute settlement referred to in paragraph 2 above, the dispute may be submitted only to the International Court of Justice, unless the parties agree otherwise.

Article 17. Signature

This Convention shall be open for signature at Aarhus (Denmark) on 25 June 1998, and thereafter at United Nations Headquarters in New York until 21 December 1998, by States members of the Economic Commission for Europe as well as States having consultative status with the Economic Commission for Europe pursuant to paragraphs 8 and 11 of Economic and Social Council resolution 36 (IV) of 28 March 1947, and by regional economic integration organizations constituted by sovereign States members of the Economic Commission for Europe to which their member States have transferred competence over matters governed by this Convention, including the competence to enter into treaties in respect of these matters.

Article 18. Depositary

The Secretary-General of the United Nations shall act as the Depositary of this Convention.

Article 19. Ratification, acceptance, approval and accession

1. This Convention shall be subject to ratification, acceptance or approval by signatory States and regional economic integration organizations.

2. This Convention shall be open for accession as from 22 December 1998 by the States and regional economic integration organizations referred to in article 17.

3. Any other State, not referred to in paragraph 2 above, that is a Member of the United Nations may accede to the Convention upon approval by the Meeting of the Parties.

4. Any organization referred to in article 17 which becomes a Party to this Convention without any of its member States being a Party shall be bound by all the obligations under this Convention. If one or more of such an organization's member States is a Party to this Convention, the organization and its member States shall decide on their respective responsibilities for the performance of their obligations under this Convention. In such cases, the organization and the member States shall not be entitled to exercise rights under this Convention concurrently.

5. In their instruments of ratification, acceptance, approval or accession, the regional economic integration organizations referred to in article 17 shall declare the extent of their competence with respect to the matters governed by this Convention. These organizations shall also inform the Depositary of any substantial

modification to the extent of their competence.

Article 20. Entry into force

1. This Convention shall enter into force on the ninetieth day after the date of deposit of the sixteenth instrument of ratification, acceptance, approval or accession.

2. For the purposes of paragraph 1 above, any instrument deposited by a regional economic integration organization shall not be counted as additional to those deposited by States members of such an organization.

3. For each State or organization referred to in article 17 which ratifies, accepts or approves this Convention or accedes thereto after the deposit of the sixteenth instrument of ratification, acceptance, approval or accession, the Convention shall enter into force on the ninetieth day after the date of deposit by such State or organization of its instrument of ratification, acceptance, approval or accession.

Article 21. Withdrawal

At any time after three years from the date on which this Convention has come into force with respect to a Party, that Party may withdraw from the Convention by giving written notification to the Depositary. Any such withdrawal shall take effect on the ninetieth day after the date of its receipt by the Depositary.

Article 22. Authentic texts

The original of this Convention, of which the English, French and Russian texts are equally authentic, shall be deposited with the Secretary-General of the United Nations.

IN WITNESS WHEREOF the undersigned, being duly authorized thereto, have signed this Convention.

DONE at Aarhus (Denmark), this twenty-fifth day of June, one thousand nine hundred and ninety-eight.

Annex I

LIST OF ACTIVITIES REFERRED TO IN ARTICLE 6, PARAGRAPH 1(A)

1. Energy sector:

   - Mineral oil and gas refineries;

   - Installations for gasification and liquefaction;

   - Thermal power stations and other combustion installations with a heat input of 50 megawatts (MW)or more;

   - Coke ovens;

   - Nuclear power stations and other nuclear reactors including the dismantling or decommissioning of such power stations or reactors[83] (except research installations for the production and conversion of fissionable and fertile materials whose maximum power does not exceed 1 kW continuous thermal load);

   - Installations for the reprocessing of irradiated nuclear fuel;

   - Installations designed:

   - For the production or enrichment of nuclear fuel;

   - For the processing of irradiated nuclear fuel or high-level radioactive waste;

[83] Nuclear power stations and other nuclear reactors cease to be such an installation when all nuclear fuel and other radioactively contaminated elements have been removed permanently from the installation site.

- For the final disposal of irradiated nuclear fuel;

- Solely for the final disposal of radioactive waste;

- Solely for the storage (planned for more than 10 years) of irradiated nuclear fuels or radioactive waste in a different site than the production site.

