Floating nuclear power units for Net Zero industry clusters development in remote regions

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The role of nuclear technologies in decarbonization

ROSATOM IS A NATIONAL LEADER IN ELECTRICITY GENERATION (ABOUT 20% OF TOTAL OUTPUT), THE 1ST LARGEST PORTFOLIO OF ORDERS FOR THE CONSTRUCTION OF NUCLEAR POWER PLANTS IN THE WORLD.

ROSATOM'S STRATEGY IS AIMED AT DEVELOPING LOW-CARBON GENERATION AND REDUCING CO2 EMISSIONS.

TRENDS AFFECTING THE DEVELOPMENT OF ENERGY SYSTEMS:

- **globalization** international cooperation and widespread use of unique technical solutions;
- **localization** is creation of sustainable regional systems that are aimed at reducing the burden on the environment when operating;
- **acceleration of development** is a request for flexible and fast solutions;
- **adaptability** is an ability to conform to changing reality and resistance to the appearance of "black swans".

Innovative nuclear solutions that meet modern requirements.
Nuclear floating power units of low power are a reliable and flexible solution for the needs of local consumers

**TECHNICAL SOLUTIONS FOR THE RITM SERIES REACTOR UNITS ARE APPROVED BY THE EXPERIENCE OF DESIGN, MANUFACTURE AND OPERATION:**
- 6 RITM-200 reactor units are operated on 3 nuclear icebreakers;
- 2 nuclear icebreakers under construction

**ADVANTAGES OF NUCLEAR FLOATING POWER UNITS:**

- continuous energy production for a period of 5-10 years
- maneuverability (rapid change in the power of the energy source)
- reducing CO2 emissions
- factory construction of a fully operational facility
- changing the capacity at the customer's request by changing the number of power units on the operation site
- serial construction, technical solutions do not depend on the operation site
- “green lawn” after completion of operation
- competitiveness in comparison with gas sources

Based on operational experience, a line of nuclear floating power units with RITM series reactors was created.
The Russian Arctic: the development of a high-potential region in the conditions of the Far North

- **low population density** – 0.1-0.2 people per 1 m²;
- small and **isolated** settlements;
- **harsh climatic conditions**: permafrost, low sub-zero temperatures all year round, high wind strength, heavy precipitation, polar day/night;
- **vulnerable natural environment** and slow recovery rate of disturbed natural objects;
- **the developing port and transport infrastructure** of the Northern Sea Route - cargo traffic increased from 4 million tons in 2014 to 34 million tons in 2022;
- the high cost and **complexity of the construction**;
- **significant natural resources**;
- the need to use **special equipment for cargo delivery**;
- complex logistics;
- the need to use **maneuverable power plants**.
The emissions of carbon dioxide equivalent of OVER 300,000 TONS into the atmosphere have been prevented.

ELECTRICITY AND HEAT SUPPLY to residential consumers in the Chukotka Autonomous District.

MORE THAN 491 million kWh of electricity has been generated.

OVER 402,000 GCal of thermal energy has been generated.

Conditions for ACCELERATED SOCIO-ECONOMIC DEVELOPMENT of the Arctic and the Northern Sea Route are created.

EXPERIENCE IN OPERATING KLT-40 SERIES REACTOR PLANT:

- 2 nuclear icebreakers
- 1 nuclear LASH carrier

* FPU – Floating power unit
Development of industrial clusters in the Arctic: case of the Baimskaya ore zone

Energy Solution – a modernized floating power unit

There are 2 RITM-200S reactor units on board

MFPUs electric power – 2*53 MW

**PROJECT DEPLOYMENT SCHEDULE:**

- **AUGUST 2022**
  Keel-laying of 2 hulls in China

- **SEPTEMBER 2021**
  Signing the agreement with GDK Baimskaya LLC

- **Q1, Q2 of 2027**
  Commissioning of the 1st and 2nd MFPUs construction

- **Q1 of 2028**
  Commissioning of the 3rd MFPU

- **Q1 of 2032**
  Commissioning of the 4th MFPU

THE BAIMSKAYA ORE ZONE IS THE RICHEST IN THE WORLD IN TERMS OF RESERVES:
23 million tons of copper and 2 million kg of gold on the territory of 13 deposits

* MFPU — Modernized floating power unit
Optimized floating power unit: a complete solution for tropical regions

OPTIONS FOR THE OFPU APPLICATION IN ORDER TO MEET THE NEEDS OF TROPICAL REGIONS:

- energy supply to remote and isolated settlements and industrial facilities
- desalination of seawater
- replacement of imported energy resources, the cost of which increases due to delivery

* OFPU – Optimized floating power unit

CO2 EMISSION REDUCTION AND PROTECTION OF UNIQUE FLORA AND FAUNA IN THE REGION

2 RITM-200M reactor units

- 60 years Service life
- 2*50 MW OFPU electric power

The OFPU operating organization assumes all risks associated with construction and operation of nuclear facilities

- The responsibility of the energy consumer is minimized
- significant reduction in the timing and cost of projects implementation
Challenges of deploying floating power units

01 Approval of safety for transportation between countries
02 Legal and regulatory support for projects, unique business schemes of implementation
03 The necessity of international cooperation based on transparent and non-discriminatory approaches

THE WAY FORWARD:

1. Cooperation between IAEA and IMO
2. Analyzing the experience of pilot projects and successful practices of international cooperation
3. Forming working groups to develop specific standards
Conclusions:

- Nuclear floating power units can become the basis for power systems development of which has been limited by isolation and/or remoteness from large power grids and infrastructure.

- Nuclear floating power units are a competitive solution and can be used in hybrid power systems together with gas, wind, solar energy sources.

- The widespread use of nuclear floating power units can lead to a significant reduction in CO2 emissions while accelerating regional development.
Thank you for attention!

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