



International Cooperation for Creation of Closed System SMR

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As a whole it is supposed, that the nuclear power (NP) structure on base small medium reactor (SMR) will consist of two parts:

- external - it is the power plants network with safety, having a highest level, which operation does not require extreme qualification;
- internal - closed from "world", in which these power plants are created and are processed after there decommission, and where all works in manufacturing both processing of fuel and wastes manipulation will be carried out.

Using possessed experience and industrial base of small medium reactors (SMR) for ice breakers and submarines, the serial production of transportable SMR of a capacity range, for example, 1, 5 - 50 MWe is possible to design and to adjust. Capacity only of Russian market for these units is estimated approximately in 2000, 1000 and 100 pieces accordingly.

Low a core power density allows to ensure operation without an reload of fuel during 8 - 15 years and more. After the expiration of a scheduled lifetime resource the power unit will come back to the enterprise Centralized Repair-Reloading Base (CRRB) for recycling, and to be replaced on new one similarly to electrical battery.

For such reactors the integrated configuration is most expedient, i.e. the modular designs, therefore they can be wholly made at industrial conditions and in assembled mode are delivered to an operation site, that essentially reduces terms and expenses of construction, external infrastructure, raises quality of manufacturing and reliability of SMR, facilitates a task of decommissioning.

Small capacity SMR can be universal purposes: production of the electric power, industrial heat, district heating, water desalination, chemistry and petrochemistry production, drive of compressors of gas-transport stations etc.

The design bases of small capacity reactors are incorporated for a long time. Russia saved the 40-year's experience of creation and operation SMR of various types for icebreaking propulsion and submarines, space SMR, there is a set of the projects multi-purpose SMR for technological, for manufacture of heat, electric power and their cogeneration; various modifications of NPP construction (mobile, floating, stationary) are worked.

But remains unsolved some more very large complex of problems connected to large-scale use of SMR in civil power.

For this purpose it is necessary to execute a complex of basic works including study of structure and organization of "integral NP structure of Small capacities", where should enter: development system-made elements and their characteristic, namely, relative capacities of manufactures, services for operation and repair, SMR decommissioning, and fuel cycle facilities including RW processing and transmutation (it is an "internal" part of System) with a choice of necessary technologies for "System", a choice of reactors types, acceptable in safety, profitability, fuel consumption (elements of an "external" part of System).

It is necessary to note that the majority of the existing now SMR projects can not answer perspective norms and requirements of the future, where these projects are aimed.

It is quite definite the place for SMR in power sector exists, an alternative to him it is difficult to find. For the compact large consumers - are intended large power NPP; SMR - for the allocated small consumers.

As for independent power sources the requirement only of northern regions of Russia in such SMR makes about 20 GWe.

At such places the application of nuclear power sources of small power capacity are possible in complex of independent power-technology facilities - IPTF - "a cells" manufacturing both electricity, and heat, fresh water, accompanying chemical products from sea water, sea foods, hydrogen for power and technological application etc.

Now SMR is considered as one of the most perspective directions in global power the water desalination. Besides the future development of power in the third world countries which have not advanced electric systems, also directly connected to introduction of SMR.

The functions "of an internal" part of SMR system should be ensured with specially created combine - regional base plant CRRB, taking place on Russia territory and ensuring complete spectrum "of services" for nuclear reactors at IPTF, located in the different countries of region (for example, Far East-Pacific ocean).

SMR of small power capacity should be transportable in complete factory readiness, work 5-10 and more years without fuel reloading at operation site, that relieves the owner of problems with change of fuel and electric power cost in the world market, decommissioning of SMR and handling of RW. At such reactors a safety potential is much higher; there is an opportunity of a flexible combination of various reactors types, turbine-force cycle, cooling systems and their parameters with reference to needs of region and consumers.

The creation of such integral NP system of small powers will require essential capital expenses, excessive within the framework of one state.

It is offered on the basis of interstate cooperation for power-deficit places to develop system "of cells" - IPTF with nuclear power source in a complex with creation of CRRB.

It is possible to believe, that the given arguments prove enough urgency of study a wide complex of problems connected with SMR, and allocation of this NP direction to independent section of power researches for the international cooperation.

Keywords: small medium reactor, multi-purpose SMR, independent power-technology facilities