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Legal and regulatory solutions to facilitate SMR deployment

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CIL Webinar: A Multi-Pronged Approach Towards SMR Regulation

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1.

The SMR business case and regulatory impacts

"The term "*SMRs*" is not a description of technology – it is a description of a business model"

SMR vendor

“This machine arrives on the site, and just a few days later, you start getting your energy. So, it’s a product, it’s not a project.”

Jacopo Buongiorno, MIT speaking of factory-built micro-reactors

https://scitechdaily.com/nuclear-batteries-offer-a-new-approach-to-carbon-free-energy/

“I’m primarily concerned about the costs and risks of obtaining a license to construct an SMR in my country”

CEO of future SMR owner/operator

SMR business case and regulatory impacts

SMR business case drivers	Success determinants
Design features – revolutionary technology, passive and inherent safety, small, simple, multi-unit facilities, deployed underground/ on barge	**Regulatory action**– new regulations for new technologies and deployment scenarios; validation of safety case and regulatory approval of new design features: time and cost to develop regulations and license new design and deployment features
Standardised design and deployment – subject to limited design changes	**Harmonised/compatible regulations** – overcome established nuclear market inconsistencies in process/regulations/codes and standards: multiple paths to this outcome – contractual, bilateral, regional, international; maximum re-utilisation safety case and safety assessment
Factory manufacture and transport – fully fabricated (fuel loaded?) units with limited on-site construction	**Regulatory action**- shift in focus from on-site construction to in-factory construction; foreign factory manufacture with regulatory oversight: reconsideration of traditional licensing process and bilateral mechanisms for mutual recognition; new transport requirements for fully fueled units?

SMR business case and regulatory impacts (cont.)

SMR business case drivers	Success determinants
Economics – SMR "economies of repetition"	**Regulatory action** - ability to standardize designs and repeat (in multi-unit project, same country, foreign markets): maximum re-utilisation safety case and safety assessment
Financability – reduced equity and debt burden, reduced construction period, expansion of investor/lender sources	**Regulatory risk** – achievement of n'th of a kind; readiness and approach of host country regulator and regulatory infrastructure: achieve not only reduction in actual risk but also perceived risk and reputational risk
Market access – smaller grids, remote locations, diverse applications	**Regulatory barriers to entry** - requirements as to nuclear regulatory and regulatory infrastructure; licensing approach: new markets have the opportunity to develop fit-for-purpose regulatory regimes and approaches

2.

International initiatives and future licensing models

Historical and ongoing work

- **Work to date and ongoing:** IAEA Safety Standards, SMR Regulator's Forum, MDEP, WENRA, the WNA CORDEL Working Group and in the European Utility Requirements
    - Unlikely that global/regional regulatory harmonisation or international design certification will support the first intended wave of SMR export
- **New perspectives:** Example - Fermi Energia

Overview of Fermi Energia study

- **Fermi Energia:** Is an Estonian company that seeks to be the first deployer of SMRs in Europe – around 2030
- **Estonian Government:** Has not yet decided to pursue nuclear energy – in early 2021 established a Government Committee to consider
    - Fermi Energia is working with the Government on all aspects of developing a nuclear power programme in Estonia
- **Study:** Fermi recognises the significance of licensing on SMR viability and commissioned a study with Fortum in 2020 on an optimal approach to SMR licensing
- **Starting point:** A legislative and regulatory "blank canvas"
- **Licensing model:** Presents a potential "**licensing model**" for obtaining a construction licence for an SMR

Note: Whilst the study considers Estonia in particular, it aims to propose a licensing model that can be accepted more broadly

Key findings of the study

1. **International certification:** International or European design certification would be an optimal way to support an Estonian licensing process and model but cannot be expected in the near future
2. **Existing safety case: Licence applicants should seek maximum utilisation of an existing safety case / PSAR prepared for a standard SMR design or reference plant**
3. **Existing safety assessment: The licensing model adopted by the regulatory body should seek to achieve maximum utilisation of the safety assessment undertaken by an experienced foreign regulatory body of the standard SMR design or reference plant**
4. **Regulatory independence:** Despite maximum utilisation of a safety assessment of an experienced foreign regulatory body, an independent safety assessment by the host country regulatory body is essential
5. **Regulatory harmonization:** Utilisation of a standard design or reference plant PSAR and a foreign regulatory body's safety assessment is only possible if the regulatory basis of the host county and relevant foreign country are harmonized
6. **Safety criteria:** Estonian legislation and regulations should set safety criteria compatible with international practice (such as IAEA), but should avoid setting detailed, prescriptive requirements
7. **Methodology:** The Estonian nuclear regulatory body should develop a methodology for (i) its verification of the safety assessment process conducted by the relevant foreign regulatory body, and (ii) the application of a graded approach to review of the Construction Licence application. Existing models, such as that developed by FANR can be utilised or new methodologies developed
8. **Cooperation:** Cooperation between the relevant experienced foreign regulatory body and the host country regulatory body will be essential and mechanisms of cooperation should be put in place expeditiously

