Future Deployment of Transportable Nuclear Power Plants (TNPPs): Legal and Regulatory Issues and Challenges

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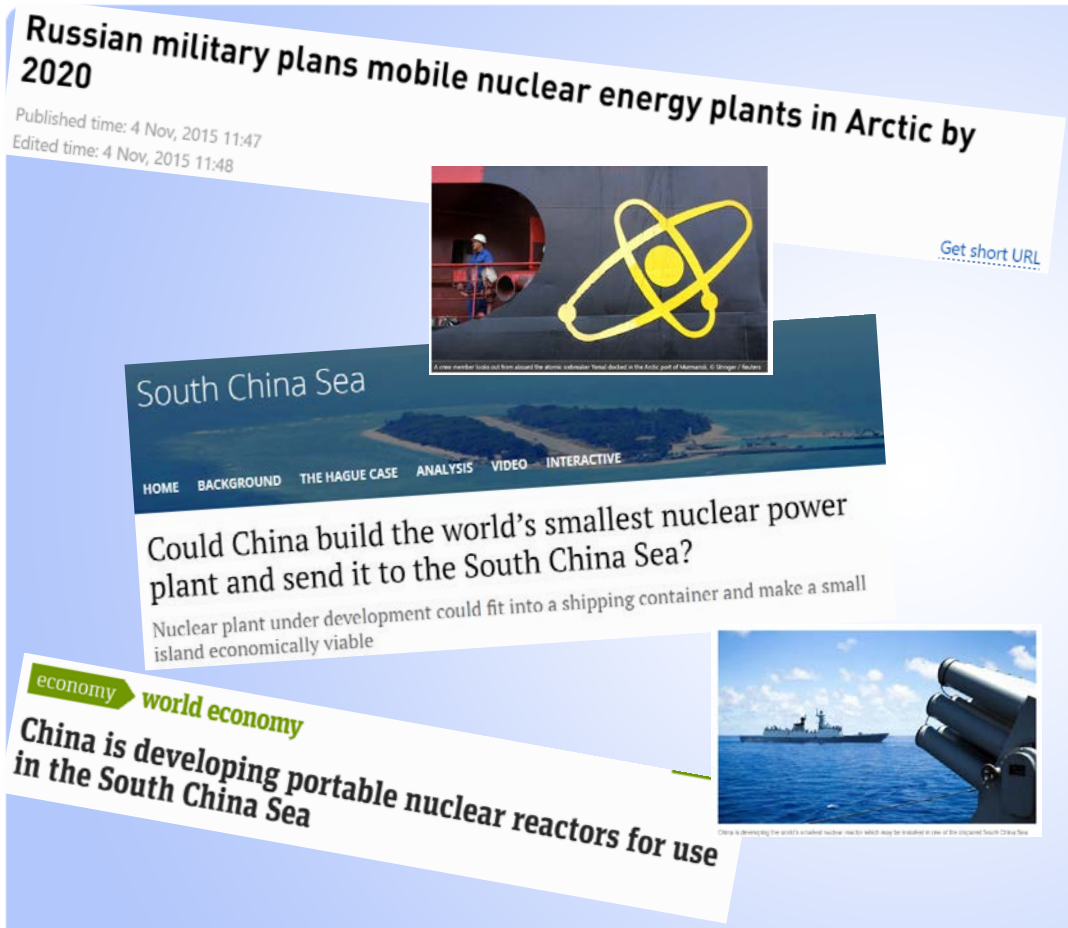
PRESENTATION OVERVIEW

PART I.	BACKGROUND ON TNPPs
PART II.	APPLICATION OF EXISTING INTERNATIONAL INSTRUMENTS / TEXTS
PART III.	OPERATIONAL ISSUES • Placement • Transport • Operation • Regulatory Control
PART IV.	CONCLUSION

PART I: BACKGROUND ON TNPPs (1/3)

- A TNPP is an SMR, transportable modular reactor (35MW(e) on a non-self-propelled barge. It includes the reactor, balance of plant (i.e. steam generator, turbine) and fuel/waste storage facilities.
- The first of a kind is being commissioned in the Russian Federation for deployment in Pevek, Siberia (2017). It is based on Russian nuclear PWR propulsion reactor technology.
- The reactor is not designed to produce energy during transportation or provide energy for the transportation itself.

