



General Approaches to Physical Protection of Small Modular Reactors

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and their Applications

1. CONVENTION ON THE PHYSICAL PROTECTION OF NUCLEAR MATERIAL AND NUCLEAR FACILITIES

Amendment to the Convention on the Physical Protection of Nuclear Material

IAEA International Law Series No. 2



FUNDAMENTAL PRINCIPLE:

Each State Party shall establish, implement and maintain an appropriate physical protection regime applicable to nuclear material and nuclear facilities under its jurisdiction, with the aim of:

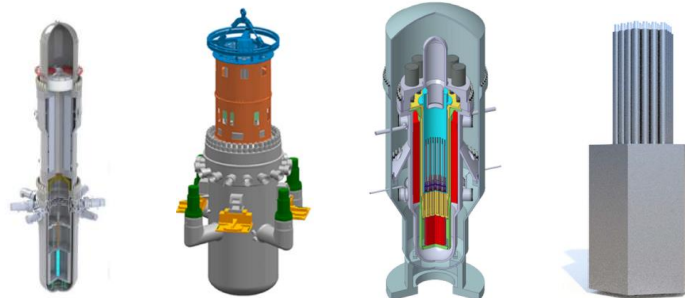
- protecting against theft and other unlawful taking of nuclear material in use, storage and transport;
- ensuring the implementation of rapid and comprehensive measures to locate and, where appropriate, recover missing or stolen nuclear material;
- protecting nuclear material and nuclear facilities against sabotage;
- mitigating or minimizing the radiological consequences of sabotage.

2. TYPES OF SMALL MODULAR REACTORS

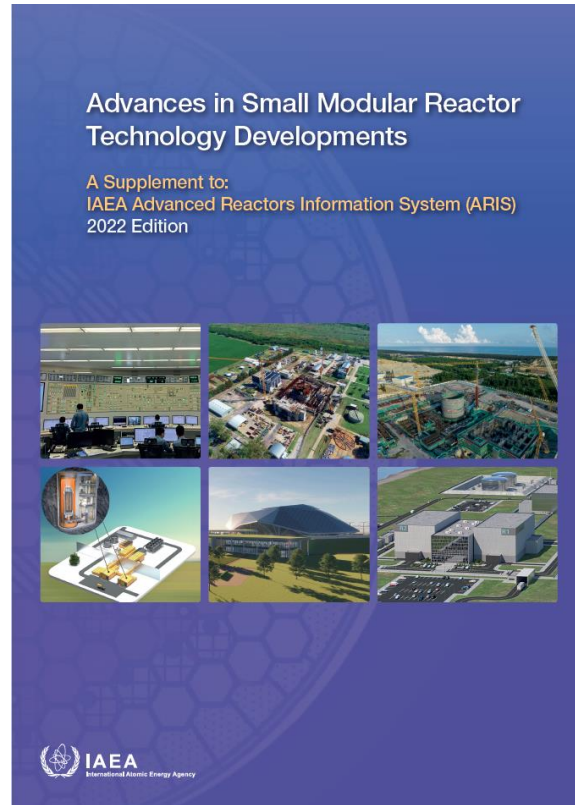
SMR CATEGORIES :

- Land-based SMR;
- Maritime-based SMR;
- Micro-reactors.

There are currently more than 80 SMR projects under development and deployment at various stages in 18 countries.



KLT-40S (JSC “Afrikantov OKBM”, Russian Federation)



3. THE RUSSIAN FEDERATION SOLUTIONS

The SMR physical protection system should be effective, taking into account the design basis threat which is typical of the SMR placement location.
The Russian Federation has successfully found all the necessary solutions.



The fundamental parameters for determining the configuration of the physical protection system and physical protection measures are the category of nuclear material, as well as the consequences of radiological exposure.

There is no fundamental difference from organizing physical protection of various types of reactors.

4. FEATURES OF THE FNTPP PHYSICAL PROTECTION SYSTEM



During the development of the physical protection system of the FNTPP, certain features were identified at the following stages:



Construction of the floating power unit (FPU)



Fuel loading and transportation of the FPU to the place of operation



Operation of the FPU

4.1. PLACE OF OPERATION OF THE FNTPP



The principal feature of the FNTPP is that the power unit is located on water. This significantly influenced the development of the design basis threat and the definition of a way of implementation of potential threats.



