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Reactor Plants for Nuclear Ships and Floating Nuclear Power Plants. Development Experience and Improvement Prospects.

One of the most effective ways to ensure logistics and economic activities in the Arctic region is to use nuclear-powered icebreakers having a high icebreaking capability and navigation autonomy. From 1959 and to this day, four generations of reactor plants for nuclear ships and floating power units (FPUs) have been developed and tested under real operating conditions. Twenty-eight reactor plants have been providing reliable operation of twelve nuclear ships and the FPU Akademik Lomonosov under Arctic conditions, and there are plans to commission thirty more reactor plants on fifteen ships and FPUs in the future.

The operating experience with nuclear ships and the FPU Akademik Lomonosov has confirmed that the technical policy is correct and promising. Starting with the reactor plants for the world's first nuclear-powered icebreaker, the reactor technology and safety of nuclear ships and FPU have been continuously improving.

A special focus is on the safety of reactor plants. The safety measures include both reactor plant inherent safety and a whole set of active and passive safety systems. The said systems are designed for all types of design-basis accidents, including a blackout, and they also ensure sufficient time margin in beyond-design-basis scenarios.

Being compact in size, the marine reactor plants have a high level of safety and reasonable economic efficiency, which enabled developing a fundamentally new class of energy sources—FPUs. The energy sources of this type are capable of generating energy in remote and hard-to-reach regions without requiring regular fuel supplies. The developed energy sources are universal and capable of operating in both 50 Hz and 60 Hz AC power grids, which allows the electricity needs of any consumer to be met.

Country OR International Organization

Russian Federation

Email address

dep59@okbm.nnov.ru

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Authors: Mr TURUSOV, Alexander (Afrikantov OKBM, JSC); Mr PAKHOMOV, Alexei (Afrikantov OKBM, JSC); VESHNYAKOV, Konstantin (Afrikantov OKBM, JSC); Mr GORBUNOV, Pavel (Afrikantov OKBM, JSC)

Presenter: VESHNYAKOV, Konstantin (Afrikantov OKBM, JSC)

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