BACKGROUND .... (2/3)



- Reports indicate the potential for future TNPP deployment to the Arctic and **new entrant countries world-wide**.
- Also, reports indicate that China is developing transportable reactors for use in the **South China Sea**.

BACKGROUND … (3/3)

- In 2013, IAEA considered TNPP deployment as most likely being a **transport of a barge with separate fuel transport** i.e. usual practice.
- Since then, **TNPP deployment is also being considered more seriously as a fuelled reactor** (IAEA International Project on Innovative Nuclear Reactors and Fuel Cycles, 18-21 Oct. 2016).
- If deployed overseas, **TNPP transports** to and from a host country may **occur approx. every 12 years** i.e. for service/ maintenance, spent fuel removal etc.

PART II: APPLICATION OF EXISTING INTERNATIONAL INSTRUMENTS/TEXTS (1/2)

- Since none of the existing international instruments/texts expressly address TNPPs, there is a need to identify the extent to which they are covered.
- IAEA considered **TNPPs in the context of the definitions and scope** of the current nuclear liability instruments.
- Applying the IAEA's approach, certain instruments/texts (non-exhaustive) are considered in the areas of nuclear liability, nuclear safety and nuclear security, as well as ocean law **- see Annex.**

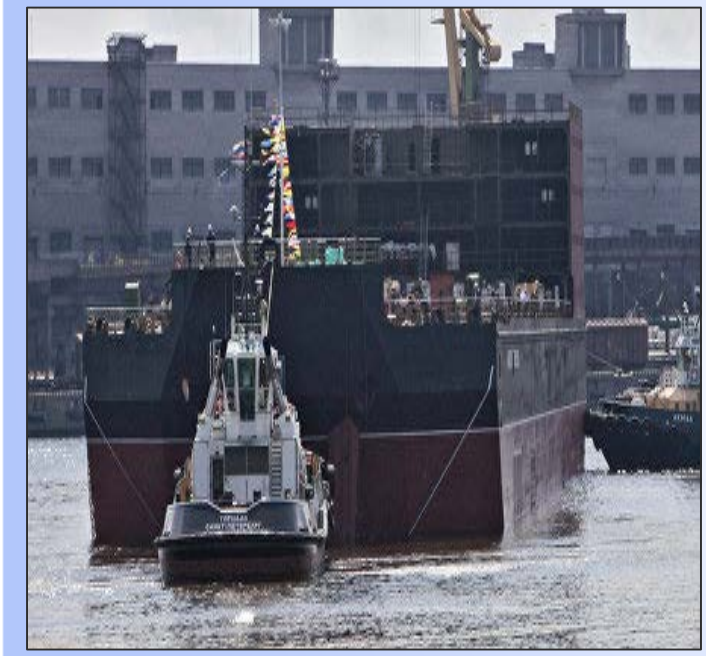
APPLICATION OF EXISTING INTERNATIONAL INSTRUMENTS/TEXTS (2/2)

- The approach results with TNPPs being **essentially covered** by the existing international instruments/texts.
- However, there are **still some important issues that need addressing**.
- In particular, the limited scope of application of **the Convention on Nuclear Safety** (i.e. to land-based NPPs) and the need for requirements addressing the transport of a fuelled reactor i.e. **IAEA Transport Regulations, IMDG Code and INF Code**.
- Finally, there is still a need to **consider whether** IAEA's **approach** of addressing TNPPs within existing scope and definitions, **is satisfactory, for example, in view of the potential hazard.**

PART III: OPERATIONAL ISSUES: Transport (1/2)

- If deployed overseas, issues may arise from UNCLOS, as well as nuclear-specific and IMO instruments/texts.
- Given the novelty of TNPP transport, concerns can be expected regarding maritime navigation and the need for **prior consultation / notification**.
- One option, could be to consider the development of voluntary and confidential Government-to-Government **communications on TNPP transport**, similar to transport of MOX fuel, high-level radioactive waste and irradiated fuel e.g. IAEA INFCIRC/862 (2014).

