Introduction to SMR Licensing study

New Generation Nuclear Energy in Estonia 9.2.2021

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Licensing study in short

- **Main goal:**
  - Seek an efficient licensing model for obtaining a construction licence for a SMR in Estonia.
  - Starting points:
    - A legislative and regulatory “blank canvas”
    - Aim for 12 month regulatory body approval time
    - Particularly considers Estonia as a newcomer nuclear country, but the model could also be accepted more broadly
- **General idea:**
  - Licensee is ultimately responsible for safety and national regulator must have competence to independently ensure it
  - Maximum utilization of an existing safety assessment by the Estonian regulator
    - The SMR design in question has been licensed by a foreign regulator
    - Not First-Of-A-Kind (FOAK) design and project
  - The Estonian regulator would verify the foreign safety assessment and accept it to the extent possible:
    - Design changes minimized and limited only to site
    - Same supplier organizations and supply chain
    - Note: No detraction from the independence and sovereign decision-making of national regulators

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Licensing study in short

- **Focus of the study**:
  - Licensing from nuclear legislation and regulation point of view
  - Construction licence
    - How to obtain it in practice?
  - Technology
    - Three licensing areas: site, technology and organization
  - Emphasis on *Intelligent Customer* and the role of the licence applicant's safety assessment
  - Technology neutral, universal

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Licensing study in short

- **Main results:**
  - Possible general licensing process
    - Overview of different licensing approaches and licensing phases in selected countries
    - Discussion on their feasibility for SMR deployment in Estonia
  - Possible Licensing model
    - Leverage on an existing foreign safety assessment
    - Safety assessments based on graded approach
      - scope of the foreign safety assessment
      - the safety significance of the subjects
      - (system engineering hierarchy)
    - Objectives and methods of safety assessments

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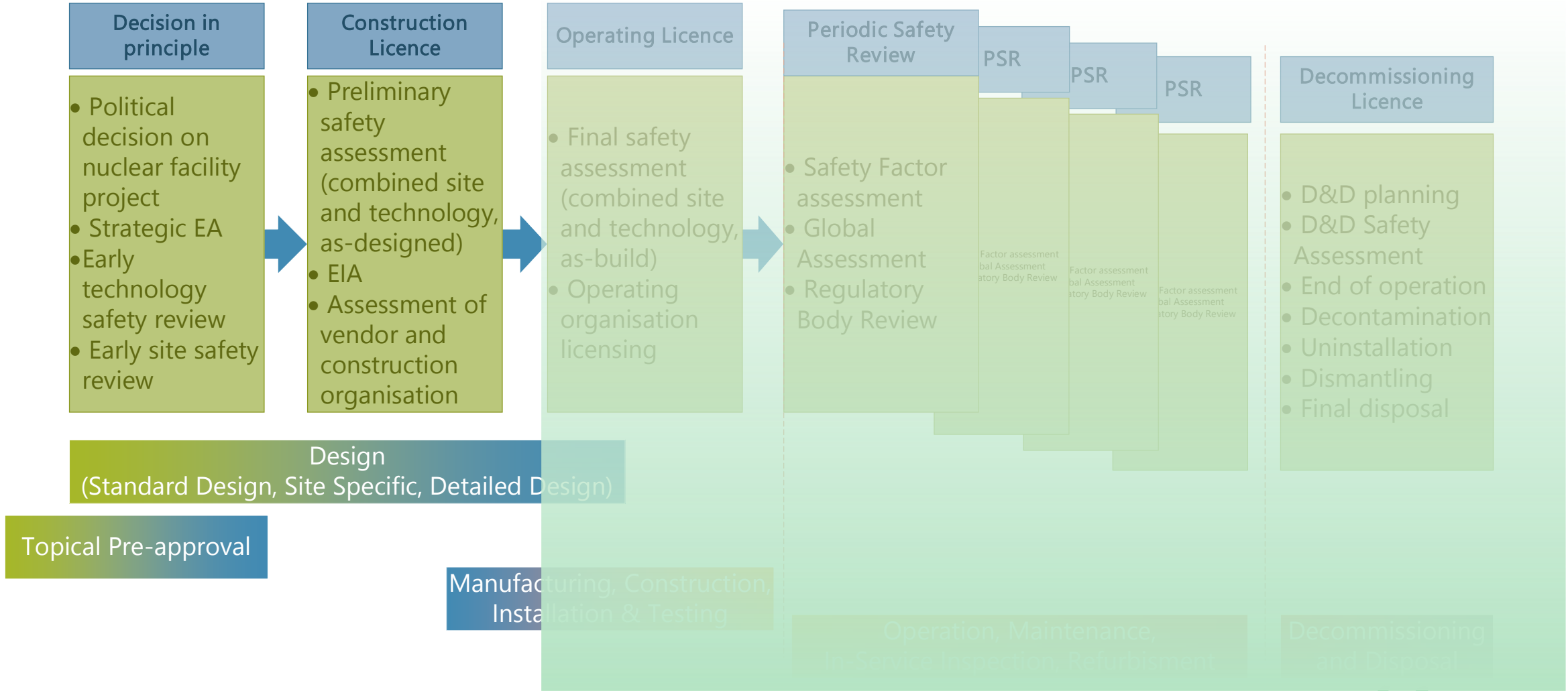
Possible general licensing process