SMR Licensing Principles

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FERMI ENERGIA LICENSING ADVISORY GROUP

SMR LICENSING PRINCIPLES

Fermi Enegia's Licensing Advisory Group:

RECOGNISES that successful deployment of small modular nuclear reactors ("**SMRs**") in Estonia, and more widely, is determined to a significant degree by the applicable licensing process and regulatory basis;

BELIEVES that a proactive and constructive approach to addressing licensing and regulatory challenges should be embraced by all stakeholders; and

SUPPORTS the following principles with respect to the potential future licensing of SMRs in Estonia:

1. **Legislative and regulatory framework:** As an important component of the national infrastructure needed for a nuclear energy programme, the Estonian legislative and regulatory framework should be established as a matter of priority. It should implement the EU Nuclear Safety Directives and be based on the International Atomic Energy Agency ("**IAEA**") Safety Standards, as applicable to the relevant SMR(s).

2. **Nuclear regulatory body:** The Estonian nuclear regulatory body should be established as soon as possible.

3. **Regulatory harmonisation:** In developing the regulatory framework, the Estonian nuclear regulatory body should seek to facilitate regulatory harmonisation, giving due consideration to compatibility with the relevant vendor/reference plant country-of-origin regulatory regime(s), which will also assist in enabling SMR design standardisation.

4. **Licensing timeline:** The Estonian nuclear regulatory body and the licence applicant should establish a proposed licensing timeline which will facilitate predictable project deployment, including proactively undertaking preparatory work, to the extent possible, prior to submission of the construction licence application.

5. **Applicant utilisation of existing safety case:** The Estonian licence applicant should seek maximum utilisation of the existing safety case prepared for a standard SMR or reference plant design. The licence applicant will need to be an intelligent customer, competent to undertake an independent assessment of the safety case and prepare the licensing documentation prior to its submission to the Estonian nuclear regulatory body. Ultimately, the licensee will have prime responsibility for the safety of the SMR plant.

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6. **Regulator utilisation of existing safety assessment:** The licensing process should enable the Estonian nuclear regulatory body to achieve maximum utilisation of the safety assessment of the standard SMR or reference plant design conducted by an experienced foreign regulatory body from the vendor/reference plant country of origin or from another experienced nuclear country, thereby making effective use of experienced global human resources in licensing and continuously building upon the safety case for the relevant SMR(s).

7. **Independent safety assessment:** The Estonian nuclear regulatory body should conduct an independent safety assessment (which may be undertaken together with technical support organisations) based on a graded approach that prioritises safety significant items, deviations from the standard SMR or reference plant design and site-specific and licence applicant-specific matters.

8. **Regulatory cooperation:** Cooperation between the Estonian nuclear regulatory body and foreign nuclear regulatory bodies is encouraged. Close cooperation between the Estonian nuclear regulatory body and the nuclear regulatory body of the relevant vendor/reference plant country-of-origin or other experienced nuclear country is essential and cooperation mechanisms should be pursued as early as possible.

9. **International engagement:** Estonia should monitor and seek active involvement in relevant international activities, such as the ongoing work of the IAEA, the OECD Nuclear Energy Agency and the Western European Nuclear Regulators' Association, particularly where significant SMR licensing activities are being undertaken.

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January 2021

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Tallinn Declaration on the Future of SMR Licensing

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THE TALLINN DECLARATION

ON

THE FUTURE OF SMR LICENSING

We, gathered in Tallinn, Estonia,

NOTING the formation of the European SMR Alliance in January 2020 with the goal of facilitating wide-spread Small Modular Reactor ("**SMR**") deployment in Europe by the 2030s;

RECOGNISING the urgent response needed to meet the European Union's commitment to achieving carbon neutrality by 2050;

BELIEVING that SMRs can make a significant contribution to low-carbon energy mixes in the European Union and globally;

RESPECTFUL of the role of nuclear regulatory bodies in ensuring safe, secure and peaceful uses of nuclear energy;

COGNISANT of the impact of nuclear licensing processes and regulatory matters on the business case for SMRs, design criteria, development of supply chains and overall viability of SMR deployment;

CONSCIOUS that effective and efficient utilisation of experienced global human resources in reactor licensing is necessary; and

CONVINCED that SMR vendors and future SMR licensees must proactively engage with regulators in their own countries and in key jurisdictions around the world to promote the optimal way forward for SMR licensing,

Hereby support and will promote the following principles of SMR licensing:

1. A pragmatic approach to SMR licensing must be employed to overcome licensing and regulatory challenges and reduce SMR project risk relating to nuclear regulation and the licensing process.

