IAEA
International Atomic Energy Agency
Atoms for Peace and Development

IAEA Activities in Transportable Nuclear Power Plants

Hussam Khartabil – INPRO Section, IAEA

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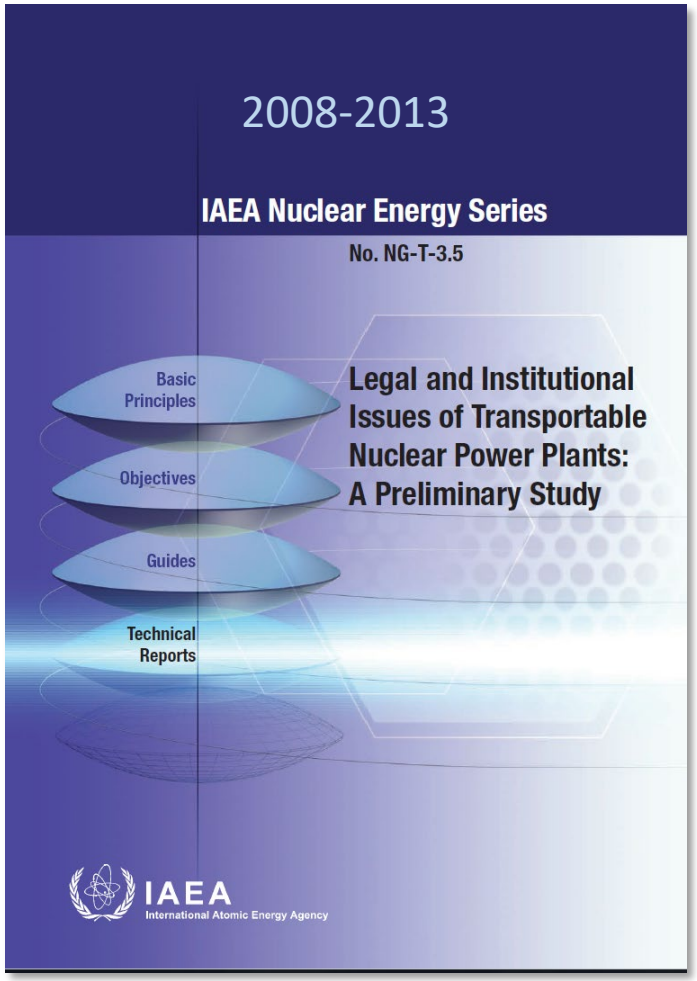
What is a TNPP?

From IAEA Publication NES No. NG-T-3.5

- Factory manufactured and transportable (or relocatable)
- With or without fuel
  - If fuelled ➔ tested/commissioned (brought to criticality)
- With or without the balance of plant
- Transported on rail, truck or barge to the selected site
  - within the manufacturer's country or in a different country
- Does not operate during transport
  - If fuelled, considered reactor in shut down condition
- Returned to the factory after its design life for decommissioning



IAEA Activities – 1st TNPP Study

Two Options (export deployment):

1. Factory fuelled and tested/commissioned
   - **Supplier** maintains, refuels and decommissions
2. Factory tested (no nuclear fuel)
   - **Host** State maintains, fuels and refuels

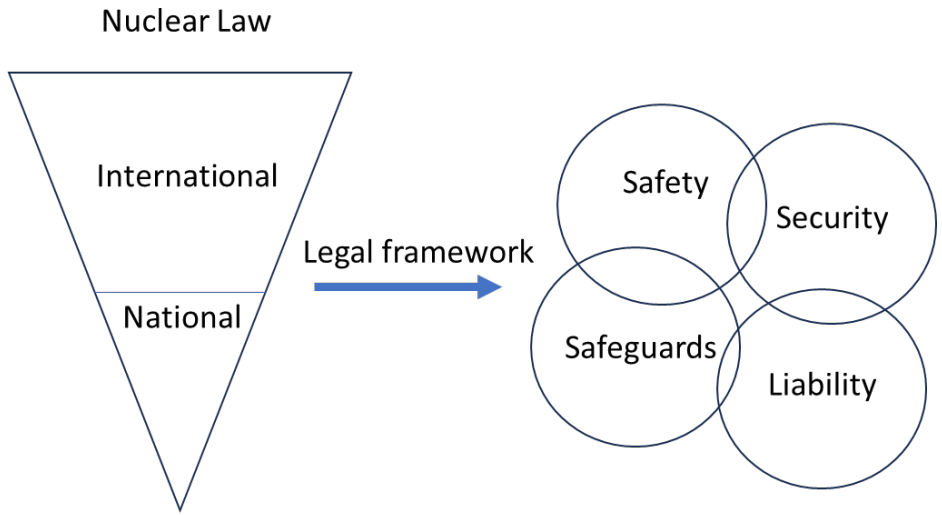
Two scenarios:

