

USSR Hands Nuclear Research Data To U.S. Scientists

A lengthy and detailed Soviet research report has been made available to U.S. scientists, in a breach of normal "classification" procedures that dramatically underscores the Soviets' push for the most rapid possible breakthrough to commercially feasible fusion power. We present here exclusive excerpts from the U.S. Energy Research and Development Administration's translation of the report, titled "Results of Research in Controlled Thermonuclear Fusion Performed in the Soviet Union from May 1976 to April 1977."

Straight Z-Pinch-Liner (Atomic Power Institute): A study is made of the schematic of the thermonuclear device based on the straight Z-pinch-liner in which the heating and confinement of the plasma are realized directly by the pinching cylindrical shell-liner. The actual magnetic field serves only for thermal insulation of the plasma in the radial direction. In the longitudinal direction the plasma is confined by the stationary ends. The departure from magnetic confinement of the plasma arises primarily from energy arguments.

A numerical experiment was set up considering both the real properties of the liner material and all of the losses. As a result it turned out that in order to obtain more than 20 percent burnup a liner speed of about 5 million centimeters per second and an energy on the order of 10 million joules are needed....

Fuel Problem and Hybrid Reactors (Atomic Power Institute): A qualitative analysis has been made of atomic power in providing for the power needs of mankind both at the present time and in the foreseeable future. It is emphasized that atomic power based on the use of U-235 cycle has proved its economic competitiveness...

However, an analysis of the prospect for the development of atomic power engineering only on light water reactors indicated that subsequently it will encounter the problems of supplying the reactors newly built with nuclear fuel and burial of the radioactive waste....This problem can be solved using fast neutron reactors. However, this type of reactor has limited applications...

Therefore, it would be more expedient to consider other generators of nuclear fuel along with breeders. They can turn out to be the electronuclear and thermonuclear (fusion-fission hybrid) generators....The thermonuclear generator can theoretically provide very large values of K when the self-supporting fusion reaction is achieved....It is proposed that the nuclear power engineering with the use of the LVR breeders and thermonuclear generators be developed as reasonable variations.

Estimation of the Basic Parameters of the Impulse Thermonuclear Generators of Plutonium (NIEFA Institute): Today the thermonuclear electrical powerplants with hybrid reactors appear to be entirely realistic in which the basic proportion of the generated energy is generated as a result of fission of the heavy nuclei by the thermonuclear neutrons....

In the case of using the relativistic electron flux the basic problems today are shortening of the pulse, the frequency operating regime of the generator, transportation and focusing of the relativistic electron flux. Considering a number of new propositions of interest with respect to transportation of focusing, it is possible to state with sufficiently great certainty that the reactor generator based on the relativistic electron flux is realizable on today's level of engineering.