- **Discrete step licensing process**



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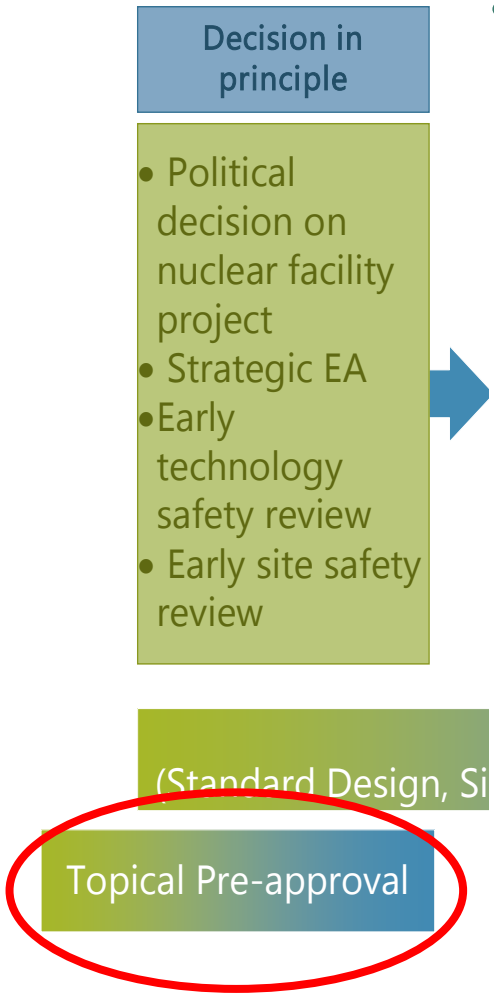
Possible general licensing process



- **Decision in Principle (DiP):**
  - Political decision regarding a **particular nuclear facility project**
    - Not IAEA milestone 1 “national position”
    - Granted during IAEA Milestone approach phase 2
  - Focus on technology and site should be very limited
    - Only preliminary safety reviews to ensure availability of technology (based on standard or reference design) and site alternatives
    - Approach closer to the “original intention” of DiP in Finland
  - Strategic Environment Assessment sufficient
    - Detailed Environmental Impact Assessment (EIA) later
  - Granted by the Government

+ **Topical Pre-Approval process**
  - Binding regulatory approvals (US NRC Licensing Topical Reports (LTRs))
  - Even before and also after the DiP

