ERDA: Go For An Operating Demonstration Fusion Plant In The Late 1980s

Following are excerpts from the statement of Dr. Robert L. Hirsch, ERDA Assistant Administrator for Solar, Geothermal and Advanced Energy, to the House Science and Technology subcommittee on Fossil and Nuclear Energy Research, Development and Demonstration, Feb. 25.

Recent Accomplishments

The year 1976 produced a number of fundamental advances in tokamak research. Improved plasma confinement and heating was obtained in the Princeton Large Torus (PLT) and the Oak Ridge Tokamak (ORMAK). In PLT operation at higher electrical currents produced better results that agreed with theoretical predictions. Both the density-confinement time product and impurity effects were found to be improved in the larger diameter plasmas produced in these machines. This is important because theory tells us that larger sizes are the key to practical systems...

In ORMAK the Oak Ridge research team produced a major advance by raising ion temperatures to 2 kilovolts (20,000,000 degrees C) by a technique known as neutral beam heating. While this temperature is below what is needed, this result unambiguously demonstrates that the required temperatures will be achieved when we finally invest in the necessary heater power.

But the most exciting event in tokamak confinement research happened only two weeks ago. The fusion research group at MIT reported that the Alcator machine produced a world record confinement value of 2 x 10^{13} cm^{-3} sec. This result, in higher magnetic fields (85 kilogauss) than any other tokamak, is double the previous achievement, and clearly carries us above the breakeven threshold. An important aspect of this result is that theory and experimental results remain in agreement as our machines are pushed to higher levels of performance.

The major alternate to the tokamak is the mirror, a straight system in which magnetic lines are squeezed at the ends so as to "mirror" reflect plasma particles that want to leak out the ends. As a consequence of important results in the 2X-IIB mirror at the Lawrence Livermore Laboratory, the mirror program has recently undergone a revolution in concept and direction. Temperatures of 230,000,000 degrees C were created while some bothersome small-scale instabilities in the plasma were simultaneously suppressed. Many of the major physics questions in the mirror program were resolved this past year so that we can begin to see a major new path to an efficient mirror reactor. With our present program we expect to have a sound technical basis for comparing tokamaks and mirrors as power reactors by 1981 or 1982.

These results and many others that did not make headlines have given fusion physicists and engineers worldwide increased confidence. Progress has been continuous, and we have found no law of nature that can prevent the achievement of practical fusion power....

'Fusion Could Be Considered The Enduring Solution To Energy Problems'

Following are excerpts from the statement on the Carter administration's proposed Fiscal Year 1978 budget authorization for the ERDA magnetic fusion program by Edwin E. Kintner, Director of ERDA's Division of Magnetic Fusion Energy.

I am especially pleased to make this initial presentation on the Magnetic Fusion Energy Program to this Committee as it commences its new responsibilities for the program. We believe fusion is an important and exciting challenge with great potential benefit for this nation, and I hope I can convey some of that belief to you....

As Dr. Hirsch has pointed out in discussing the Program Plan, the program could have a range of schedule objectives, since the rate of progress of development programs of this kind can be influenced, within limits, by the application of increased or reduced resources, or by acceptance of greater risks in making program decisions....

IX. Accomplishments in 1976

1976 was another year of important new advances in fusion. The effects of plasma size and current were measured at higher values in the PLT. The data obtained confirmed theoretical predictions of scaling as the square of the linear dimension of the plasma. These results were duplicated in the T-10 device in Moscow. Ion temperatures were raised to 2 keV (a factor of approximately three from minimum temperatures needed for ignition). For the first time, electron temperatures were raised with the ion temperatures, as predicted but not