A. Supplier State is operator

B. Host State is operator

Host State is regulator under both scenarios

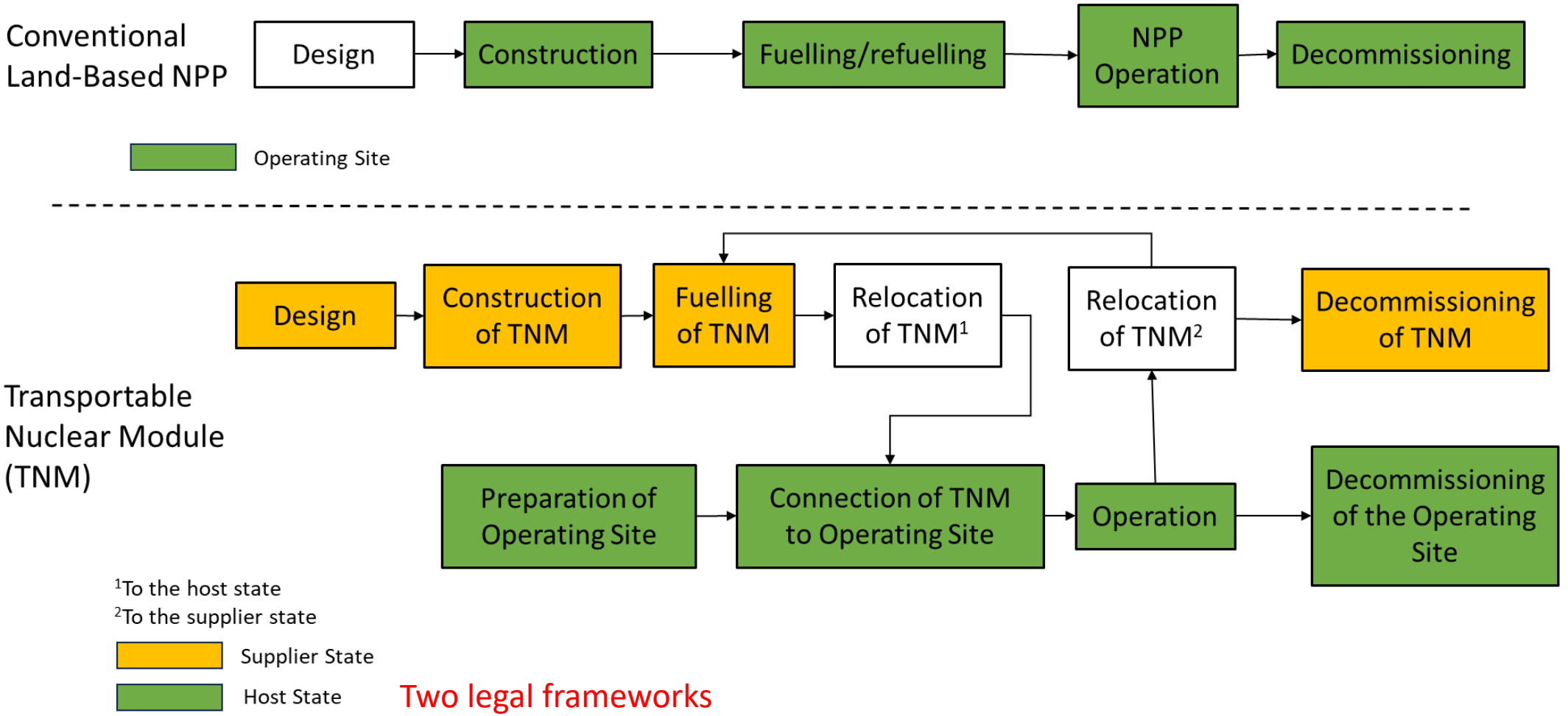
Focus on Legal and Institutional Issues



*Finding: **factory fueled TNPP** option has gaps and insufficient coverage in the international nuclear law and in the non-binding international norms ➔ 2nd TNPP study*

