



SMALL NUCLEAR CO-GENERATION PLANTS BASED ON SHIPBUILDING TECHNOLOGY

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ABSTRACT

The development of nuclear cogeneration plants and power desalination complexes of relatively small power, using proven shipbuilding technology, becomes more and more attractive for solving the power supply problems of remote districts of the Extreme North and the Far East with small and medium power grids and for removing the shortage of fresh water in different world regions.

The idea of transportation of the power unit with high degree of readiness to the place of its location with minimum construction and mounting activities at the site is very attractive. Compactness typical of RP based on shipbuilding technology allows to develop floating or ground-based plants at minimum use of water area and territory.

Small construction scope at the site under conditions of minimum anthropogenic loads and high ecological indices are important arguments in favor of floating nuclear cogeneration plant based on ship power units against the alternative fossil sources.

At present, the activities on floating nuclear cogeneration plant design, which is developed on the basis of floating power unit with two KLT-40S reactor plant, which is a modified option of standard KLT-40-type ship plant for icebreaker fleet in Russia are the most advanced. To date, a detailed design of reactor plant has been developed and approved, design activities on floating power unit are in the stage of completion, the site for its location has been selected and licensing by GAN, Russia, is in progress.

Besides OKBM has developed some designs of nuclear cogeneration plants of different power on the basis of integral reactor plants, using the experience of transport and stationary power plants designing.

Nuclear cogeneration plant investment analysis showed acceptable social and economical efficiency of the design that creates conditions for commercial construction of floating power units with KLT-40S reactor plant. At the same time the reduction of the design recovering terms, increase of budget income and net income during the floating cogeneration plant operation period is the urgent technical and economical problem, which can be successively solved owing to the use of block RP of higher power with prospective equipment, which underwent testing at the test facility, process mastering and operation check; it allows to reach high indices as for safety and reliability level at low masses and dimensions.

Further rise of NHCP technical and economical indices may be reached by considerable increase of service life, increase of the core refueling intervals, decrease of personnel number, transportation by any transport means and use of low enrichment core.

The report adduces main characteristics of KLT-40S reactor plant and floating NHCP in general, as well as characteristics of NHCP on the basis of other plant. General and environmental safety indices and technical and economical indices of the plant are given. Ways of RP improvement owing to the use of prospective equipment and new layouts and modes are considered; evolution of obtained economic indices is given.

Key words: Small nuclear reactor, co-generation, floating NPP