OPERATIONAL ISSUES: Transport (2/2)



- Also, need to ensure that **special precautionary measures** address operable reactors and not just packaged nuclear material i.e. IAEA Transport Regulations, IMDG Code and INF Code - mandatory through SOLAS, Chapter VII.
- Need to consider the adequacy of **physical protection** measures to a slow moving barge-towed fuelled reactor.
- Further, possible need to consider the **development of specific guidance under SOLAS** for TNPPs - see Code for Nuclear Merchant Ships (1981) and Safety Recommendations on the Use of Ports by Nuclear Merchant Ships.

OPERATIONAL ISSUES: Placement (1/2)

- On placement, a TNPP is likely to be an **'installation' with an economic purpose** but it must not interfere with the use of sea lanes essential to international navigation. Also, need to give due notice of, and maintain the means for warning of, the presence of the installation.
- Potential need for IMO/IAEA to consider the relation between the limited UNCLOS-prescribed **safety zone for an installation** (not exceeding 500m) and TNPP physical protection measures.

OPERATIONAL ISSUES: Placement (2/2)

- Special UNCLOS considerations relating to placement of TNPPs to avoid adverse impact on sensitive marine species/habitats.
- Need for EIAs and to monitor risks or effects of pollution on marine environment, as part of a broader obligation of due diligence to protect and preserve the marine environment.

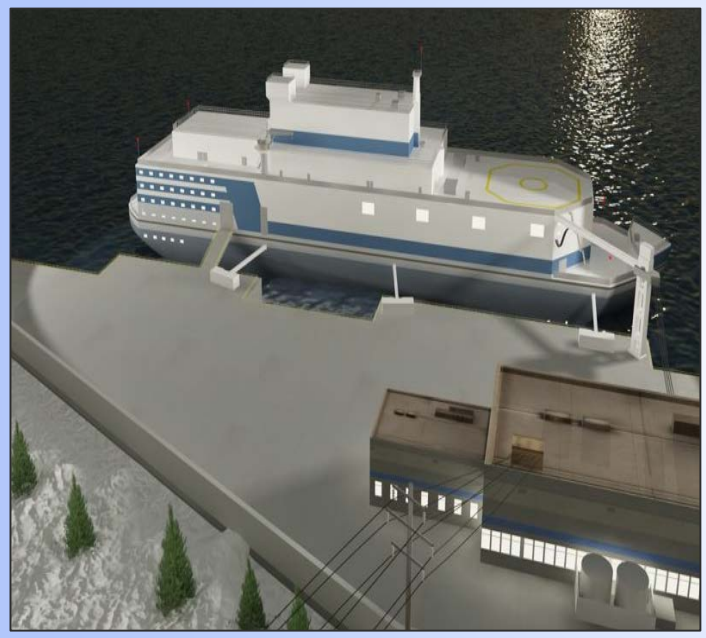
OPERATIONAL ISSUES: Operation (1/2)

- Duty to prevent, reduce and control **pollution to the marine environment** (including airspace) and not to cause **transboundary harm**.
- Duty to consult and cooperate with **neighboring States** to avoid transboundary harm.

