GT-MHR INTERNATIONAL PROGRAM AND RELATED RUSSIAN TECHNOLOGY DEVELOPMENTS

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High-temperature gas-cooled reactors (HTGR) of modular type possess all features needed for safe development of nuclear power, as one of its components having high proliferation resistance properties. International project of GT-MHR modular helium reactor with gas turbine is suggested as one of potential collaboration lines.

Conceptual Design of the GT-MHR NPP was developed at parity funding by Russian MINATOM and private funds of "General Atomics", Framatome, and "Fuji Electric" in 1997. Preliminary Design of the GT-MHR NPP is currently developed within the framework of USA – Russia scientific-technical cooperation for weapons-grade plutonium disposition.

HTGR reactor technologies, including GT-MHR Project, after numerous discussions, have been included into Strategy of Russia's Nuclear Power Development. Stage-by-stage implementation of HTGR technology is provided, including application of the reactors for electricity generation in direct gas-turbine cycle with high efficiency and utilization of waste heat, and for generation of process heat. Effective generation of electricity in the GT-MHR plant is currently considered as the first stage of HTGR implementation in power industry. Other applications (coal gasification, oil refinement, production of synthetic liquid fuel and hydrogen) need for non-traditional approach to safety validation and are considered as the following stage of HTGR implementation.

The GT-MHR reactor plant is based on 600 MW high-temperature gas-cooled reactor with annular-type active core assembled of prismatic fuel blocks.

Implementation of the modular helium reactor with gas turbine (GT-MHR) technical concept is based on implementation of the following advanced technologies:

- ceramic plutonium oxide fuel based on fuel particles with multi-layer coatings which confine fission products under high temperatures (~1600 °C);
- latest achievements in large-size gas turbines;
- electromegnetic bearings;
- high-effective compact recuperators;
- heat-resistant materials and large reactor vessels manufacturing technology;

The indicated technologies represent an innovative essence of the GT-MHR Project and define main directions of related technology developments.

It is planned to construct NPP with the GT-MHR module and fuel fabrication facilities on Siberian Chemical Combine site. Such a decision minimizes the risk associated with transport of fissile materials and potential subversive actions.