Physicists Give ISABELLE a Yes, But . . .

High energy panel says Brookhaven's partially completed accelerator should be finished only if funding is increased substantially

A panel of high energy physicists has told the Department of Energy (DOE) that Brookhaven National Laboratory's ISABELLE accelerator should be completed, but only if DOE can substantially increase its high energy research spending.

ISABELLE has been causing problems for about 2 years because Brookhaven initially was not able to make the superconducting magnets that are the key to the accelerator. Although this problem now seems to be solved, the delays coupled with a higher than expected rate of inflation have driven up the cost of the project to the point where it threatens other components of the U.S. high energy program (*Science*, 21 November 1980, p. 875, and 21 August, 1981, p. 846).

The High Energy Physics Advisory Panel (HEPAP), which counsels DOE on the research community's priorities, met on 1 November to receive a report from its long-range planning subpanel headed by George Trilling of the Lawrence Berkeley Laboratory. Trilling told HEPAP that from fiscal 1983 onward, about $500 million would be needed to complete ISABELLE, which started out as a $275 million project and which has already cost $130 million. Nonetheless, Trilling's subpanel found the research that ISABELLE would make possible compelling enough to recommend strongly that the project go through.

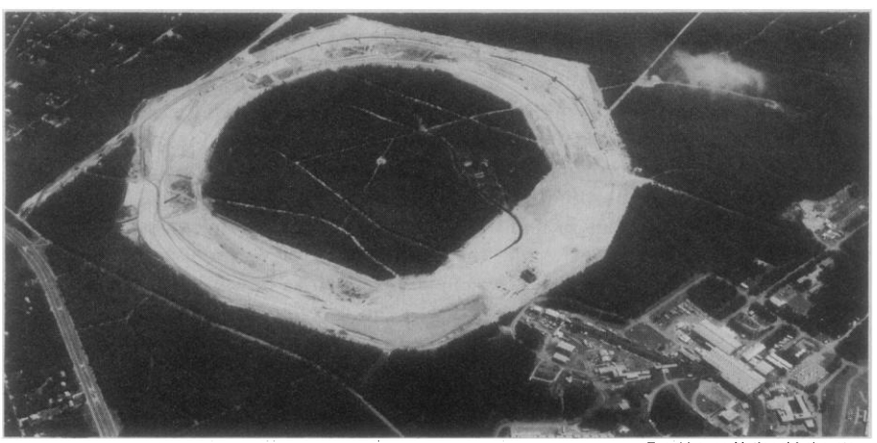
The hitch is that the subpanel also concluded that several other components of the U.S. program, especially ensuring the adequate use of existing facilities, are more compelling. The subpanel arrived at a figure of $440 million (in fiscal 1982 dollars uncorrected for inflation) as the minimum annual DOE expenditure needed to support these components and complete ISABELLE. "If support at this level cannot be made available in time for ISABELLE completion within this decade, the ISABELLE project cannot be continued," read the principal conclusion of the report.

Whether $440 million is a reachable figure is arguable. President Reagan's first 1982 budget allowed DOE $393 million for high energy physics, but after the latest 12 percent across-the-board cuts, this dropped to $345 million. Presidential science adviser George Keyworth has said more than once that large increases are not to be expected in the next couple of years. ISABELLE has a tough row to hoe.

ISABELLE is a colliding-beam accelerator; that is, two beams of protons, each with an energy of 400 billion electron volts (GeV), circulate in opposite directions inside two storage rings that lie side by side. At six places around the 3.8-kilometer circumference, the rings cross and the beams collide head on. Detectors at these locations look for the particles created in the collisions and sort out the forces acting between them. Among colliding-beam machines, ISABELLE would be unique in having both a high beam energy and a high collision rate (luminosity). Brookhaven's machine has been expected to be the workhorse facility for U.S. high energy research in the late 1980's and 1990's.

In its assessment of U.S. high energy physics, the Trilling subpanel steered a careful course. It concluded that "ISABELLE provides a major new facility that will enable the U.S. high energy physics program to remain active and healthy during this decade and into the next." But it then identified six components of a core program "which must be supported whether or not ISABELLE is constructed." The six are:

- More support for accelerator operations and for the physicists that use them at the Stanford Linear Accelerator Center, the Fermi National Accelerator Laboratory, and Brookhaven.
- Completion of the superconducting ring at Fermilab that will double the energy of the existing proton synchrotron to 1000 GeV.
- Modification of the Fermilab accelerator to allow proton-antiproton colliding-beam operation, although at much lower luminosity than ISABELLE would have.
- Research at Stanford leading to the possible construction of an advanced electron-positron colliding-beam machine (the single-pass collider).
- Research on superconducting radio-frequency cavities at Cornell University that could make circular electron-positron colliding-beam machines cheaper to operate.
- Research on advanced accelerator concepts.



