



FEDERAL ENVIRONMENTAL, INDUSTRIAL AND NUCLEAR
SUPERVISION SERVICE OF RUSSIA
(ROSTECHNADZOR)

*Licensing of new designs:
BREST-300, RITM-200 (land deployment)*

*Alexey Ferapontov
Deputy Chairman, Rostechnadzor*



5th MDEP Conference

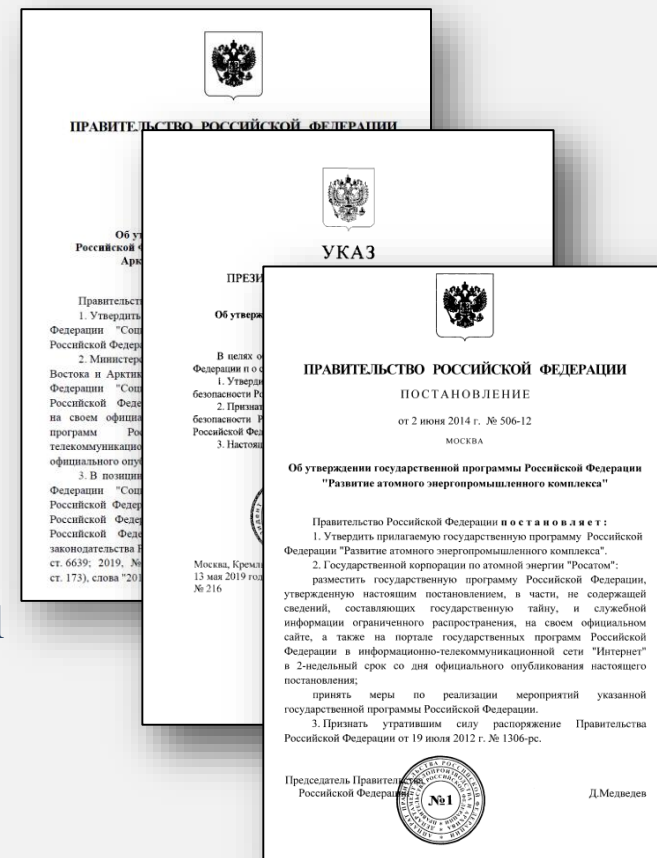
**International Co-operation:
Past, Present and Future**

24-25 April 2023 | Antalya, Türkiye





- The Doctrine of Energy Security of the Russian Federation
- The Energy Strategy of Russia for the Period up to 2035
- The Strategy of Development of the Arctic Zone of the Russian Federation and Provision of National Security for the Period up to 2035
- The State Programme “Development of Nuclear Power Industry Complex”
- The Comprehensive Programme “Development of Technical Capabilities, Technology and Scientific Research in the Use of Atomic Energy in the Russian Federation until 2024”
- The State Programme “Social and Economic Development of the Arctic Zone of the Russian Federation”