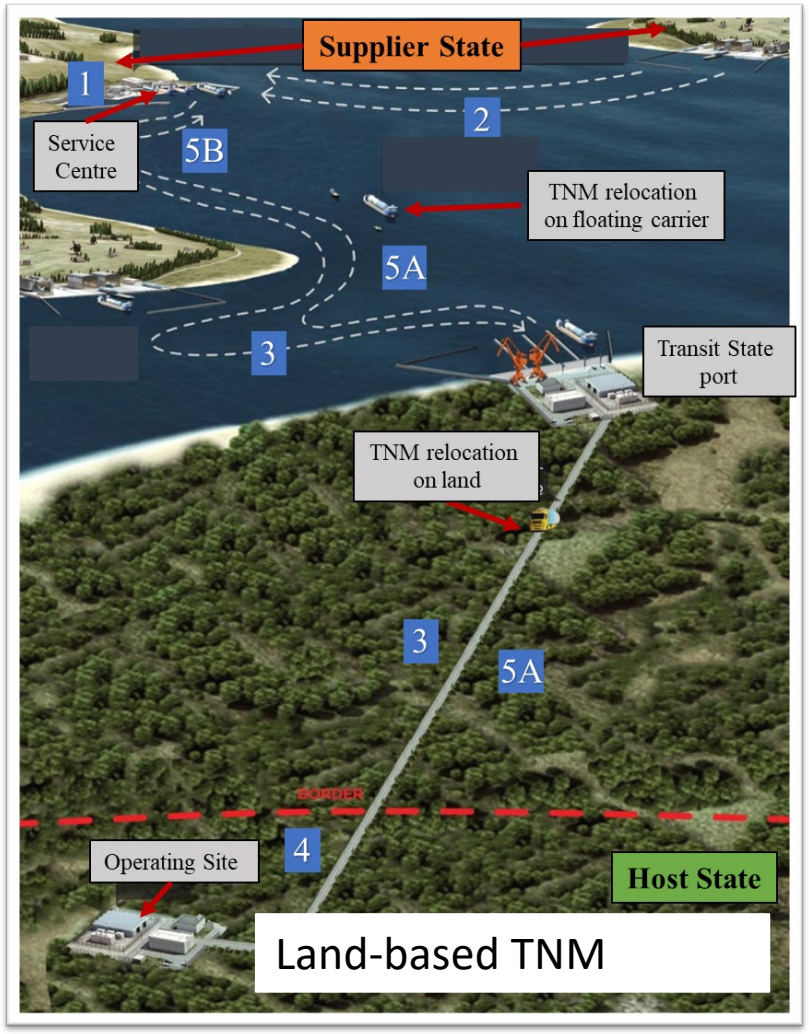
Conventional NPP vs. Factory Fuelled TNPP

Transportable Nuclear Module (**TNM**): factory **fuelled and commissioned** reactor (SMR or microreactor) that can be transported as **complete or near complete system**



Two legal frameworks

Deployment Scenarios



Stage 1. Design and Construction of the TNM

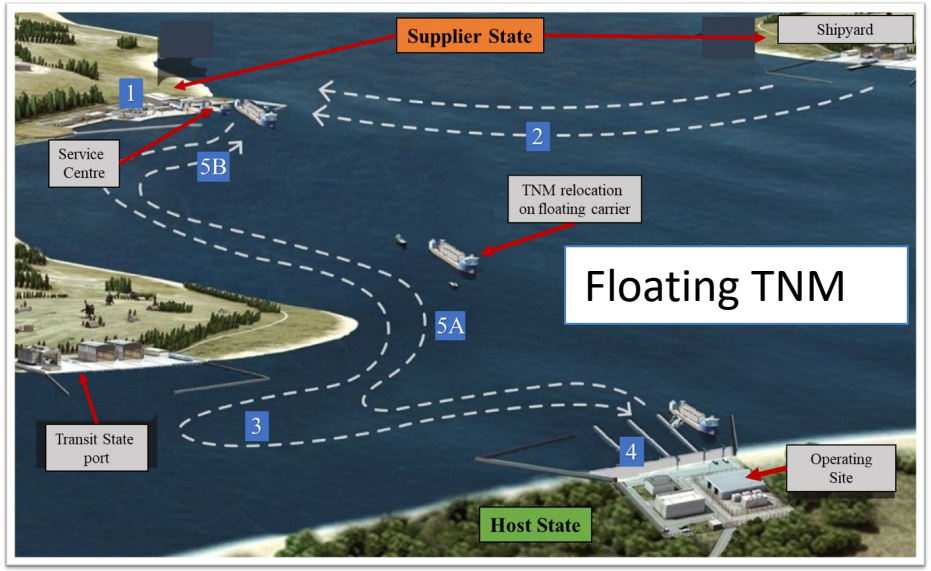
Stage 2. Delivering fuel and first fuel loading into TNM

