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# Legal and Institutional Issues of Transportable Nuclear Power Plants: A Preliminary Study

IAEA Nuclear Energy Series No. NG-T-3.5

*NENP/INPRO Section*



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International Project on  
Innovative Nuclear Reactors  
and Fuel Cycles

# OUTLINE

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- Security Issues for Factory Fuelled and Tested TNPPs (Option 1)
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# STATUS

- The study was carried out in 2007-2012
- In 2013, the results of this study were published as:  
“Legal and Institutional Issues of Transportable Nuclear Power Plants:  
A Preliminary Study”, IAEA Nuclear Energy Series No. NG-T-3.5:  
<http://www-pub.iaea.org/books/IAEABooks/10516/Legal-and-Institutional-Issues-of-Transportable-Nuclear-Power-Plants-A-Preliminary-Study>

# OBJECTIVE

The objectives of this report were to:

- Examine legal and institutional issues and challenges — including those concerning ownership and contract — related to the deployment of TNPPs, considering several technological options and deployment scenarios
- Identify challenges
- Examine the implications of TNPPs on the infrastructure of the recipient countries

The focus was on export deployments of TNPPs in countries other than country of origin and the implications of a TNPP options to the infrastructure of the recipient countries.

## DEFINITION

- A Transportable Nuclear Power Plant (TNPP) is a factory manufactured, transportable and/or re-locatable nuclear power plant, which, when fuelled is capable to produce final energy products like electricity, heat, desalinated water, etc.
- A TNPP includes the nuclear reactor (with or without fuel, depending on the TNPP option considered) and the balance of the plant and fuel storage facilities, if necessary.
- The TNPP is physically transportable, but is not designed either to produce energy during transportation or provide energy for the transportation itself.
- The installed TNPP, land-based or floating, is intended for the use in the host State for different purposes such as electricity supply for remote areas, district heating, desalination of sea water and hydrogen production, while preserving its capability for relocation if necessary.

# DEFINITION- EXAMPLE PROJECTS

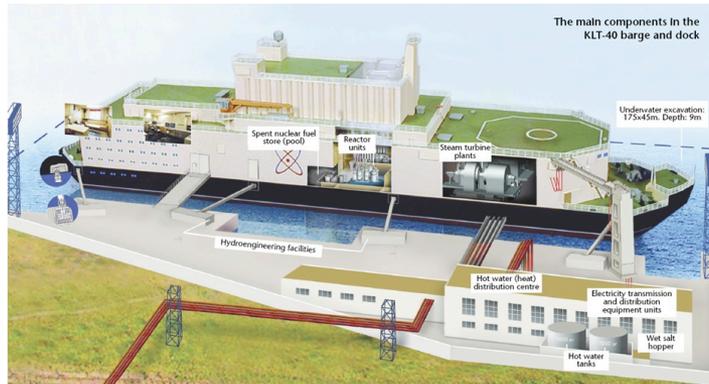


Figure 2. Flexblue NPP module in its operational position on the sea bottom [14]

Figure 1. General view of a floating NPP with the two KLT-40 reactors [13]

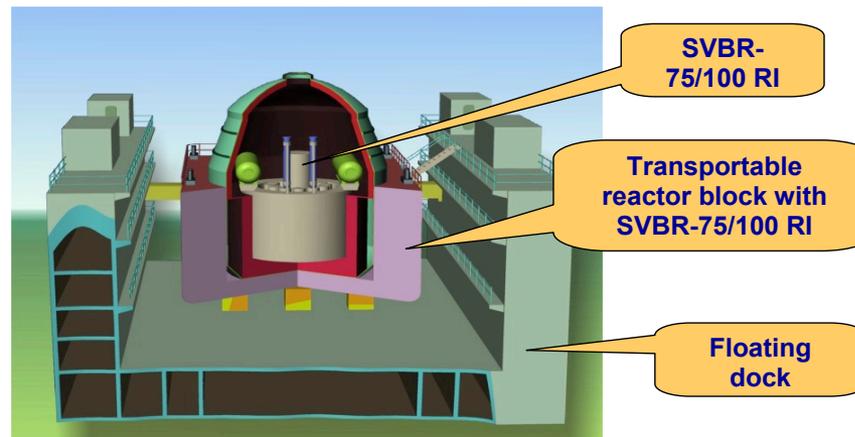


Figure 3. The SVBR-100 reactor module – a floating dock delivery option [5]

# TECHNICAL OPTIONS

## Option 1:

A TNPP, factory assembled, supplier factory fuelled and tested, supplier factory maintained and refuelled or decommissioned, complete with the balance of the plant on one barge (or platform, if transported by truck or rail) or with the balance of the plant on a separate barge (or platform), or the balance of the plant built on the land in a conventional way to which the reactor is then connected at the site.

