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ON A POSSIBLE EFFECTIVE PATH TO CREATING A THERMONUCLEAR REACTOR IN RUSSIA *)

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At the moment, on the way to creating a thermonuclear tokamak-reactor, a number of fundamental problems remain unresolved, primarily such as: experimental demonstration of quasi-stationary thermonuclear burning; generation of noninductive quasi-stationary current, development of plasma technologies and materials of the first wall and divertor. To solve them, the International Experimental Thermonuclear Reactor ITER is being created, projects of demonstration reactors DEMO are being developed, a Tokamak with Reactor Technologies (TRT) is being developed in Russia, and the construction of a tokamak BEST (Burning plasma Experimental Superconducting Tokamak) has begun in China. The report presents the main components of the technology platforms of ITER (superconducting electromagnetic system (EMS) of Nb_3Sn and NbTi, the first wall of W coated with a low-Z material, additional plasma heating systems, experimental breeder blanket modules, plasma control systems, etc.), TRT (EMC from high temperature superconductors, first wall options from W with B_4C coating, TiB_2-AlN composite and liquid metal lithium, systems for additional heating and generation of quasi-stationary noninductive current, an innovative divertor, experimental modules of breeder and hybrid blankets, reactor-compatible diagnostics and remote plasma control systems, etc.) and BEST (with a generated thermonuclear power of 20-200 MW, Q = 1 – 5, in stationary controlled discharge with dominant heating by thermonuclear alpha particles and real-time tritium breeding technologies) with a complex of thermonuclear technologies CRAFT (Comprehensive Research Facility for Fusion Technology). The technology platforms of ITER, TRT and BEST together contain, according to modern concepts, a complete set of technologies and production facilities required for the implementation of a future thermonuclear reactor.

The creation and experimental operation of the ITER, TRT and BEST technological platforms, taking into account the experience of implementing other large thermonuclear experiments of ITER partners, will allow the next step to successfully implement the construction of both a pure thermonuclear and a hybrid (fusion-fission) reactor in our country.

Russia's participation in the BEST Project will allow Russian scientists and engineers to participate in experimental studies of stationary thermonuclear plasma with Q = 5 in 2028 - 2040 at the largest and closest to the reactor (before the full start of deuterium-tritium experiments at ITER) thermonuclear complex BEST. In turn, a number of BEST/CRAFT technologies (HTSC and LTSP conductors, cryogenics, power supply systems, ICRH systems, robotics, etc.) can be used in the manufacture of TRT systems with essantial economic effect. In addition to Russia's participation in the ITER Project, it seems extremely advisable to collaborate in TRT and BEST construction with China.

*) abstracts of this report in Russian