OPERATIONAL ISSUES: Operation (2/2)

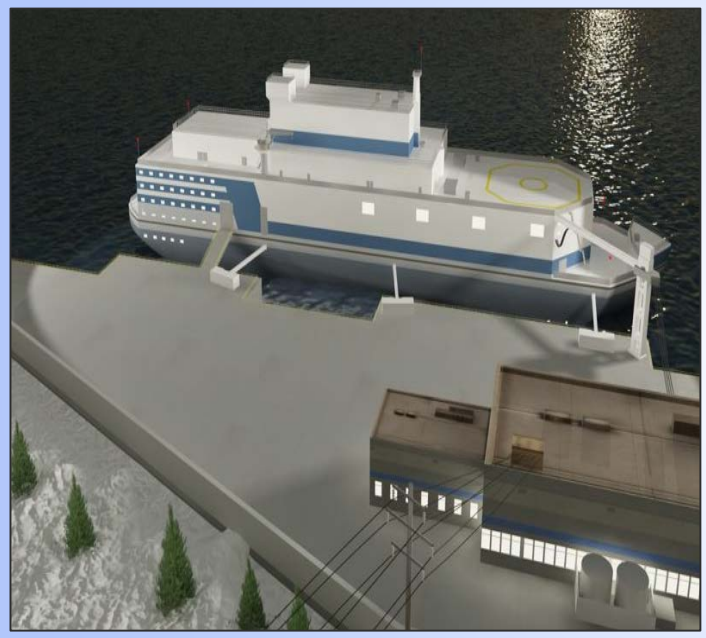
- Need for **emergency planning** and **contingency plans** against pollution.
- Obligation to **notify** of imminent or actual damage (UNCLOS) and obligations in the 1986 Convention on Early Notification of a Nuclear Accident and the 1987 Convention on the Physical Protection of Nuclear Material and Amendment thereto.
- Duty to **assist/cooperate** in search and rescue efforts (UNCLOS) and the rights and obligations in the 1986 Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency.

OPERATIONAL ISSUES: Regulatory Control (1/2)



- A potential future deployment of TNPPs to new entrant countries may involve:
  - **early technology selection** and **partnering** with the supplier country
  - potentially **short TNPP lead time** due to modularization and build-own-operate model/off-take agreement i.e. experienced TNPP operator in new entrant country.

OPERATIONAL ISSUES: Regulatory Control (2/2)



- Such a scenario, amplifies what the new entrant country needs to do in respect of **regulatory control**, as compared to what it is capable of doing.
- There is a need therefore to strengthen how a new entrant country establishes its national nuclear legislative and regulatory framework, including, a **competent regulatory body and licensing system**.

PART IV: CONCLUSION (1/2)

- Need to ensure that the in**ternational instruments/texts comprehensively cover TNPPs** (all stages) in view of design/technical innovations.

- In this context, need to address the issues arising from the limited scope of application of **the Convention on Nuclear Safety** i.e. only to land-based NPPs.

- Also, need for requirements addressing the transport of a fuelled reactor i.e. **IAEA Transport Regulations and IMDG Code and INF Code** - mandatory through SOLAS, Chapter VII.

CONCLUSION (2/2)

- Also, there is a need to consider whether a **new dedicated international legal instrument(s) and/or amendment** of existing instruments/texts is required, as well as other actions including further **guidance/clarification from IAEA/IMO**.
- Finally, a potential future TNPP deployment raises a number of **issues in connection with the transport, placement and operation** of the TNPP.
- In this context, it will be important to ensure that the development of the needed r**egulatory competence** in new entrant countries matches the TNPP deployment timeframe.

Please note that a paper addressing the legal and regulatory challenges associated with the deployment of TNPPs to new entrant countries is being prepared for publication.

Thank you for your attention!

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- ANNNEX -
APPLICATION OF EXISTING INTERNATIONAL INSTRUMENTS/TEXTS
(1/12)

- Since none of the existing international instruments/texts expressly address TNPPs, there is a need to identify the extent to which they are covered.
- IAEA considered TNPPs in the context of the definitions and scope of the current nuclear liability instruments.
- Applying this approach, the following (non-exhaustive) instruments/texts are considered in the areas of nuclear liability, safety and security, as well as ocean law.

APPLICATION … (2/12)

NUCLEAR LIABILITY

- **1963 & 1997 Vienna Convention on Civil Liability for Nuclear Damage & 1997 Convention on Supplementary Compensation for Nuclear Damage**:
  - Applies to a TNPP as a transport of 'nuclear material' and as a 'nuclear installation'.