Innovative Designs in the Field of the Use of Atomic Energy

Pilot Demonstration Energy Complex with BREST-OD-300 Reactor



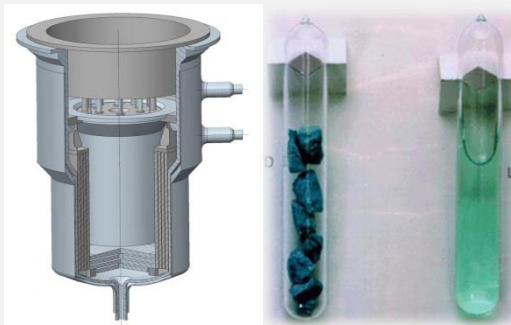
Small Modular Reactor RITM-200N



Floating Power Units with RITM-200M Reactors



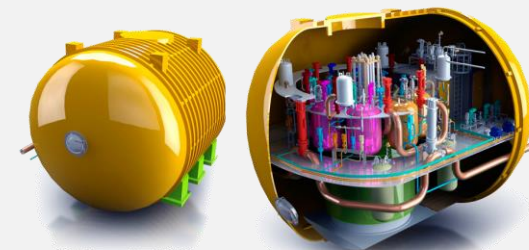
Reactors with Molten Salt Fuel



Nuclear Power Technology with High-Temperature Gas-Cooled Reactor



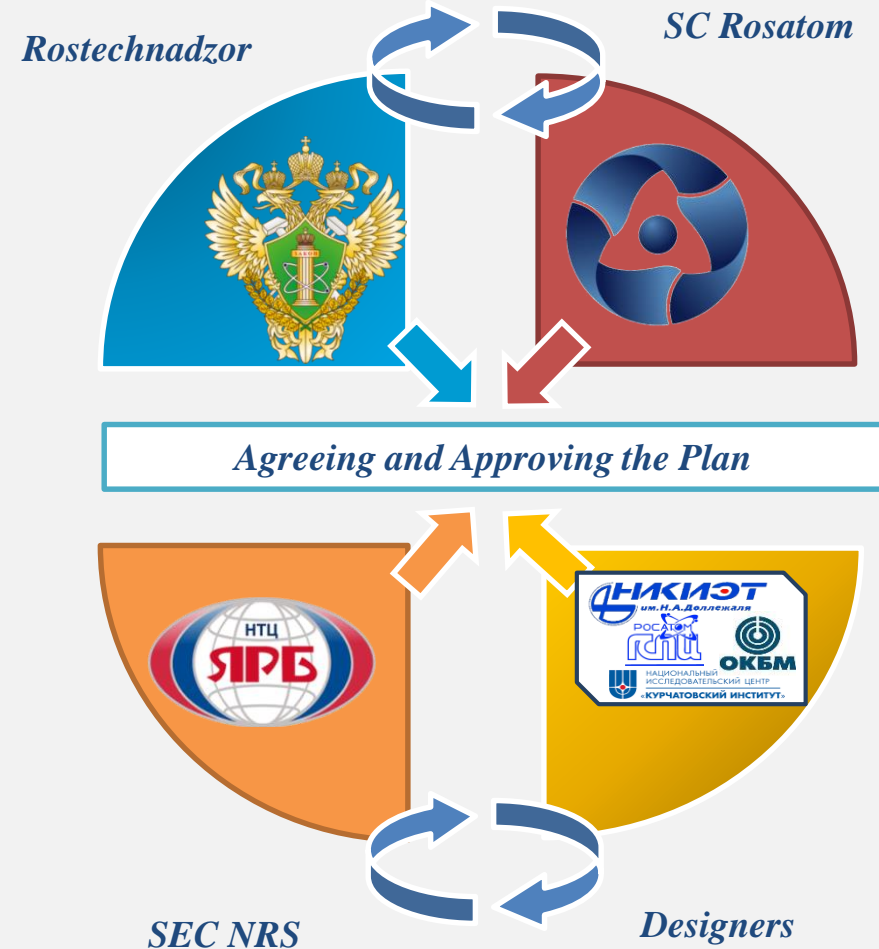
Transportable Reactor SHELF-M





Improving Legal and Regulatory Framework with Regard to Specifics of Innovative Designs

- ✓ Analyzing information about Russian advanced technologies
- ✓ Evaluating applicability of requirements of current regulatory documents to innovative designs
- ✓ Analyzing international safety regulatory practice
- ✓ Proposals on amending current and developing new regulatory legal acts in the field of the use of atomic energy
- ✓ Developing draft action plan to improve legal and regulatory framework

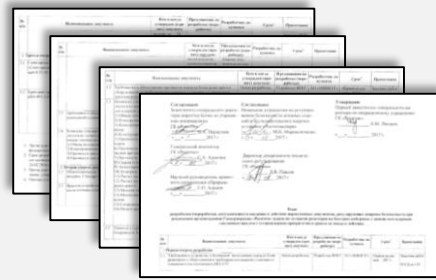




Developing Plans to Improve Legal and Regulatory Framework

As per RF Government Decree No. 401 of 30.07.2004 Rostechndzor exercises functions related to formulation and implementation of the state policy and safety regulation in atomic energy

- Identifying key actions
- Specifying responsible executors and co-executors
- Setting time limits
- Identifying expected outcomes for each action



Regulatory documents development plan for safety regulation of fast neutron reactors

№ п/п	Наименование	Кем и когда утверждено	Принципиальное одобрение	Разработка	Сроки	Исполнитель	Примечание
1	ИТЭП						
2	ИТЭП						
3	ИТЭП						
4	ИТЭП						

№	Исполнитель работы	Исполнение работы	Сроки выполнения работ	Сроки	Примечание
1	ИТЭП	ИТЭП	ИТЭП	ИТЭП	
2	ИТЭП	ИТЭП	ИТЭП	ИТЭП	
3	ИТЭП	ИТЭП	ИТЭП	ИТЭП	
4	ИТЭП	ИТЭП	ИТЭП	ИТЭП	