2. Production and processing of metals:

   - Metal ore (including sulphide ore) roasting or sintering installations;

   - Installations for the production of pig-iron or steel (primary or secondary fusion) including continuous casting, with a capacity exceeding 2.5 tons per hour;

   - Installations for the processing of ferrous metals:

     (i) Hot-rolling mills with a capacity exceeding 20 tons of crude steel per hour;

     (ii) Smitheries with hammers the energy of which exceeds 50 kilojoules per hammer, where the calorific power used exceeds 20 MW;

     (iii) Application of protective fused metal coats with an input exceeding 2 tons of crude steel per hour;

   - Ferrous metal foundries with a production capacity exceeding 20 tons per day;

   - Installations:

     (i) For the production of non-ferrous crude metals from ore, concentrates or secondary raw materials by metallurgical, chemical or electrolytic processes;

     (ii) For the smelting, including the alloying, of non-ferrous metals, including recovered products (refining, foundry casting, etc.), with a melting capacity exceeding 4 tons per day for lead and cadmium or 20 tons per day for all other metals;

   - Installations for surface treatment of metals and plastic materials using an electrolytic or chemical process where the volume of the treatment vats exceeds 30 m^3.

3. Mineral industry:

   - Installations for the production of cement clinker in rotary kilns with a production capacity exceeding 500 tons per day or lime in rotary kilns with a production capacity exceeding 50 tons per day or in other furnaces with a production capacity exceeding 50 tons per day;

   - Installations for the production of asbestos and the manufacture of asbestos-based products;

   - Installations for the manufacture of glass including glass fibre with a melting capacity exceeding 20 tons per day;

   - Installations for melting mineral substances including the production of mineral fibres with a melting capacity exceeding 20 tons per day;

   - Installations for the manufacture of ceramic products by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain, with a production

capacity exceeding 75 tons per day, and/or with a kiln capacity exceeding 4 m^3 and with a setting density per kiln exceeding 300 kg/m^3.

4. Chemical industry: Production within the meaning of the categories of activities contained in this paragraph means the production on an industrial scale by chemical processing of substances or groups of substances listed in subparagraphs (a) to (g):

   (a) Chemical installations for the production of basic organic chemicals, such as:

      (i) Simple hydrocarbons (linear or cyclic, saturated or unsaturated, aliphatic or aromatic);

      (ii) Oxygen-containing hydrocarbons such as alcohols aldehydes, ketones, carboxylic acids, esters, acetates, ethers, peroxides, epoxy resins;

      (iii) Sulphurous hydrocarbons;

      (iv) Nitrogenous hydrocarbons such as amines, amides, nitrous compounds, nitro compounds or nitrate compounds, nitriles, cyanates, isocyanates;

      (v) Phosphorus-containing hydrocarbons;

      (vi) Halogenic hydrocarbons;

      (vii) Organometallic compounds;

      (viii) Basic plastic materials (polymers, synthetic fibres and cellulose-based fibres);

      (ix) Synthetic rubbers;

      (x) Dyes and pigments;

      (xi) Surface-active agents and surfactants;

   (b) Chemical installations for the production of basic inorganic chemicals, such as:

      (i) Gases, such as ammonia, chlorine or hydrogen chloride, fluorine or hydrogen fluoride, carbon oxides, sulphur compounds, nitrogen oxides, hydrogen, sulphur dioxide, carbonyl chloride;

      (ii) Acids, such as chromic acid, hydrofluoric acid, phosphoric acid, nitric acid, hydrochloric acid, sulphuric acid, oleum, sulphurous acids;

      (iii) Bases, such as ammonium hydroxide, potassium hydroxide, sodium hydroxide;

      (iv) Salts, such as ammonium chloride, potassium chlorate, potassium carbonate, sodium carbonate, perborate, silver nitrate;

      (v) Non-metals, metal oxides or other inorganic compounds such as calcium carbide, silicon, silicon carbide;

   (c) Chemical installations for the production of phosphorous-, nitrogen- or potassium-based fertilizers (simple or compound fertilizers);

   (d) Chemical installations for the production of basic plant health products and of biocides;

   (e) Installations using a chemical or biological process for the production of basic pharmaceutical products;

   (f) Chemical installations for the production of explosives;

(g) Chemical installations in which chemical or biological processing is used for the production of protein feed additives, ferments and other protein substances.

5. Waste management:

- Installations for the incineration, recovery, chemical treatment or landfill of hazardous waste;
- Installations for the incineration of municipal waste with a capacity exceeding 3 tons per hour;
- Installations for the disposal of non-hazardous waste with a capacity exceeding 50 tons per day;
- Landfills receiving more than 10 tons per day or with a total capacity exceeding 25 000 tons, excluding landfills of inert waste.

6. Waste-water treatment plants with a capacity exceeding 150 000 population equivalent.

7. Industrial plants for the:

(a) Production of pulp from timber or similar fibrous materials;

(b) Production of paper and board with a production capacity exceeding 20 tons per day.

8. (a) Construction of lines for long-distance railway traffic and of airports[84] with a basic runway length of 2 100 m or more;

(b) Construction of motorways and express roads;[85]

(c) Construction of a new road of four or more lanes, or realignment and/or widening of an existing road of two lanes or less so as to provide four or more lanes, where such new road, or realigned and/or widened section of road, would be 10 km or more in a continuous length.