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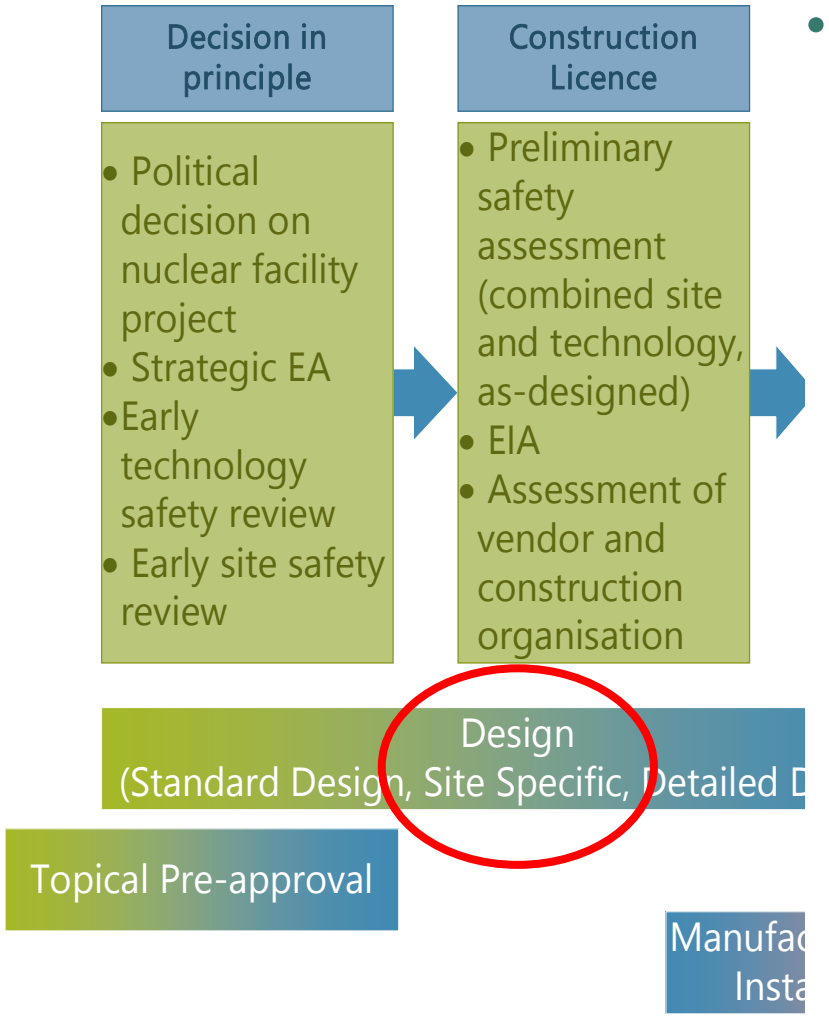
Possible general licensing process



- **Construction Licence:**
  - Combined safety assessment of the site and technology
    - Based on site specific design
  - Detailed Environmental Impact Assessment (EIA)
    - Could be done only for chosen technology and site
  - Assessment of supplier organisations and supply chain as well as licence applicant
  - Granted by the regulator

