

Fusion Plan Ignites Controversy at DOE

On-again off-again scheme to shift funds from magnetic fusion to laser program prompts a political backlash

FUSION RESEARCH, which promises to deliver the power of the sun in an Earth-bound reactor, has had its ups and downs since it was established at the Department of Energy in the 1970s, but never before has it gone on a roller-coaster ride like the one that Robert O. Hunter, the new director of DOE's Office of Energy Research, gave it last week.

The excitement began when Hunter, who began to preside over fusion research last August, quietly hatched a plan to cut \$50 million from one research technology—magnetic confinement fusion—in order to promote a rival technology—inertial confinement fusion (ICF). Magnetic confinement fusion is the traditional approach being pursued at Princeton and six other national labs across the country. It demands powerful machines that use magnetic fields to force hydrogen atoms to fuse, leading to a self-sustaining reaction. ICF is a younger concept developed principally at Lawrence Livermore in which an array of lasers are used to compress tiny target spheres, causing deuterium and tritium atoms to fuse.

Hunter's radical new idea was twofold: He would bring both of these approaches

under a single roof by creating a second, civilian ICF program within DOE. At present, ICF research is performed within DOE's atomic weapons program and is classified. And he would invest more civilian money in ICF while cutting back on DOE's magnetic fusion work. Hunter, who has a background in laser physics, was preparing to unveil this plan at a congressional hearing on 14 June.

But before he got a chance to speak, opponents—mainly from the magnetic fusion contingent—rushed in with an intense lobbying campaign. They feared that existing DOE-backed projects at universities and several national laboratories would be cut to the bone. Any reduction would be keenly felt, for DOE has been operating on a stagnant \$350-million fusion budget for years.

Among the organizations that would be hurt by a cutback in magnetic fusion are the Oak Ridge National Laboratory, Los Alamos National Laboratory, General Atomics, and a host of universities. More than any other site, Hunter's plan threatens the Plasma Physics Laboratory at Princeton, which is counting on building a new \$700-million fusion reactor.

On Saturday 10 June, when the university learned that Energy Secretary James Watkins had endorsed Hunter's plan, it put its lobbying machine into high gear. By Monday morning both of New Jersey's Democratic senators—Bill Bradley and Frank Lautenberg—were weighing in with DOE, and Republican Governor Thomas Kean was meeting with President Bush.

Come Monday night, opponents of Hunter's plan thought they had put a stop to it. At a breakfast meeting Tuesday morning, Secretary Watkins assured Senator Pete Domenici (R-NM), a long-time supporter of fusion research conducted at Los Alamos, that the proposal was dead. According to an aide, the Senator was told that the National Academy of Sciences would be asked to convene a panel to help reshape DOE's fusion agenda. But late Tuesday afternoon, Senator Lautenberg heard from DOE that the plan was alive again.

At 2 p.m. on Wednesday, Hunter presented his plan to members of the Senate

Energy and Natural Resources Committee. He told them that by 1991 he wants to be spending \$100 million a year to develop advanced laser drivers and ICF reactor designs. Plans for moving into the construction phase for the Compact Ignition Tokamak (CIT) at Princeton this year would be put on hold. In the mid-1990s, DOE would then proceed with separate ignition experiments for magnetic fusion and ICF. Around 2000, says Hunter, DOE would choose which of the technologies would be better for a multibillion-dollar energy test reactor, the forerunner of a prototype power reactor.

Hunter argues that delaying construction of the Princeton machine is warranted because "the plasma physics are a major unknown." He says that in the 3 or 4 years it takes to improve theoretical understanding of plasma heat transport in tokamak reactors researchers can close the technology gaps in laser drivers that are holding back ICF. "This dual track gives us the highest chance of finding out . . . whether fusion is a real energy alternative," says Hunter.

But David Overskei, an executive at General Atomics in San Diego, a contractor on tokamak research, says a delay of 3 or 4 years is not appropriate for the Princeton machine. "I think we will be ready to go in 2 years," says Overskei, who endorses the strategy outlined by DOE's Magnetic Fusion Advisory Committee. In a report delivered to Hunter on 7 June, the committee recommended that DOE delay ground breaking just long enough to narrow uncertainties about scaling laws in tokamaks. It also urged that critical preconstruction R&D be aggressively pursued. This is not likely to occur, Overskei says, if \$50 million is chopped from the program.

Steven O. Dean, president of Fusion Power Associates, a trade organization, says the idea of a modest civilian ICF program is a good one. But Dean describes Hunter's financing plan as "meat ax" management.

Senators attending the hearing were mostly skeptical of the soundness of Hunter's plan. "I question whether this shift in program goals . . . won't set back the department's fusion program," said Senator James McClure (R-ID). Senator Bradley questioned whether Hunter understood the gravity of his action, noting that "the power to postpone is the power to negate."

Nevertheless, committee chairman Bennett Johnston (D-LA) and McClure appear to support Hunter's plan to delay the CIT. "The days of willy-nilly expenditures on fusion . . . are over with," commented Johnston. "We have got to demand a higher degree of success than we have in the past."