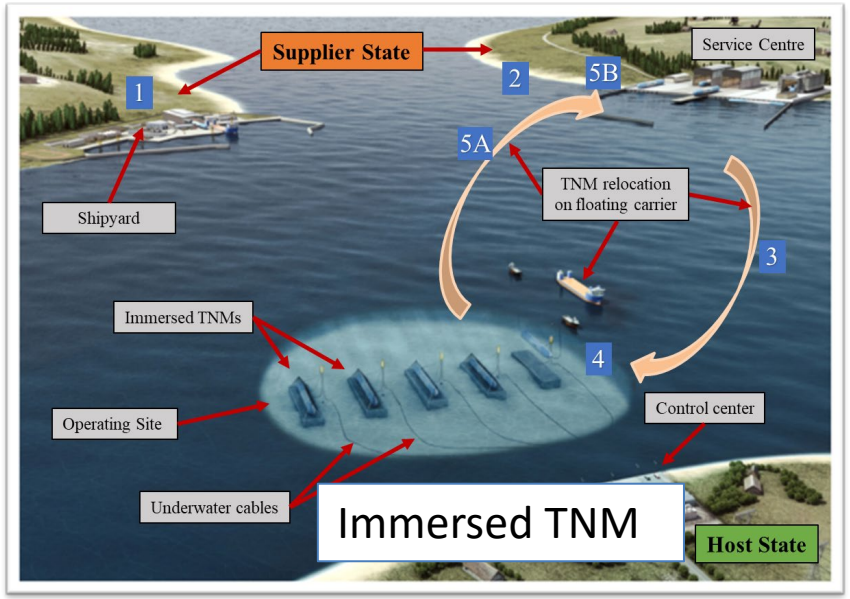
Stage 3. Relocation of the TNM to the Operating Site

