

Science & Technology by Dr. Morris Levitt

The Soviets' ambitious nuclear program

A recent speech by Soviet Academician Velikhov described the Soviets' aggressive nuclear research and the proposal to make fusion development an international effort.

Fusion is in a very special and suitable position for international cooperation. The technology of magnetic confinement fusion has no military applications, and as yet no commercial connections, thus providing an opportunity for international cooperation. In 10 to 15 years that possibility will be lost. Once we reach the stage of commercial demonstration, we will have a situation much less suitable for international cooperation. I think that with INTOR there is a great possibility to have a very important experience of international cooperation."

This is how Soviet Academician E.P. Velikhov, the leader of the U.S.S.R.'s nuclear energy development program, described to a meeting of the Swedish Academy of Engineering Sciences his proposal for broadened international cooperation in magnetic confinement fusion power research. That proposal, put forward by Velikhov in 1978, has been partly realized in the creation of the INTOR project in which the Soviet Union, the United States, Japan and the European Community nations have been participating for the past year under the auspices of the International Atomic Energy Agency.

Velikhov reported on INTOR's progress: Several hundred fusion scientists from all over the world have been at work for the past year outlining the nature of the technological problems to be overcome

on the road of achieving a demonstration commercial reactor by the mid-1990s. That accomplished, the INTOR team will now undertake discussion on the conceptual design of a tokamak device to be constructed.

"I think it represents a very great leap, not only for fusion but for international science generally," said Velikhov.

The Soviet academician was the featured speaker at the March 10 meeting of engineers in Stockholm. His audience, of mainly Swedish nuclear researchers and scientists was highly impressed by the depth and scope of the Soviet research effort Velikhov described.

"We estimate that after the INTOR project achieves the technological demonstration of fusion-power, we will take the next step in the form of (fission-fusion) hybrid systems, which produce not only heat and electricity, but also fissionable material.

"This is guided by our policy in the U.S.S.R. that nuclear power must be developed by all the means available, and not only for the production of electricity, but also for the production of heat. Small nuclear reactors will produce heat for (the Soviet Union's) outlying regions, and standard breeder reactors are inadequate to supply them with fuel. We therefore need an additional source of fissionable material, and hybrid systems provide a very good source."

Velikhov then went on to outline the Soviet Union's program for achieving the commercial introduction of revolutionizing fusion technologies before the year 2000—a program which is a far cry from the Carter administration's counterproductive classification and cost-effectiveness policies. The second generation of fusion reactors fueled by the reaction of two molecules of the hydrogen isotope deuterium will make "energy available in unlimited amounts for all nations." The introduction of fusion technologies on a wide scale will transform international relations, Velikhov hinted, noting that "with fusion, we will not have the problems faced today with oil."

The Soviet program is pursuing several lines of approach in both magnetic confinement tokamak, mirror and stellarator machine and laser, electron and other particle beam devices (inertial). But the U.S.S.R. is particularly determined to "go all the way" to a demonstration commercial tokamak fusion reactor by the mid-1990s. The Soviet Union is following two lines of development for the tokamak program, Velikhov elaborated. It is scaling up its machines in order to approach conditions in commercial reactors. It is also building smaller machines with relatively strong magnetic fields.

The Soviets are developing two methods for auxiliary heating for the fusion plasma to ignition temperatures of over 50 million degrees Kelvin: neutral particle beam technology that has been in existence for several years, and the new microwave generator that is just going into application in the U.S.S.R. program.