Action plan for design of SNPP with RITM-200N reactor

№	Содержание мероприятия*	Планируемый срок начала	Планируемый срок окончания	Срок исполнения	Исполнитель**
1	Разработка проекта инженерной и функциональной схем, а также в составе функциональной схемы (ФИС) системы безопасности реактора (СБС) реактора (ИТЭП-ИТЭП)	2022 г.	2023 г.	2023 г.	ИТЭП
2	Разработка проекта инженерной и функциональной схем, а также в составе функциональной схемы (ФИС) системы безопасности реактора (СБС) реактора (ИТЭП-ИТЭП)	2022 г.	2023 г.	2023 г.	ИТЭП
3	Разработка проекта инженерной и функциональной схем, а также в составе функциональной схемы (ФИС) системы безопасности реактора (СБС) реактора (ИТЭП-ИТЭП)	2022 г.	2023 г.	2023 г.	ИТЭП
4	Разработка проекта инженерной и функциональной схем, а также в составе функциональной схемы (ФИС) системы безопасности реактора (СБС) реактора (ИТЭП-ИТЭП)	2022 г.	2023 г.	2023 г.	ИТЭП

Regulatory documents development plan for Nuclear Power Engineering Plant with HTGR

№ п/п	Наименование	Кем и когда утверждено	Принципиальное одобрение	Разработка	Сроки	Исполнитель	Примечание
1	ИТЭП						
2	ИТЭП						
3	ИТЭП						
4	ИТЭП						

№	Исполнитель работы	Исполнение работы	Сроки выполнения работ	Сроки	Примечание
1	ИТЭП	ИТЭП	ИТЭП	ИТЭП	
2	ИТЭП	ИТЭП	ИТЭП	ИТЭП	
3	ИТЭП	ИТЭП	ИТЭП	ИТЭП	
4	ИТЭП	ИТЭП	ИТЭП	ИТЭП	

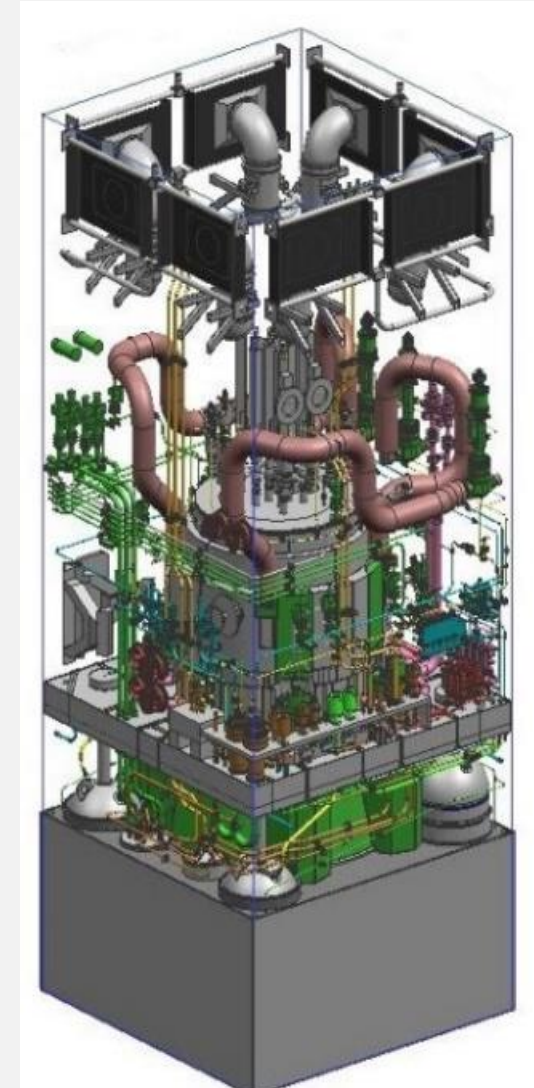
Regulatory documents development plan for molten salt research reactor



Experience in Innovative Design Licensing: RITM-200N Reactor Installation (RI)

Technical Data for RITM-200N in Brief

<i>Performance data</i>	<i>Value</i>
Thermal power, MWt	190
Electric power, MWe	55
Layout	Integral
Primary coolant	Water
Type of fuel	UO ₂
Number of fuel assemblies	199
Enrichment in ²³⁵ U, %	19,4
Type of fuel	UO ₂
Dimensions of RI in the containment, m×m×m	8×8×19
Mass of RI in the containment, t	1010
Time between refuellings, year	5

