On work scenario selection for compact energy tokamak-reactors with transmutation and pure blankets

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An ultimate purpose of the magnetic confinement study is creation of tokamak-reactor as power station unit. For achievement the purposes of development of tokamak-reactors, the necessary fundamental scientific and technological database has been obtained by efforts of scientific laboratories, centers and institutes during many years. The first step on the way of real utilization of fusion energy is supposed to be design and creation of ITER device. On basis of existing and the next experimental and technological data obtained from ITER a new DEMO project with a super-conducting electromagnetic system will be implemented.

The subject of discussion of presented work is a status of compact tokamak with copper coils cooled by water or liquid nitrogen. Does this concept have perspectives for design of fusion power plant? Such a possibility, on the base of sufficiently strong assumptions, was earlier considered by GA researchers. Further, some works were devoted to a possibility of use of compact tokamaks as CTF device or as VNS for MA transmutation. For the VNS case, by choosing accordingly fuel composition for a blanket, it is possible to use the energy produced in the result of MA fission by 14 MeV neutrons with the following transformation of this energy into the electrical one, part of which will compensate own needs and the rest part will go to energy system. Despite of hybrid character of offered tokamak-reactor such a perspective is quite enough justified, because the risk of non-authorized access to the plutonium is minimal because it will be in mixture with high-level radioactive MA. Parameters and scenario of the stationary work of such a tokamak-reactor with electro-magnetic system, cooled by water and liquid nitrogen, are based on the existing (today's) database and are considered as quite realizable.

In given contribution a working scenario for compact tokamak-reactor with blanket not containing fission materials is examined too. Parameters of such "pure" tokamak-reactor are the following: R_0 = 3.5 m, a = 1.75 m, B_T = 3.9 T, I_P = 19 MA, P_{NBI} = 100 MW, E_{NBI} = 500 keV, Q > 50.

Physical base for scenario of pure CT-reactor with cryoresistive coils, energy balance for stationary regime and variant of an arrangement of such reactor are given at the presented report.