2. SMR design standardisation must be facilitated to the greatest extent possible.

3. In developing or updating the regulatory framework applicable to SMRs, host country nuclear regulatory bodies should seek to facilitate regulatory harmonisation. Regulatory frameworks should be based on the International Atomic Energy Agency ("**IAEA**") Safety Standards (as applicable to the relevant SMR(s)) and implement European Union Nuclear Safety Directives, as well as give due consideration to compatibility with relevant vendor/reference plant country-of-origin or other experienced nuclear country's regulatory regimes.

4. As the licensee will have prime responsibility for the safety of its SMR plant, the licence applicant will need to be an intelligent customer, competent to undertake an independent assessment of the safety case and prepare the licensing documentation prior to its

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submission to the host country nuclear regulatory body. Licence applicants should seek maximum utilisation of an existing safety case prepared for a standard SMR or a reference plant design.

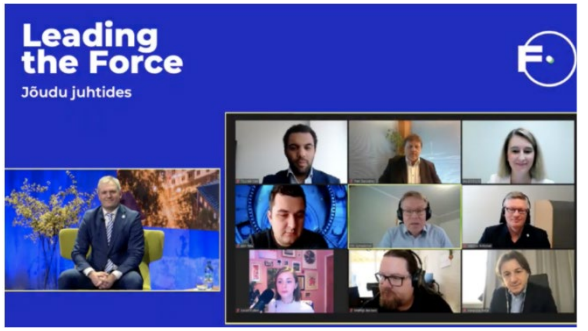
5. To the extent the host country deems it appropriate in its particular circumstances, the licensing process should enable the host country nuclear regulatory body to achieve maximum utilisation of the safety assessment of the standard SMR or reference plant design conducted by an experienced, independent and transparent foreign regulatory body from the vendor/reference plant country-of-origin or from another experienced nuclear country, thereby making effective use of experienced global human resources in licensing and continuously building upon the safety case for the relevant SMR(s). In all circumstances, the host country nuclear regulatory body maintains sovereign and independent decision-making authority.

6. The host country nuclear regulatory body should conduct an independent safety assessment (which may be undertaken together with technical support organisations) based on a graded approach that prioritises safety significant items, deviations from the standard SMR or reference plant design and site-specific and licence applicant-specific matters.

7. Close cooperation between the host country nuclear regulatory body and the nuclear regulatory body of the relevant vendor/reference plant country-of-origin or other experienced nuclear country is essential. Cooperation mechanisms which enable mutual recognition and acceptance of regulatory approvals of experienced, independent and transparent foreign regulatory bodies should be pursued.

8. A mechanism for international design certification should also be pursued and made viable in the future.

9. The signatories will consider the work being undertaken by the IAEA, the IAEA SMR Regulator's Forum, the Nuclear Energy Agency of the OECD, the activities of the International Framework for Nuclear Energy Cooperation with regards to SMRs, and the work of the Cooperation in Reactor Design Evaluation and Licensing Working Group of the World Nuclear Association and the European Utility Requirements, among others.



Tallinn Declaration on the Future of SMR Licensing

Fermi Energia OU, Estonia

Fortum Power and Heat Oy, Finland

Vattenfall AB, Sweden

Tractebel Engineering S.A., Belgium

Synthos Green Energy S.A., Poland

Elektrarna Temelin, a.s.; CEZ Group, Czech Republic

S.N. Nuclearelectrica S.A., Romania

The e-Lise Foundation, Netherlands

18for0, Ireland

Engagement

Licensing Study presented to:

Republic of Estonia
Ministry of the Environment

Estonian Ministry of Environment

IAEA

International Atomic Energy Agency

U.S.NRC
United States Nuclear Regulatory Commission

US Nuclear Regulatory Commission

CNSC CCSN

Canadian Nuclear Safety Commission

stuk

Radiation and Nuclear Safety Authority (STUK), Finland

Not new?

Needs to become accepted and standard practice for licensing SMRs globally

3.
Conclusions

Conclusions – Legal/regulatory solutions to facilitate SMR deployment

- **Industry**
  - Licensing and construction of FOAK standard design/demonstration projects as the priority
  - Vendors (and other licensees) should pay close attention to:
    - Ability to achieve true n'th of a kind future projects to facilitate economies of replication – including in foreign markets
    - Exportability of safety case
- **Regulators**
  - Need experienced regulators to resolve novel aspects of new designs/deployment scenarios
  - Develop harmonised regulatory regimes to facilitate SMR design standardization and optimised licensing processes – pursue immediate solutions as well as longer term goals
  - Develop standard models for mutual recognition of safety assessments
  - Develop standard mechanisms of bilateral regulatory cooperation
  - Opportunity for newcomer countries to develop fit-for-purpose, optimised regulatory frameworks for SMRs
  - Opportunity for similarly situated newcomer countries to cooperate in development of SMR regulatory frameworks and develop harmonised markets for standardised SMR designs

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