Fusion Looks to the Future—Again

Recent budget cuts have led the DOE to revise its whole approach to magnetic fusion. The result: less engineering, more basic science

When Congress cut the funding for the U.S. magnetic fusion program last summer (*1*), it catalyzed what many people see as a long overdue change in the program's basic philosophy. As embodied in a draft Fusion Policy Plan now under review by the Department of Energy (DOE), the new approach abandons the race to build a working power reactor in favor of a longer term emphasis on science, technology, and international cooperation.

The cuts to the fusion program amounted to $46 million, nearly 10 percent of the President's fiscal year 1985 budget request of $483 million. There are any number of stories about why Congress did it, but at heart it seems to have been a matter of changing perceptions.

Ever since the OPEC oil embargo of 1973–74 and President Nixon's Project Independence, the fusion program has been fired by a sense of energy crisis: fusion was going to save the world when the oil ran out. The urgency was made official in the Magnetic Fusion Engineering Act of 1980, which called for stress on the engineering aspects of fusion and the construction of a demonstration fusion power reactor by the year 2000.

Less than 4 years later, however, that philosophy has already fallen out of fashion in Washington. OPEC is in disarray, oil is in plentiful supply for the moment, and the energy crisis mentality has become something of an energy glut mentality. Moreover, the Reagan Administration, while proclaiming that fusion is exactly the sort of long-term research that the government should be doing, has also been adamant that big demonstration projects should be left to the private sector. Add in the general concern about the deficit, plus the fact that the magnetic fusion budget has grown to nearly half a billion dollars, and people have inevitably started to ask, "What's the rush?"

Some of that dissatisfaction was apparently shared at the DOE fusion program office itself. "The department has been reviewing the program for 2 years," says John F. Clarke, head of the DOE's Office of Fusion Energy. "We felt that the program wasn't quite right, and as time went on, it became clear that the concerns on the Hill were similar. We didn't expect the cuts to come so fast, but they only precipitated the changes that were happening anyway."

A cynic might wonder if all this is rationalization after the fact. But be that as it may, the DOE has chosen to absorb the cuts by stretching out the schedules for the program's two "flagship" projects. Princeton University's Tokamak Fusion Test Reactor (TFTR) will thus delay its first burn of deuterium-tritium fuel for a few years, and the Mirror Fusion Test Facility (MFTF-B) at the Lawrence Livermore Laboratory will delay completion from 1987 to 1989. A hefty slice will also come out of the advanced reactor engineering efforts.

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The philosophy behind those choices is reflected in the draft Fusion Policy Plan, which was released for comment in mid-September. The final version will be included in the President's fiscal year 1986 budget submission in February.

In accordance with Administration predilections, the policy plan defines the goal of the magnetic fusion program as "[establishing] the scientific and technological base . . .upon which decisions could be made by the private sector to proceed with the commercialization of specific fusion energy sources."

This means in particular that the program will no longer be oriented toward producing a demonstration reactor. Instead, the plan calls for an increased emphasis on alternatives to the main-line tokamak and magnetic mirror designs (*2*).

The plan also calls for international cooperation on the next generation of research machines, which are expected to cost in the $1 billion range. This approach has been especially popular in European policy circles, where finance ministers are also becoming disenchanted with the spiraling cost of fusion projects. (It is considerably less popular with the European researchers themselves. See page 522.) In accordance with agreements signed at the Versailles economic summit in June, DOE officials have been meeting regularly with their counterparts in Europe and Japan to study possible mechanisms for cooperation.

The fusion research community has had a number of chances to comment on the policy plan since its release, notably on 3 October at a Rockville, Maryland, meeting of a professional group called the Fusion Power Associates, and again on 4 and 5 October at a meeting of the DOE's Magnetic Fusion Advisory Committee. Judging by the comments, the researchers are satisfied that the cuts have been distributed as fairly as possible, and that the basic direction of the new plan is reasonable.

However, there is still some concern about the long-range health of the program. True, Representative Tom Bevill (D–Ala.), chairman of the House Appropriations subcommittee where the latest cuts originated, did tell the Fusion Power Associates meeting that he will support future funding for the fusion program at "a constant level." But many researchers are worried that without such specific goals as a demonstration power reactor, together with a reasonably detailed timetable, the program would lack focus and would thus be vulnerable to more budget cuts in the future.

DOE officials concede that the draft plan was more vague on this point than it should have been. They intend to include a more explicit timetable in the final version of the plan. "Without a sense of time, then what does a plan like this mean? How do you translate it into action?" says Michael Roberts, the fusion program's planning director. "Since a lot of the facilities are already in place," he adds, "we can hope to be somewhat clearer in terms of technical objectives than policy statements usually are."

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References

1. E. Marshall, *Science* **224**, 1322 (1984).
2. M. M. Waldrop, *ibid.* **219**, 154 (1983).