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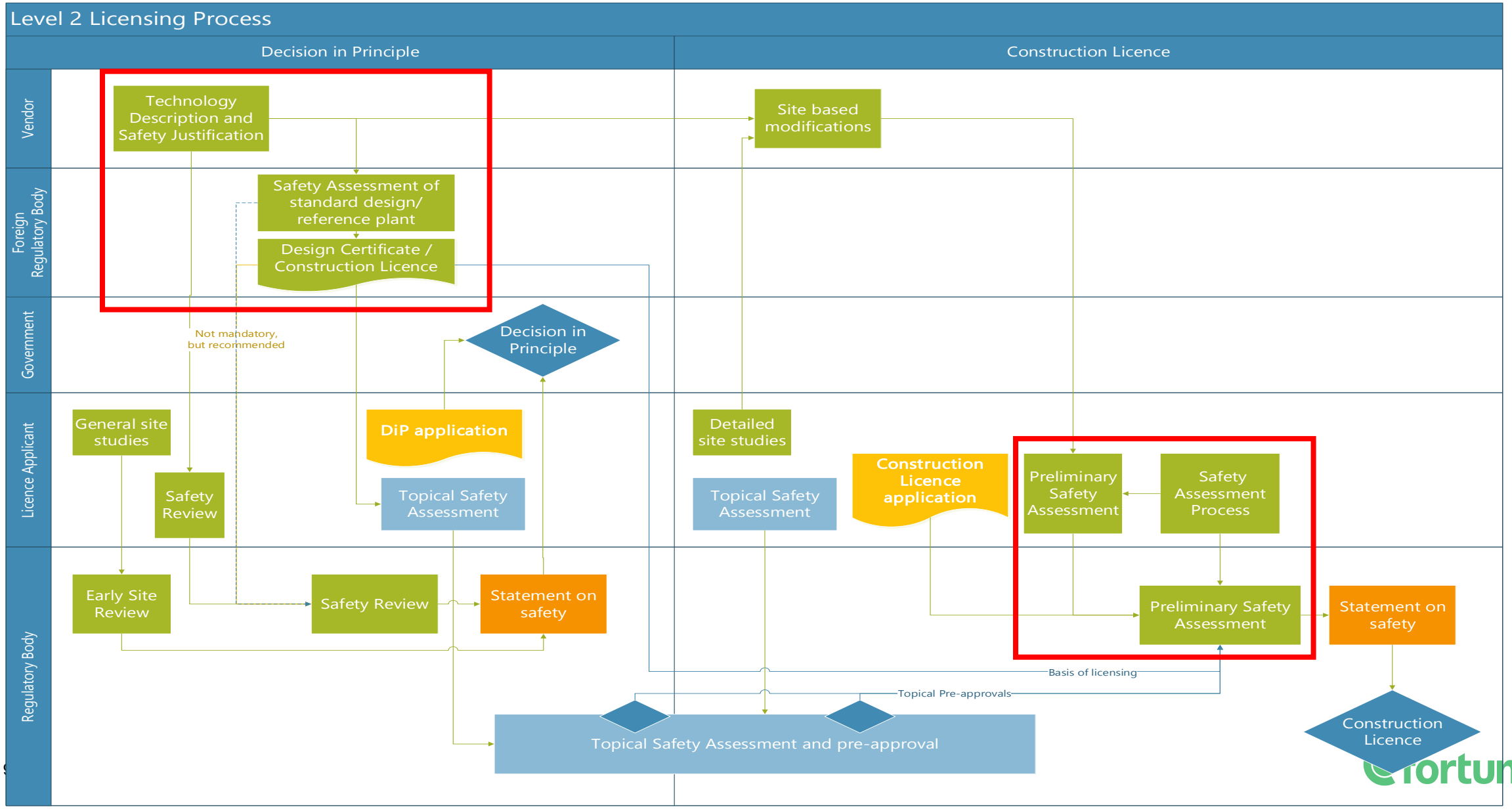