4.2. CONSTRUCTION OF FPU AND FNTPP



The construction of the FNTPP took place in several stages:

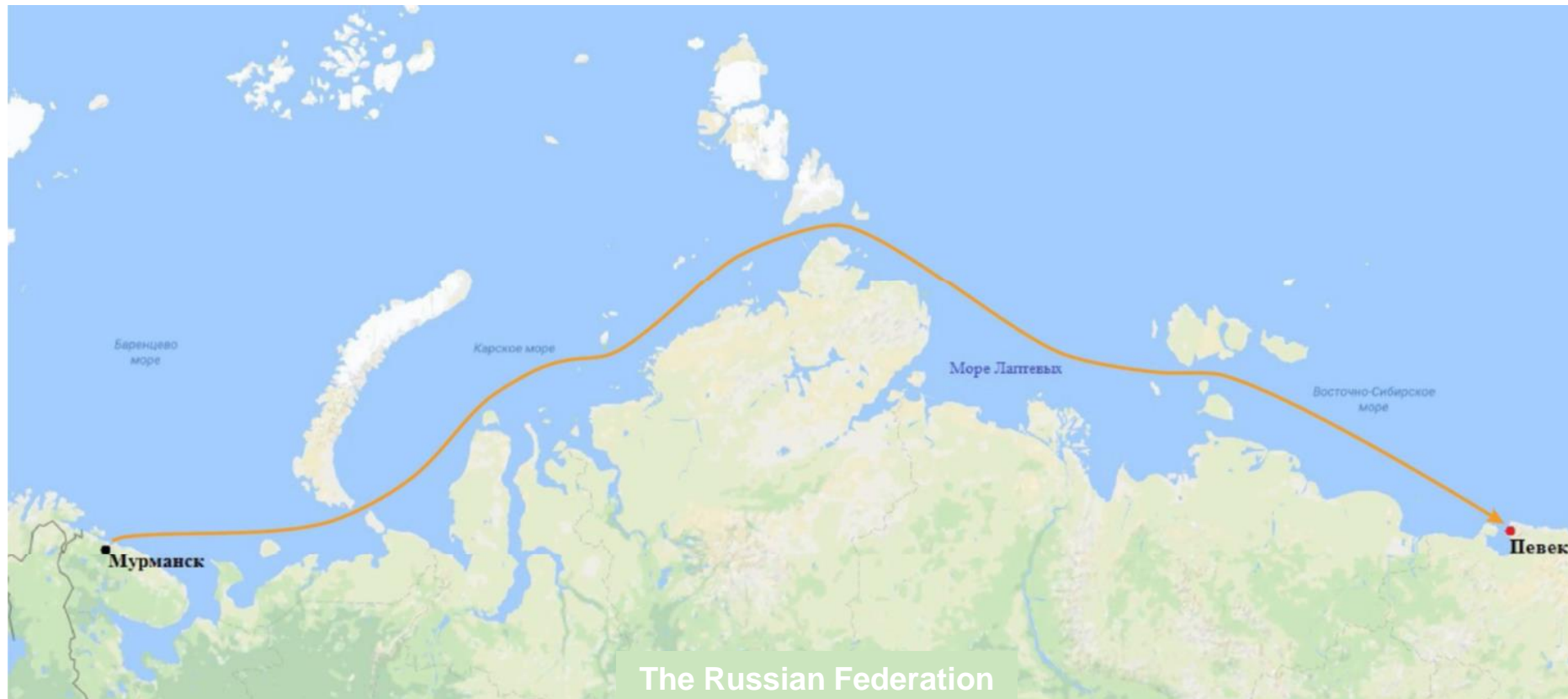
- Construction of a vessel without a nuclear installation;
- Towing of the manufactured vessel to the port of Murmansk;
- Loading of nuclear fuel to the FPU;
- Towing the FPU with nuclear fuel to the place of operation;
- Connection of the FPU to the coastal infrastructure and commissioning of the FNTPP.



4.3. TRANSPORTATION



From August 25 to September 14, 2019, four power units with two KLT-40S reactors were successfully transported from Murmansk to Pevek, where they are currently in operation.



4.4. DEVELOPMENT OF THE DOCUMENTATION FOR PPS



The specifics of physical protection measures for SMRs in the Russian Federation are defined by federal rules and regulations of Rostekhnadzor.



For 'Academik Lomonosov', 3 sets of documents were developed that define measures to ensure physical protection and/or the configuration of the PPS:

for the FPU within the boundaries
of the vessel

for transportation of the FPU to the
place of operation

for the operation of the FPU as
part of the FNTPP

Thank you for your attention

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