9. (a) Inland waterways and ports for inland-waterway traffic which permit the passage of vessels of over 1 350 tons;

(b) Trading ports, piers for loading and unloading connected to land and outside ports (excluding ferry piers) which can take vessels of over 1 350 tons.

10. Groundwater abstraction or artificial groundwater recharge schemes where the annual volume of water abstracted or recharged is equivalent to or exceeds 10 million cubic metres.

11. (a) Works for the transfer of water resources between river basins where this transfer aims at preventing possible shortages of water and where the amount of water transferred exceeds 100 million cubic metres/year;

(b) In all other cases, works for the transfer of water resources between river basins where the multiannual average flow of the basin of abstraction exceeds 2 000 million cubic metres/year and where the amount of water transferred exceeds 5% of this flow.

In both cases transfers of piped drinking water are excluded.

12. Extraction of petroleum and natural gas for commercial purposes where

[84] For the purposes of this Convention, "airport" means an airport which complies with the definition in the 1944 Chicago Convention setting up the International Civil Aviation Organization (Annex 14).

[85] For the purposes of this Convention, "express road" means a road which complies with the definition in the European Agreement on Main International Traffic Arteries of 15 November 1975.

the amount extracted exceeds 500 tons/day in the case of petroleum and 500 000 cubic metres/day in the case of gas.

13. Dams and other installations designed for the holding back or permanent storage of water, where a new or additional amount of water held back or stored exceeds 10 million cubic metres.

14. Pipelines for the transport of gas, oil or chemicals with a diameter of more than 800 mm and a length of more than 40 km.

15. Installations for the intensive rearing of poultry or pigs with more than:

    (a) 40 000 places for poultry;

    (b) 2 000 places for production pigs (over 30 kg); or

    (c) 750 places for sows.

16. Quarries and opencast mining where the surface of the site exceeds 25 hectares, or peat extraction, where the surface of the site exceeds 150 hectares.

17. Construction of overhead electrical power lines with a voltage of 220 kV or more and a length of more than 15 km.

18. Installations for the storage of petroleum, petrochemical, or chemical products with a capacity of 200 000 tons or more.

19. Other activities:

    - Plants for the pretreatment (operations such as washing, bleaching, mercerization) or dyeing of fibres or textiles where the treatment capacity exceeds 10 tons per day;

    - Plants for the tanning of hides and skins where the treatment capacity exceeds 12 tons of finished products per day;

    - (a) Slaughterhouses with a carcass production capacity greater than 50 tons per day;

      (b) Treatment and processing intended for the production of food products from:

        (i) Animal raw materials (other than milk) with a finished product production capacity greater than 75 tons per day;

        (ii) Vegetable raw materials with a finished product production capacity greater than 300 tons per day (average value on a quarterly basis);

      (c) Treatment and processing of milk, the quantity of milk received being greater than 200 tons per day (average value on an annual basis);

    - Installations for the disposal or recycling of animal carcasses and animal waste with a treatment capacity exceeding 10 tons per day;

    - Installations for the surface treatment of substances, objects or products using organic solvents, in particular for dressing, printing, coating, degreasing, waterproofing, sizing, painting, cleaning or impregnating, with a consumption capacity of more than 150 kg per hour or more than 200 tons per year;

    - Installations for the production of carbon (hard-burnt coal) or electrographite by means of incineration or graphitization.

20. Any activity not covered by paragraphs 1-19 above where public participation is provided for under an environmental impact assessment procedure in accordance with national legislation.

21. The provision of article 6, paragraph 1 (a) of this Convention, does not apply to any of the above projects undertaken exclusively or mainly for research, development and testing of new methods or products for less than two years unless they would be likely to cause a significant adverse effect on environment or health.

22. Any change to or extension of activities, where such a change or extension in itself meets the criteria/thresholds set out in this annex, shall be subject to article 6, paragraph 1 (a) of this Convention. Any other change or extension of activities shall be subject to article 6, paragraph 1 (b) of this Convention.

Annex II

ARBITRATION

1. In the event of a dispute being submitted for arbitration pursuant to article 16, paragraph 2, of this Convention, a party or parties shall notify the secretariat of the subject matter of arbitration and indicate, in particular, the articles of this Convention whose interpretation or application is at issue. The secretariat shall forward the information received to all Parties to this Convention.

2. The arbitral tribunal shall consist of three members. Both the claimant party or parties and the other party or parties to the dispute shall appoint an arbitrator, and the two arbitrators so appointed shall designate by common agreement the third arbitrator, who shall be the president of the arbitral tribunal. The latter shall not be a national of one of the parties to the dispute, nor have his or her usual place of residence in the territory of one of these parties, nor be employed by any of them, nor have dealt with the case in any other capacity.