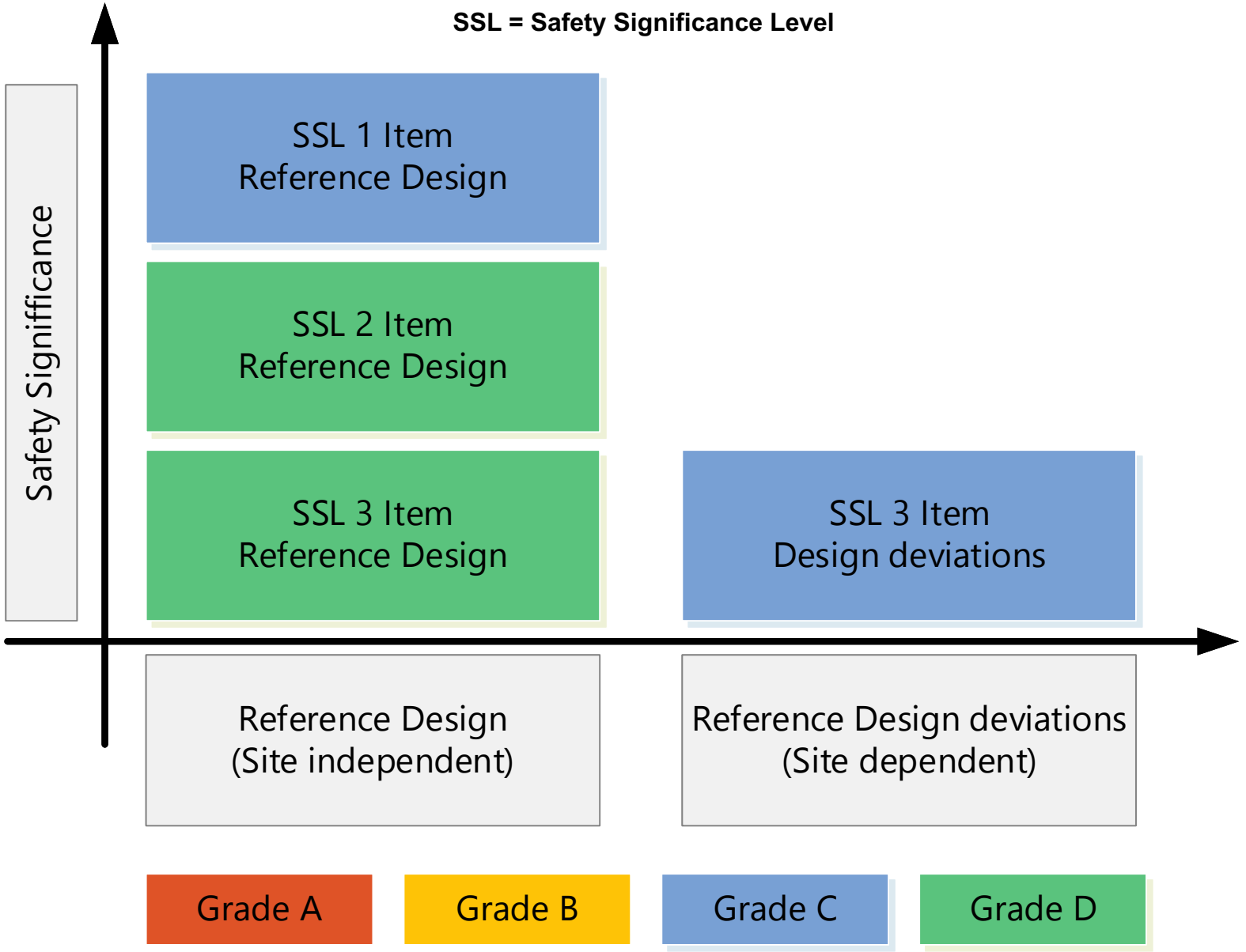
Possible Licensing model