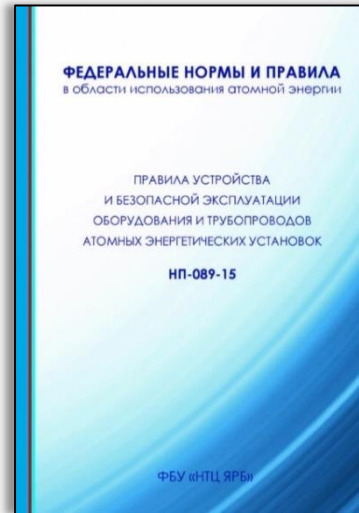




Development and Updating Plan for Regulatory Documents and Documents on Standardization (SMR NPP with RITM-200N RI)

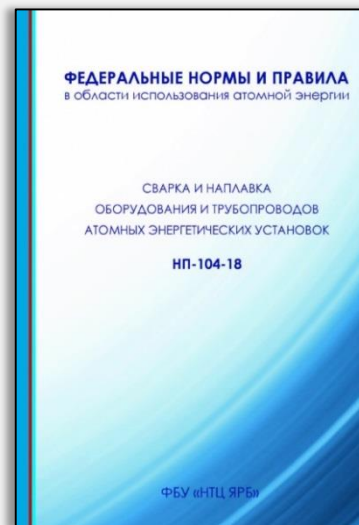
The development of draft amendments to Federal Rules and Regulations in the field of atomic energy use and documents on standardization, with respect to materials and technologies previously used only in ship installations, is aimed at taking into account the specifics of the RITM-200N RI

The amendments are related to the compactness and prefabricated reactor vessel with integral layout, as well as long fuel campaign duration, which complicates the metal and joints in-service inspection. In particular, due to the lack of a sufficient number of surveillance specimen sets, in advance irradiation of surveillance specimen in the research reactors is assumed



The amendments are related to the use of titanium components for once-through steam generators and threaded-soldered joints in the RITM-200N RI

STO 95 12XXX-20XX



The amendments are related to the usage of previously unused types of welded joints in terms of materials to be welded, as welding procedures

In support to the amendments of NP-104-18, 4 standards of Rosatom State Corporation on materials and technologies related to the production of permanent joints, as well as appropriate programs and qualification tests have been developed



Design features of land-based SMR NPP with RITM-200N RI

- **RI integral layout**
- **Prefabrication RI**
- **The compact dimensions of RI**
- **Once-through vertical titanium steam generator**
- **Application of threaded-soldered joints**
- **High campaign duration (5 years)**
- **Limited capabilities of metal and welded joints in-service inspection**
- **Pelletized fuel, dispersed in silumin matrix**





Review of Safety Justification Documents for SMR NPP with RITM-200N RI



License for siting

License for construction

- 82 documents reviewed (4 additional)
- According to the safety review performed by Rostechнадзор's TSO, the safety at the stage of siting is justified
- **Siting license issued: April 21, 2023**

Key issues of the review :

- The evaluation of regulatory framework, adopted by Applicant while selecting the power unit site
- The evaluation of power unit safety concept
- The evaluation of resistance to external hazards
- The evaluation of emergency planning aspects
- The evaluation of quality assurance measured while siting
- ...





Experience in Innovative Design Licensing: BREST-OD-300

Technical Data for BREST-OD-300 in Brief



BREST-OD-300

<i>Performance data</i>	<i>Value</i>
Thermal power, MWt	700
Electric power, MWe	300
Layout	Integral
Primary coolant	Lead
Type of fuel	(Pu+U)N
Weight of fuel in the core, t	20.6
Number of fuel assemblies in the core, pcs	169
Coolant temperature at the core inlet/outlet, °C	420/535
Secondary coolant	Water/steam
Steam temperature at SG outlet, °C	505
Steam pressure at SG outlet, MPa	17



Development Plan for New Regulatory Documents and Documents on Standardization (for BREST Reactor Design)

New federal rules and regulations in the field of the use of atomic energy and documents on standardization for fast neutron lead-cooled nuclear installations are to be developed in line with the plan approved by the State Corporation Rosatom and agreed with Rostechnadzor.

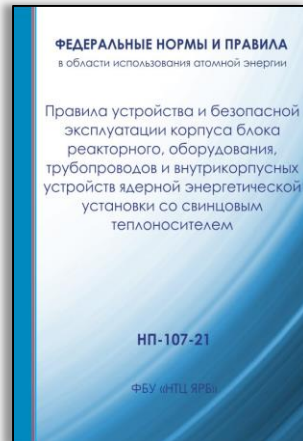
STO 95 12047...49, 52, 53-2019



NP-108-21 was enacted on 16.10.2021
(Order of Rostechnadzor No. 258 of 21.07.2021).