As for Hunter's dual-track proposal for the ICF and magnetic fusion programs,



Robert O. Hunter: Plans to revitalize fusion research.

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Johnston quickly cast doubt on it. "Frankly I do not know where the dollars for this are going to come from," he said, noting that earlier that day a House appropriations subcommittee had chopped \$68 million from DOE's \$350-million budget request for magnetic fusion. An aide to Johnston told *Science* that the energy committee is likely to cut the magnetic fusion program by \$50 million in 1990.

Despite the gloomy outlook, Hunter says he will refine his plan and bring it back to Congress. Meanwhile, bureaucrats in DOE's fusion office are busy figuring out how to hold the fusion program together with \$68 million less to spend. "We are in deep trouble," says Fusion Power's Dean, "It looks like we are really going to suffer this year." ■ **MARK CRAWFORD**

Support Offered for Fang Lizhi

The Federation of American Scientists and the University of California at Berkeley have both offered financial support to Fang Lizhi, the Chinese dissident and astrophysicist, if he is allowed to leave China.

Fang took refuge in the U.S. embassy in Beijing around 6 June. The Chinese government, which has labeled Fang a counterrevolutionary, is demanding that the United States hand him over for trial.

The Federation's executive committee said in a statement released 14 June that it is concerned for the safety and well-being of Fang and his wife, Lu Shuxian, who is also a physicist and has been a professor at Beijing University. "We intend to support Fang Lizhi not only because of the importance of his case and our empathy for the dilemma of a scientific colleague but also as a sign of opposition to the Chinese Government position on democracy in China," the committee said.

The University of California's departments of physics and astronomy have invited Fang and his wife to spend several months there. The university made a similar offer to Fang almost a year ago, but Chinese authorities barred him from traveling overseas. (*Science*, 28 April, p. 417)

In a letter to James Lilley, U.S. Ambassador to China, the university expressed "abhorrence at the acts of violence and repression which threaten the lives and safety of students and faculty and violate international standards of academic freedom."

The American Physical Society, like the University of California and the Federation, last week issued a statement supporting President Bush's decision to protect Fang.

■ **MARJORIE SUN**

Soviets Admit 1957 Nuclear Mishap

After 20 years of silence, followed by 10 years of adamant denials, Soviet authorities have at last admitted that a major nuclear accident occurred in the south Urals in 1957, and that it contaminated several hundred square miles of countryside with radioactivity.

The admission represents a significant vindication for Russian emigré geneticist Zhores Medvedev, who is currently working with Britain's Medical Research Council. Medvedev first claimed in 1977 that a nuclear accident had taken place near the town of Kyshtym, but his conclusions were met with a wall of public denials from nuclear officials on both sides of the Iron Curtain. Some critics even called his claims "science fiction," "a figment of the imagination," or just plain "rubbish." (Medvedev was attending a conference in Mexico last week and could not be contacted for comment.)

Last week, however, Boris Nikolpelov, first deputy minister of medium machine building, told a press conference in the town of Chelyabinsk that a serious chemical explosion had occurred in 1957 in a tank containing radioactive waste, contaminating an area of 375 square miles. The resulting cleanup, he added, cost 200 million rubles at current prices.

According to a report carried by the Soviet news agency Tass, the explosion discharged about 2 million Curies of radioactive elements into the atmosphere—a figure the agency compares to the 50 million Curies released during the nuclear accident at Chernobyl.

Nikolpelov said that the accident was never publicly reported since it occurred at a defense factory; the plant that produced the radioactive waste is generally believed to have been producing plutonium for nuclear weapons.

Medvedev drew his conclusions about the accident primarily from a series of research papers in the Soviet scientific press describing the impact of high levels of strontium-90 and cesium-137 on fauna and flora. The precise location from which the samples were taken had (in all but one case) been censored.

His initial claims were subsequently confirmed by Lev Tumerman, formerly head of the biophysics laboratory at the Institute of Molecular Biology in Moscow who emigrated to Israel in 1972. Tumerman told Medvedev that he had personally seen large areas of land in the region that had been permanently evacuated, with many villages and towns destroyed.

The Soviet report claims that, although 10,000 people were evacuated from their homes, "there were no casualties." However, no reference is made to the long-term health effects of those in the exposed regions; Medvedev originally claimed that "many villages and towns were not evacuated on time," and that this probably caused "the deaths later of several hundred people from radiation sickness."

But the precise cause of the 1957 explosion remains a mystery. Sir John Hill, former head of Britain's nuclear power program and one of Medvedev's strongest critics in the 1970s, continues to challenge the notion that a chemical explosion of the nuclear waste itself caused the accident. "What I said at the time was that the accident as described by Medvedev could not have happened, and I stick to that view today," he told *Science*. He added that experiments carried out at the Los Alamos laboratory confirmed his view that nuclear waste could not explode of its own accord. "I said at the time that there might well have been some form of explosion there," added the British physicist. "After all, they were using Chernobyl-type reactors, and there was a lot of carelessness at the time in the U.S.S.R. in handling waste. But I still believe that the type of accident reported by Medvedev was impossible."

■ **DAVID DICKSON**