Possible example for application of Graded approach



Reference Design deviations

- Site/environment

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Objectives and methods of safety assessments

- Understanding the safety performance and safety features of the plant

- **Grade A**: Verification of **detailed safety requirements**
  - Independent safety assessment: methods, tools, inputs

- **Grade B**: Verification of **general safety requirements**
- **Grade C**: Verification of **high level safety requirements**
- **Grade D**: Verification of **safety principles**

  - Graded focus Grade B – D regarding methods, tools, input data, results (and licence applicant's and designer's processes).

Grade C example:	
Licence applicant's assessment of:	Regulator's assessment of:
designer's safety assessment: **results, methods, tools and input.**	• foreign regulator's safety assessment **results** • designer's and licence applicant's safety assessment **processes** and **results**.

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Key findings/Conclusions

- **International or European design certification**
  - Would be an optimal way to support an Estonian licensing process and model
  - Cannot be expected in the near future (at least, not on a timeline considered for the first SMR in Estonia).
- Licensing efficiencies can be enhanced through **maximum utilization of an existing safety case and PSAR** and the corresponding **safety assessment of an experienced, independent and transparent foreign regulator.**
- Since the licensee will eventually have prime responsibility for the safety of the plant, the licence applicant will need to demonstrate **intelligent customer** capability.
  - Licence applicant needs to be competent enough to undertake own safety assessment of the PSAR and other licensing documents.
- If the Estonian regulator chooses to maximize the use of a safety assessment of a foreign regulator, the **Estonian regulator must be competent to and must undertake its independent safety assessment**.
  - Verify the completeness and adequacy of the foreign safety assessment
  - To ensure that local or site specific features have been appropriately addressed
  - Assess licence applicant specific matters

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Key findings/Conclusions

- Utilization of the foreign **safety assessment should be based on graded approach**
  - Estonian regulator's depth of safety assessment (technology) prioritizing deviations from the standard or reference plant design and safety significant items.
  - This study presents one possible approach for application of graded approach, but other possibilities also exist and the details can be further discussed.
- **Endorsement of regulatory requirements of foreign country.**
  - Utilisation of standard design or reference plant PSAR and foreign safety assessment are only possible if the regulatory basis and safety standards in Estonia and the relevant foreign country are harmonised. Thus, Estonian legislation and regulations should set safety targets compatible with international practice (such as IAEA), but should avoid setting detailed, prescriptive requirements.
- For **codes and standards** graded approach could be recommended.
  - For higher safety classes the codes and standards of the country of origin could be used. Whereas local codes and standards could be used in the lower safety classes.
- **Cooperation between the Estonian and foreign regulatory bodies**.
  - Significant human resources may be needed from the foreign regulatory body to support the Estonian regulator. This might require government-to-government commitment.
- The suitability (site envelope-based) and **availability of the PSAR** and other relevant licensing documentation, which may be developed/owned by a foreign licensee as opposed to the reactor vendor, must be ensured.

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Licensing Advisory Group

Stephen Burns

- Currently an independent consultant to the IAEA and Nuclear Energy Agency of the OECD.
- Former Chairman/ Commissioner **US Nuclear Regulatory Commission**.
- Former Head of Legal Affairs at the **Nuclear Energy Agency** of the OECD.
- Former General Counsel, US Nuclear Regulatory Commission.

Ian Grant

- Currently an independent consultant.
- Former Deputy Director General Operations and Director of Nuclear Safety of the **Federal Authority for Nuclear Regulation, Abu Dhabi, UAE**. Developed FANR licensing process for Barakah NPP.
- Former Director General, Safety Management, Power Reactor Regulation and Assessment and Analysis of the **Canadian Nuclear Safety Commission.**

Juhani Hyvarinen

- Currently a Professor of Modelling in Nuclear Engineering, **Lappeenranta University of Technology**, Finland.
- Former Executive Vice President and Chief Nuclear Officer of **Fennovoima**.
- Former specialist and management positions at the **Finnish Radiation and Nuclear Safety Authority (STUK)**.
- Membership of OL3 Safety Committee; Loviisa Nuclear Power Plant Safety Advisory Committee; Fortum Nuclear Safety Council; STUK Nuclear Safety Advisory Committee; Fennovoima Nuclear Safety Committee.

Jozef Misak

- Currently a consultant to UJV Rez, a.s. (TSO).
- Former Director General of the VUJE, **Slovak Regulatory Body.**
- Former Head of **Department of Nuclear Safety of IAEA**.
- Expert regarding IAEA Safety Standards, WENRA safety requirements and European Utility Requirements.
- **IAEA expert** for review of compliance of new reactor designs with IAEA Safety Standards (AP 1000, ATMEA, APR 1400, APR 1000, AES 2006, ACPR 1000, TOI-VVER, ACP 1000, ACP 100, CAP 1400)

SMR Licensing Principles

FERMI.

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.

Stephen Burns | **Ian Grant**

Juhani Hyvärinen | **Jozef Misak**

January 2021

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