5 standards of the SC Rosatom within the series of standards for “Ensuring integrity of the RPV, equipment, pipelines and reactor internals of the lead-cooled nuclear power installation” were developed and put into effect in support of NP-108-21 and included into the summarized list of documents on standardization in the field of atomic energy use.

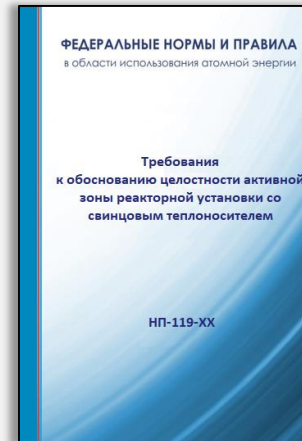
STO 95 12040...46, 50, 51, 54-2019



NP-107-21 was enacted on 08.06.2021
(Order of Rostechnadzor No. 112 of 24.03.2021).

10 standards of the SC Rosatom within the series of standards for “Ensuring integrity of the RPV, equipment, pipelines and reactor internals of the lead-cooled nuclear power installation” were developed and put into effect in support of NP-107-21 and included into the summarized list of documents on standardization in the field of atomic energy use.

STO 95 12076...79-2022



Draft NP-119-XX is under development
4 standards of the SC Rosatom (within the series of standards “Core elements of the lead-cooled reactor installation”) were developed and put into effect in support of NP-119-XX.



Assessing Safety Demonstration Documents and Elaborating License Conditions



Siting license

- 491 questions after review
- 213 documents (688 additional ones)

Construction license

- 527 questions after review
- 317 documents (399 additional ones)

Key issues of the review:

- Demonstration of core items lifetime
- Demonstration of the operability of reactor equipment and systems, including safety systems
- Analysis of transients and accident processes
- Demonstration of safe operational limits and safe operational conditions. Operational limits and conditions
- Demonstration of safety when managing nuclear fuel
- Probabilistic safety analysis
- ...

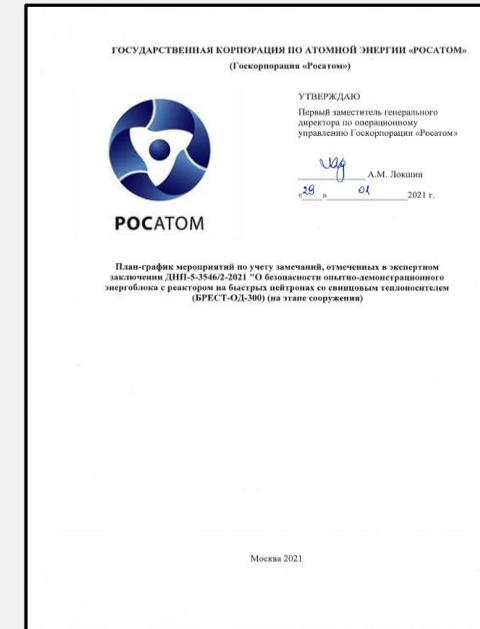




Supporting Construction License for BREST-OD-300



- As part of license support, safety analyses reviews are continuously arranged for design updates
- The scheduled action plan to resolve comments specifies key tasks and sets deadlines and paths for their resolving
- Need to take actions from the scheduled plan is established by the license conditions
- Some work on BREST-OD-300 construction is allowed after taking actions from the scheduled plan, along with appropriate changes to the license conditions
- Rostechnadzor inspections at construction stage
- Sessions of Scientific and Technical Board on certain topical issues



*Scheduled action plan
to resolve comments
noted in review conclusion
has been approved and is
implemented*



Conclusions

➤ **Joint Coordinated Work**

The coordinated work of the regulator and organizations of the nuclear industry contributes to the timely development of safety requirements and technical standards that take into account features of innovative reactors.

➤ **License Conditions as a Tool**

The license conditions are an effective tool that establishes, among other things, requirements for the transition from one stage to another when constructing innovative reactors based on safety review results.

➤ **Ways Forward**

The wide interest in SMR projects not only in Russia but also among many members of the nuclear community makes this area promising for joint work including MDEP framework.



THANK YOU FOR YOUR
ATTENTION!