Brookhaven National Laboratory

ISABELLE construction site

The accelerator is shaped like a hexagon with rounded corners. The six particle detectors will sit in the straight sections. The circular road in the lower right marks the Alternating Gradient Synchrotron, Brookhaven's main accelerator at present.

Trilling told HEPAP that, during its deliberations, the subpanel received about 170 letters from high energy physicists. The dominant theme was an extreme concern that ISABELLE construction without an adequate budget for the total program would irreparably damage U.S. high energy physics. The subpanel's conclusions mirror this concern.

In transmitting the subpanel report to DOE, HEPAP unanimously endorsed its conclusions. HEPAP also recognized

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that a jump in high energy funding to $440 million, even if forthcoming, was unlikely to occur in just 1 year. It therefore asked for a substantial increase in fiscal 1983 and a Reagan Administration commitment to the full figure in 1984 and beyond. HEPAP estimated that the level of spending needed to finance the subpanel's core program would still come to $395 million, but noted that the loss of ISABELLE would be a severe blow.

All in all, the most positive face to put on the subpanel report is that now the ball is in the Reagan Administration's court. (The core program by itself is "insufficient to maintain the preeminence of the U.S. high energy physics program through the end of this decade.") But is anyone in the Administration playing this game?

—ARTHUR L. ROBINSON

Acid Rain Bills Reflect Regional Dispute

Congressmen from Northeast want midwestern states to reduce sulfur dioxide emissions

"I don't think my neighbor should be permitted to throw garbage on my lawn, and say it's too expensive for him to hire a garbage man, and that it's cheaper for him simply to continue throwing it on my lawn," says Senator Robert Stafford (R–Vt.). The neighbors he has in mind are the citizens of the Midwest, and the garbage is windborne sulfur dioxide and nitrogen oxides, the precursors of acid rain. Stafford is one of a growing number in the Northeast to become militant about the pollutants. As chairman of the Senate Environment Committee, he recently co-sponsored legislation that would force midwestern states to spend billions of dollars to control acid rain.

Senator George Mitchell

Concerned with fish and forests

The legislation, which was also introduced in the House, has considerably quickened the pace of debate about the adverse effects of acid rain. Supporters feel that it may be more important than any other single aspect of the ongoing rewrite of the National Clean Air Act. It may also be the most divisive. The primary cause of the debate is geographical inequity. Pollution that causes acid rain is largely produced by utilities in Ohio, Indiana, Missouri, Pennsylvania, and Illinois among other states. Yet the bulk of the adverse environmental effects are felt hundreds of miles away, in Stafford's state of Vermont and others nearby, as well as in Canada.

The preeminent questions in the dispute are whether enough is known about acid rain to apportion blame, and if so, how much. Senator George Mitchell (D–Maine) believes that midwestern states are guilty, and that "a reasonable and effective solution to the acid rain problem" can be purchased by taxpayers in those states for $2 billion to $4 billion annually. Mitchell is the principal author of the Senate bill that has been introduced in the House by Representatives Toby Moffett (D–Conn.) and Judd Gregg (R–N.H.). "I have no desire to point a finger at any state," Mitchell says. "I am simply looking at the facts. Some states contribute more sulfur to the region than others. That is the amount to which they must clean up."

Mitchell is concerned about acid rain because of its immediate impact on fishing, as well as its potential future impact on the forest industry, which accounts for 30 percent of all manufacturing jobs in Maine. His bill, which was drafted with help from several environmental groups, requires a 40 percent reduction in the sulfur dioxide being emitted in a 26-state region east of the Mississippi. The choice of 40 percent is of necessity somewhat arbitrary. Acid rain models are not yet sensitive enough to demonstrate the economic benefits of a specific percentage reduction in pollution, a significant drawback that will make it hard for proponents to gather much support.

A similar, but less stringent, bill has been proposed by Senator Daniel Moynihan (D–N.Y.). His proposal calls for a 35 percent reduction in sulfur dioxide emissions by 1991 from 16 states east of the Mississippi. The reduction is to be accomplished first by forcing each state to meet existing requirements to limit emissions; many are not now in compliance and otherwise would not be for years.

Senator Daniel Moynihan

Proposes a 35 percent total SO_2 reduction

Then the states must reduce emissions further by requiring pollution scrubbers at old utility plants, by coal washing, by switching to alternative fuels, or by energy conservation. "While we do not know all there is to know about the acid rain phenomenon, I feel the available evidence is clear that if we do not begin to act now we run the risk of causing irreversible damage," Moynihan says.

Another bill has been proposed by Senator David Durenberger (IR–Minn.) in an effort to strengthen the ability of a state to stop pollution generated outside its borders. His bill would make it easier for a state receiving acid rain to affix legal liability on a state where sulfur

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