Stage 4. TNM Operation

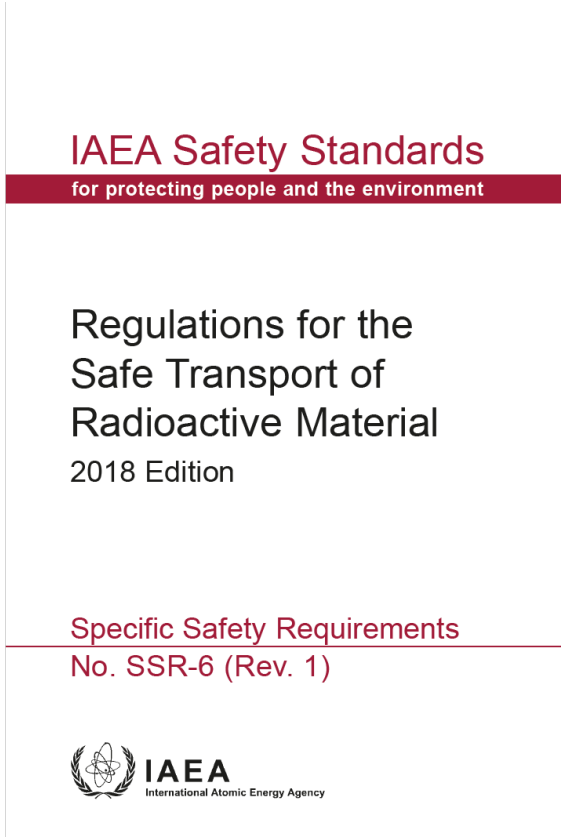
Stage 5A. TNM relocation and refuelling

Stage 5B. Decommissioning of TNM



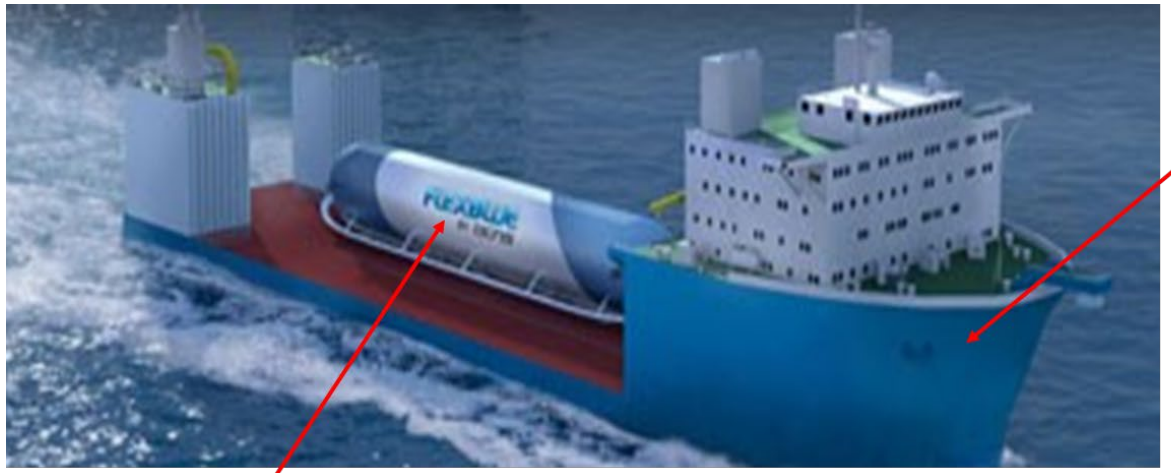


Example of gap in international legal instruments: Transport



Safety requirements for the transport of radioactive material by all modes of transport. Safety is assured by **packaging**

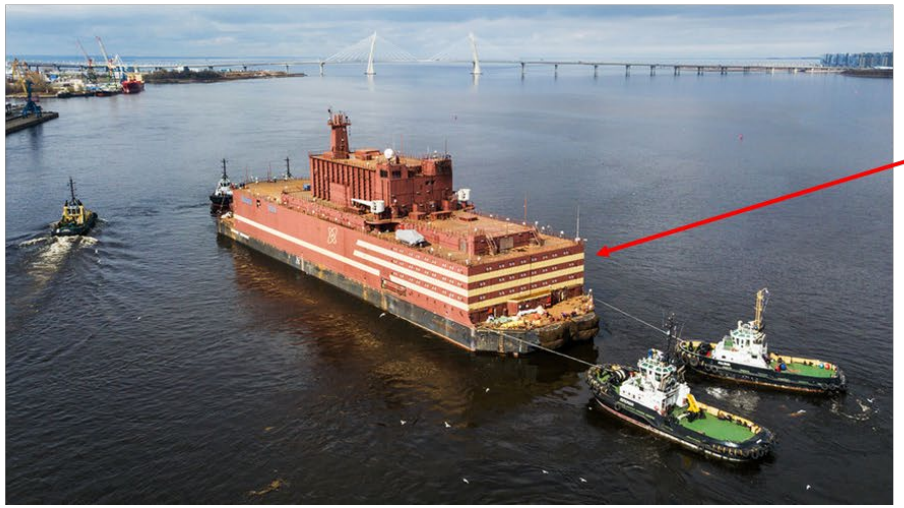
TNM Examples



Cargo (Bulk) Ship

Land-based TNM – land and possibly sea transport

Immersed TNM or TNPP



Floating TNM or TNPP or FNPP

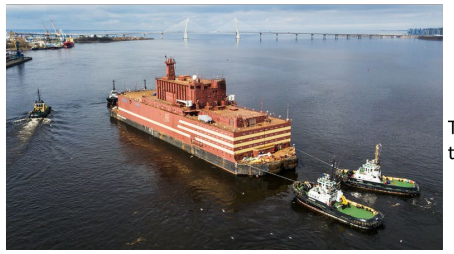
Transport of TNM

- Transport using packages specified in SSR-6 may not be possible, particularly for large size TNMs
- For transport by sea: no code for design of ships to transport nuclear reactors with irradiated fuel
  - There is a code for nuclear powered ships (needs updating) + INF code for **packaged** nuclear material

Transport using cargo ship (immersed or land-based TNM)

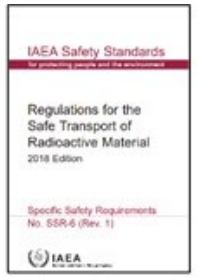
Cargo (Bulk) Ship

(Land-based TNM)



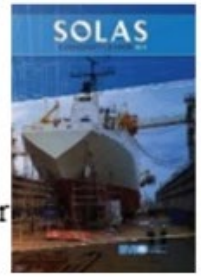
Towing using tug boats (floating TNM)