3. If the president of the arbitral tribunal has not been designated within two months of the appointment of the second arbitrator, the Executive Secretary of the Economic Commission for Europe shall, at the request of either party to the dispute, designate the president within a further two-month period.

4. If one of the parties to the dispute does not appoint an arbitrator within two months of the receipt of the request, the other party may so inform the Executive Secretary of the Economic Commission for Europe, who shall designate the president of the arbitral tribunal within a further two-month period. Upon designation, the president of the arbitral tribunal shall request the party which has not appointed an arbitrator to do so within two months. If it fails to do so within that period, the president shall so inform the Executive Secretary of the Economic Commission for Europe, who shall make this appointment within a further two-month period.

5. The arbitral tribunal shall render its decision in accordance with international law and the provisions of this Convention.

6. Any arbitral tribunal constituted under the provisions set out in this annex shall draw up its own rules of procedure.

7. The decisions of the arbitral tribunal, both on procedure and on substance, shall be taken by majority vote of its members.

8. The tribunal may take all appropriate measures to establish the facts.

9. The parties to the dispute shall facilitate the work of the arbitral tribunal and, in particular, using all means at their disposal, shall:

   (a) Provide it with all relevant documents, facilities and information;

   (b) Enable it, where necessary, to call witnesses or experts and receive their evidence.

10. The parties and the arbitrators shall protect the confidentiality of any information that they receive in confidence during the proceedings of the arbitral tribunal.

11. The arbitral tribunal may, at the request of one of the parties, recommend interim measures of protection.

12. If one of the parties to the dispute does not appear before the arbitral tribunal or fails to defend its case, the other party may request the tribunal to continue the proceedings and to render its final decision. Absence of a party or failure of a party to defend its case shall not constitute a bar to the proceedings.

13. The arbitral tribunal may hear and determine counter-claims arising directly out of the subject matter of the dispute.

14. Unless the arbitral tribunal determines otherwise because of the particular circumstances of the case, the expenses of the tribunal, including the remuneration of its members, shall be borne by the parties to the dispute in equal shares. The tribunal shall keep a record of all its expenses, and shall furnish a final statement thereof to the parties.

15. Any Party to this Convention which has an interest of a legal nature in the subject matter of the dispute, and which may be affected by a decision in the case, may intervene in the proceedings with the consent of the tribunal.

16. The arbitral tribunal shall render its award within five months of the date on which it is established, unless it finds it necessary to extend the time limit for a period which should not exceed five months.

17. The award of the arbitral tribunal shall be accompanied by a statement of reasons. It shall be final and binding upon all parties to the dispute. The award will be transmitted by the arbitral tribunal to the parties to the dispute and to the secretariat. The secretariat will forward the information received to all Parties to this Convention.

18. Any dispute which may arise between the parties concerning the interpretation or execution of the award may be submitted by either party to the arbitral tribunal which made the award or, if the latter cannot be seized thereof, to another tribunal constituted for this purpose in the same manner as the first.

INDEX

JOINT CONVENTION ON THE SAFETY OF SPENT FUEL MANAGEMENT AND ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT ("JOINT CONVENTION")..... 12

MANAGING ENVIRONMENTAL IMPACT ASSESSMENT FOR CONSTRUCTION AND OPERATION IN NEW NUCLEAR POWER PROGRAMMES ("IAEA EIA GUIDELINES") 29

STRATEGIC ENVIRONMENTAL ASSESSMENT FOR NUCLEAR POWER PROGRAMMES: GUIDELINES ("IAEA SEA GUIDELINES") 75

GOOD PRACTICE RECOMMENDATIONS ON THE APPLICATION OF THE CONVENTION TO NUCLEAR ENERGY-RELATED ACTIVITIES ("GOOD PRACTICE RECOMMENDATIONS") 288

ABOUT THE PROJECT

The Energy Studies Institute (ESI) and the Centre for International Law (CIL) of the National University of Singapore are undertaking a three-year Project on nuclear governance, beginning on 4 January 2016 and now extended until 30 June 2019. The Project is staffed by a multidisciplinary academic team carrying out research and capacity building in the governance of nuclear safety, security and civil liability for nuclear damage.

Growing interest in the use of nuclear energy world-wide and particularly in Asia raises a number of safety, security and liability concerns. Some of these concerns arise in part from an apparent lack of a unified global governance regime and complexities due to multiple levels of governance in Asia. The Project aims to carry out multidisciplinary research into the international, regional and national governance regimes for the safe and secure uses of nuclear energy, with an aim of proposing recommendations for strengthening current regimes.

Dr Philip Andrews-Speed, Senior Principal Fellow at ESI is the principal investigator for the Project. Associate Professor Robert Beckman, Head of Ocean Law and Policy at CIL, is the co-principal investigator.

For more information on the Project, see the Project website at http://www.nucleargovernance.sg/.