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# Huge non-spent potential of the “spent fuel”- the ways of its utilization

Nowadays nuclear power is based on the usage of exothermic nuclear processes. Actually it means that the thermal engine principle of heat conversion into mechanical work is used - with the respective thermodynamic limitation of maximal efficiency (by Carnot cycle). The only difference is that heat is obtained due to nuclear fuel “burning”- instead of traditional fossil fuel burning. As a result, the presently running “nuclear thermal machine”is worse than a traditional one (because of the security and safe concerns, its operating temperature is lower as compared with the presently attained working temperature in the traditional thermal engine). This “thermal inertia”of nuclear power technology leads to small achievable efficiency (of about 30%) and, respectively, enormous thermal pollution.

We develop the alternative, “cold”nuclear power technologies, which could supplement exothermic nuclear power; at present stage they need additional investigation and promotion (are not the subject of the present paper).

The current situation in the nuclear power industry is the next: most of the nuclear energy is produced by the thermal reactors working on enriched uranium as a fuel; the resulting thermal pollution is inadmissibly large (about 70%); the output is the highly radiating “spent fuel”, which needs expensive storage; its reprocessing generates “nuclear wastes”.

The first of the two above-mentioned shortages can be eliminated by elaboration and implementation of the cutting-edge technologies for secondary (low-potential) energy utilization. As for the second one, we consider the best solution for the “spent fuel”coming from the light water reactors - its re-use without constructive changes in the specially designed heavy water reactors. Reprocessing (especially using presently applied technologies) should be postponed for an indefinite period (but still could be indicated - only for the eventually damaged fuel bundles). Such a solution ensures substantial cost-effective growth of nuclear power, reduces the threat of nuclear proliferation and terrorism, stimulates development and implementation of technologies for the active storage of the spent fuel. Perfectly (hermetically) sealed spent fuel rods represent full-value high-tech products and can be technologically used as “cold”(non-equilibrium) plasma generators, sources of heat, gamma-radiation etc. In such a way, the problem of nuclear wastes disappears definitely.

We develop for the spent fuel: on-site use for the condensation process intensification and microbiological sterilization; “distributed”energy-active storage, inclusively geological one; “cold”MHD power generation and other technologies.

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