APPLICATION … (3/12)

NUCLEAR SAFETY

- **1994 Convention on Nuclear Safety**
  - Expressly limited to apply to 'land based nuclear power plants'.
  - **ISSUE: Does a TNPP qualify as such a plant?**
- **1997 Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management**
  - Applies to a TNPP as a 'nuclear facility', 'radioactive waste management facility', 'spent fuel management facility', and for transport purposes, as a 'transboundary movement' of 'radioactive waste' and/or 'spent fuel'.

APPLICATION … (4/12)

NUCLEAR SAFETY contd.

- **1986 Convention on Early Notification of a Nuclear Accident**; and **1986 Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency**
  - Applicable to a 'nuclear accident' and/or 'radiological emergency' involving a TNPP as a 'facility' and/or as an 'activity' i.e. during transport.

APPLICATION … (5/12)

NUCLEAR SECURITY

- **1987 Convention on the Physical Protection of Nuclear Material** and **2005 Amendment**
  - Applies to a TNPP as a 'nuclear facility' and for transport purposes, as an 'international nuclear transport' i.e. of nuclear material.
- **2005 International Convention for the Suppression of Acts of Nuclear Terrorism**
  - Applies to a TNPP as a 'nuclear facility' and for transport purposes, as a transport of 'nuclear material'.

APPLICATION … (6/12)

NUCLEAR SECURITY cont'd

- **1997 International Convention for the Suppression of Terrorist Bombings**
  - Applies to a TNPP as an 'infrastructure facility'.
- **2005 Protocol to the 1988 Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation**
  - Applies to a TNPP as an 'infrastructure facility' and for transport purposes, as a transport by 'ship' of 'special fissionable material'.

APPLICATION … (7/12)

NUCLEAR SECURITY cont'd

- **2005 SUA Fixed Platforms Protocol**
  - Under certain circumstances, it could apply to TNPP as a 'fixed platform' i.e. if permanently attached to sea-bed (continental shelf).

APPLICATION … (8/12)

LAW OF THE SEA & MARITIME INSTRUMENTS/TEXTS

- **UNCLOS**
  - Applies to a TNPP as a 'ship' carrying 'nuclear … substances or material' and likely as an 'installation'.
- **SOLAS 1974, as amended:**
  - Applies to a TNPP as a 'ship' on an international voyage in Chapter V and Chapter VII on carriage of dangerous goods also applies.

APPLICATION … (9/12)

LAW OF THE SEA & MARITIME INSTRUMENTS/TEXTS cont'd

- **INF Code** (mandatory through SOLAS, Chapter VII)
  - Applies to a TNPP in the context of transport of 'inf cargo i.e. packaged 'irradiated fuel' and/or 'high-level radioactive waste'.
  - **ISSUE: Application to a fuelled reactor needs to be addressed.**

APPLICATION … (10/12)

LAW OF THE SEA & MARITIME INSTRUMENTS/TEXTS cont'd

- **IMDG Code** (mandatory through SOLAS, Chapter VII)
  - Applies to a TNPP in the context of transport of packaged 'radioactive material'.
  - **ISSUE: Application to a fuelled reactor needs to be addressed.**
- **MARPOL 73/78**
  - Applies to a TNPP as a 'ship'.

APPLICATION … (11/12)

IAEA SAFETY STANDARDS

- **Regulations for the Safe Transport of Radioactive Material** (incorporated into IMDG Code)
  - Applies to a TNPP in the context of transport of packaged 'radioactive material'.
  - **ISSUE: Application to a fuelled reactor needs to be addressed.**

APPLICATION … (12/12)

IAEA NUCLEAR SECURITY GUIDANCE

- **Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities, INFCIRC 225 Revision 5, NSS no. 13**
  - Applies to a TNPP in the context transport of 'nuclear material' and as a 'nuclear facility'.
  - **ISSUE: Adequacy of physical protection measures to a slow moving barge-towed fuelled reactor.**