SSR 6 (Rev.1)
2018 Edition
Class 7 – All modes



UN Model Regulations
All 9 Classes of Dangerous Goods – All modes

SOLAS
International Convention for the Safety of Life at Sea



IMDG Code
International Maritime Dangerous Goods

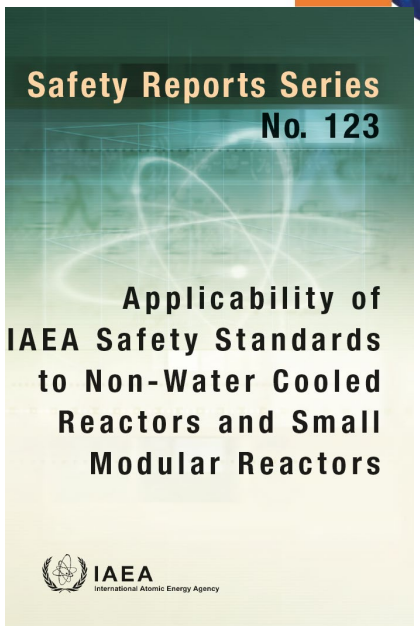
EmS Guide
Emergency Response Procedures for Ships carrying DGs

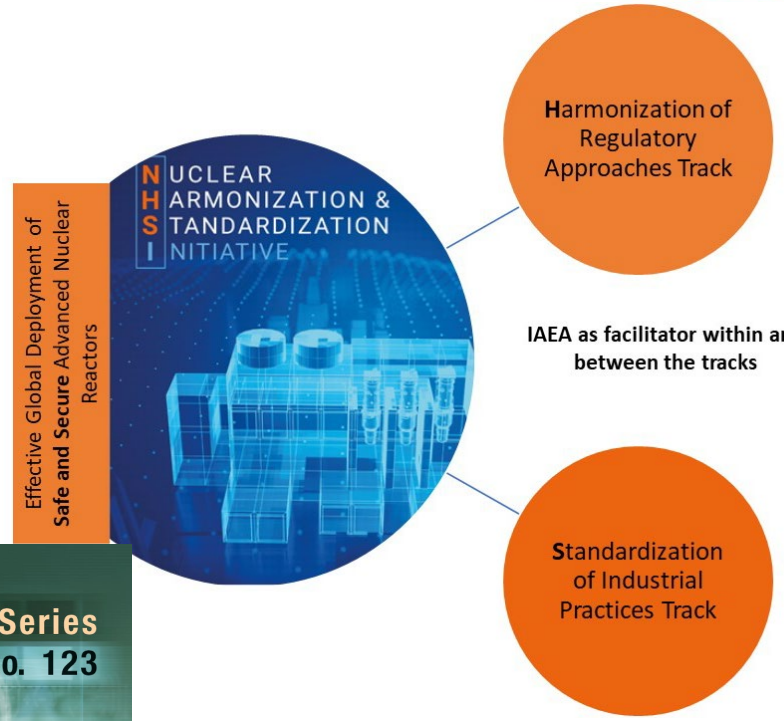
INF Code

International Code for the Safe Carriage of Packaged Irradiated Nuclear Fuel, Plutonium, and High-Level Radioactive Wastes on Board Ships.

Recent and Ongoing Activities to Address Gaps

- IAEA FNPP Symposium, November 14 -15, 2023
- Nuclear Harmonization and Standardization Initiative
- Advanced Reactors Information System (ARIS)
- Applicability of IAEA Safety Standards to Non-Water Cooled Reactors and Small Modular Reactors, SRS No. 123 (2023)
  - Includes TNPPs
- Design Safety and Security Considerations for Floating Nuclear Power Plants
- Transport Safety Standards Committee created working group on TNPPs
- 3S (safety, security, safeguards) by design





Key Findings

- International legal framework has limited applicability due to TNM unique features such as transportability
  - TNM life cycle is implemented under the jurisdiction of two legal frameworks (Supplier and Host States) ➔ cooperation and close interaction necessary
- Some gaps in legal framework may be covered by Intergovernmental Agreements
  - Pilot Projects (FOAK) will bring new practical information for further deployment of TNMs
- TNM relocation by road or sea may be possible using existing legal framework
  - Depends on TNM size/design but challenges remain – may need a different approach
- There is currently no regulatory framework for the relocation of “large” TNM that cannot be packaged based on SSR-6 requirements
- IAEA-International Maritime Organization (IMO) cooperation needed to address TNM relocation by sea

Thank you

h.khartabil@iaea.org