## Option 2:

A TNPP, factory assembled, factory pre-tested (non-nuclear tested), maintained, fuelled and refuelled on site, with storage facilities for fresh and spent fuel located on board or at the site. Fuel is delivered to the site either overland in the conventional way or by a dedicated fuel delivery ship. The balance of the plant may be on the same barge (or platform) as the fuel, on a separate barge (or platform), or built on land in a conventional way with the reactor then connected at the site.

# REFERENCE SCENARIOS (1)

## Scenario 1 (Supplier is operator/host State is regulator):

- The supplier provides, operates and takes back the entire TNPP, including the spent fuel. The TNPP is operated by the supplier. The TNPP is regulated and licensed by the host State.

## Scenario 2 (Host State entity is operator/host State is regulator):

- The supplier provides and takes back the entire TNPP, including the spent fuel. The TNPP is operated by an entity established by the host State, and regulated and licensed by the host State.

# REVIEW OF INFRASTRUCTURE ISSUES AGAINST “MILESTONES” NG-G-3.1 (1)

- Infrastructure issues relevant to export deployment of TNPPs have been reviewed in the nineteen areas defined by the IAEA Nuclear Energy Series No. NG-G-3.1, Milestones in the Development of a National Infrastructure for Nuclear Power .
- The review was centrally focused on the differences from when a conventional NPP is acquired.

# REVIEW OF INFRASTRUCTURE ISSUES AGAINST “MILESTONES” NG-G-3.1 (2)

- It was found that export transactions with TNPPs may involve not only the supplier State and the host State but, depending on the technical option used, other countries too, i.e. third parties to the transaction.
- Transport of non-irradiated components for NPPs is current practice and the fresh and spent fuel is transported under clearly defined and agreed upon standards.
- Different from that, third parties may consider that they also have an interest, if factory-fuelled reactors are transported through their territory or territorial waters.
- At the end of operating life, the removal of a TNPP with the fuel in the core may also arouse similar interest. In view of this, the transport of a TNPP with fuel in the core (Option 1) requires careful consideration by all involved countries (the supplier State, the host State, and the countries through the territories or territorial waters of which the plant is to be transported) and may require special legal arrangements.

# REVIEW OF INFRASTRUCTURE ISSUES AGAINST “MILESTONES” NG-G-3.1 (3)

## Conclusions regarding the Supplier:

- A TNPP supplier may consider several options, such as leasing the TNPP, selling the TNPP with payment on delivery, operating the TNPP and selling the electrical output, the produced steam or any other products.
- Each of these options could facilitate a host State deciding that buying a TNPP is more appropriate than purchasing a reactor to be constructed on the site.
- Recognizing the responsibilities of the host State regulator, the supplier may need to make a commitment to the host State regulator, to enable access to the design details and safety case approved by the national regulator of the supplier country.

# REVIEW OF INFRASTRUCTURE ISSUES AGAINST “MILESTONES” NG-G-3.1 (4)

## Conclusions regarding the Host Countries:

- Introducing a TNPP may require less financial and human resources from the host State. There are, however, several issues that the Host State will not be able to avoid and these need to be considered by all involved parties within the host State. The establishment of a group to consider all of the implications of nuclear energy within the country remains important.
- Among the key topics that the Host State needs to address are commitments to establish appropriate nuclear legislation, liability undertakings, and a regulatory body with the authority, responsibility and competence to oversee the a nuclear plant.
- The host State regulatory body needs to be capable of setting national standards for the nuclear plant, of ensuring that the standards are achieved during manufacture and commissioning, as well as during licensing the operation.

# REVIEW OF INFRASTRUCTURE ISSUES AGAINST “MILESTONES” NG-G-3.1 (5)

## Conclusions regarding the Host Countries (continued):

- The Host State regulatory body cannot outsource the responsibility for these actions although it will be appropriate to obtain advice and guidance from other regulatory bodies, including the supplier’s regulatory body
- The Host State will need to establish criteria for the site. Arrangements for environmental protection, emergency planning, security and physical protection should (like in the case of a conventional NPP) consider all phases of the TNPP lifecycle, in particular, TNPP transport before and after installation.

# SAFEGUARDS ISSUES

- There is nothing distinctive about the characteristics of the construction or operation of a transportable nuclear installation which would differentiate it from the construction or operation of a non-transportable nuclear installation from the point of view of safeguards
- If the facility is to be constructed in a Nuclear Weapon State (NWS) and exported to a Non-Nuclear Weapon State (NNWS), it would be useful for the NWS to enter into an arrangement with the IAEA whereby the IAEA is able to verify the design information of the facility while it is under construction.
- In the case when TNPPs are based on factory fuelled reactors designed for operation without on-site refuelling, the IAEA may need to validate its ability to verify long life cores without access to fuel for re-measurement

# INTERNATIONAL LEGAL FRAMEWORK AND LEGAL ISSUES

## The international legal framework has been analyzed explicitly (Annex 1 to the report)

- The applicability of the international legal instruments (conventions) on nuclear safety, nuclear security and liability for nuclear damage to TNPP transactions conducted by the States parties to these instruments needs careful consideration in light of the provisions regarding the scope of each particular convention.
- International non-legally binding documents established by the IAEA would apply to TNPPs. The flexibility of the “Fundamental Principles” as well as of the “Safety Requirements” allows to select the provisions which are applicable to meet requirement of the supplier State and the host State.

# INTERNATIONAL LEGAL FRAMEWORK AND LEGAL ISSUES (2)

- **Option 2 (where fuel is transported separately from the reactor) will not require any new legal instruments to be developed to cover transport.** It may require special arrangements to ensure that the TNPP (as opposed to the fuel) can be transported back to the supplier state. Examples of international transport of large irradiated NPP components under special arrangements exist
- **Scenarios 1 (Supplier is operator/host State is regulator) and 2 (host country entity is operator/host State is regulator) do not pose legal or institutional challenges.** The important point is to ensure that commercial arrangements for TNPP supply address, in a comprehensive manner, the legal authority of the supplier and the host State and the rights of supervision of the host State regulator, which in any case retains the authority to issue the licences and permits at all stages of operation taking place in the host State

# INTERNATIONAL LEGAL FRAMEWORK AND LEGAL ISSUES (3)

- The applicable international nuclear law and related regulations has shown that for the case when factory-fuelled and -tested reactors (Option 1) are to be used in a TNPP, there are obvious 'gaps' and an insufficient coverage of certain TNPP related activities. In addition to this, there is no sufficient legal certainty or predictability in the evolution of international legal frameworks.
- Suppliers and hosts of TNPPs interested to operate in clear and predictable legal realities can achieve this goal, if the Supplier state and the Host state and all of the involved third countries, conclude an international treaty among themselves on the use of factory fuelled TNPPs
- In the absence of such a treaty, the supplier and operator of TNPPs will have to abide by the applicable national laws, regulations and international conventions.

# SAFETY ISSUES FOR OPTION 1 (1)

- A consensus needs to be found on whether the particular factory fuelled reactor in transport should be considered an operable reactor or could be rated as just a package of nuclear fuel (fresh or spent).
- The consensus needs to be found among all involved parties, which are the supplier State, the host State and all countries through the territories or territorial waters of which the fuelled reactor is transported.
- The decision would depend on the assessment of the technical measures implemented in a particular TNPP design to prevent criticality in transport and would need to be communicated clearly to the international community.

# SAFETY ISSUES FOR OPTION 1 (2)

- If the consensus is to rate the transported reactor as a fuel package, then the currently adopted legal norms and safety standards for the transportation of fresh and spent nuclear fuel would apply.
- The specific case when the transported reactor is rated as an operable reactor, is at the moment not addressed explicitly by international legally binding norms or non-binding recommendations (safety standards and security recommendations)

# SECURITY ISSUES FOR OPTION 1

- The existing legally binding norms and recommendations on nuclear security (physical protection) are of a generic nature - they have been carefully developed by the States Parties (IAEA member states in the case of IAEA security recommendations) not to impede technological innovations of any kind.
- Lacking any rationale to the contrary, it could be concluded that the application of the existing legally binding and non-legally binding physical protection norms and recommendations remains valid to address the known concerns in the case of a transport of a TNPP.
- Given the novelty of this option, existing recommendations should perhaps be more stringently applied until more specific, experienced based, norms and best-practices are established.

# OPTION 1 – HOW TO RESOLVE ISSUES IN THE NEAR TERM (1)

- In a broader context, all countries likely to be involved in the use of TNPPs should become in due time Parties to the international conventions on nuclear safety, nuclear security and liability for nuclear damage.
- The supplier State, the host State, and all involved third countries could agree to conclude an international treaty or treaties among themselves to cover relevant innovative aspects regarding the use of TNPPs that are presently not the object of existing legal norms.
- Specifically, such treaties should legally define when the NPP becomes subject to international safety, security and nuclear liability requirements, and how and by whom the responsibilities for nuclear safety, security and liability are to be exercised (if necessary, transferred) during TNPP commissioning, transport through other legal jurisdictions, and installation at the host State site.

# OPTION 1 – HOW TO RESOLVE ISSUES IN THE NEAR TERM (2)

- On the basis of the provisions of the above mentioned treaties, the relevant safety, security and environmental requirements would need to be developed and emplaced as part of national regulations in all of the States involved in the export transaction.
- Thoughtful application of the existing national regulatory norms and international safety standards also provides a good starting point, as many of them would be applicable to innovative technical developments that might not have been considered at the time of drafting

# LOOKING AHEAD

- It remains a point for future consideration that international certification of the designs, and international licensing of the equipment, components and even operating staff might greatly facilitate international transactions involving the innovative TNPPs



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**THANK YOU  
for your attention!**

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