U.S. SCIENCE BUDGET

Bigger Contribution to ITER Erodes Domestic Fusion Program

The U.S. fusion program is in a bind. To remain at the cutting edge, U.S. fusion researchers must participate in the huge international experiment called ITER being built in Cadarache, France. But to pay for ITER—which aims to produce a self-sustaining fusion reaction, or "burning plasma," and prove that fusion is a viable energy source—the United States may have to sacrifice the very community of researchers who would use the machine when it is ready.

That paradox hit home last week, when President Barack Obama submitted a 2013 budget request to Congress that would slash the nation's already beleaguered domestic fusion program while boosting the U.S. contribution to ITER. Contributing to ITER "is reasonable only in the context of a domestic program," says Martin Greenwald, a physicist at the Massachusetts Institute of Technology (MIT) in Cambridge and chair of the Department of Energy's (DOE's) Fusion Energy Sciences Advisory Committee (FESAC). "Otherwise, you're just building a piece of equipment for other people to use."

At first blush, the proposed 2013 budget for the fusion energy sciences program at DOE doesn't look so bad. It would dip by less than 1% to $398 million. However, within that flat budget, spending on ITER construction would increase by 43% next year, from $105 million to $150 million. As a result, spending on fusion research at home would fall 16%, to $248 million.

The effects of the cut would be dramatic. DOE supports three large experimental devices called tokamaks—doughnut-shaped chambers in which ionized gas, or "plasma," is confined by magnetic fields and heated and squeezed to the point at which atomic nuclei fuse and release energy. In the biggest blow, the tokamak at MIT, called the Alcator C-Mod, would shut down.

"I was shocked," says Miklos Porkolab, director of MIT's Plasma Science and Fusion Center. "I didn't have the vaguest idea of what was coming." C-Mod is the only U.S. tokamak that operates at magnetic fields as strong as ITER's will be, Porkolab says. It supports 100 staff members and 30 graduate students.

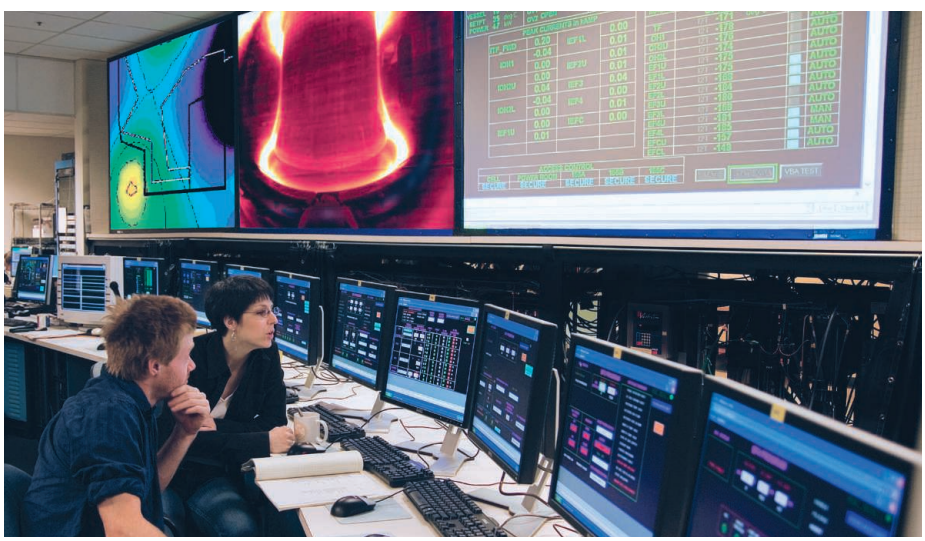
The budget of the United States's sole dedicated fusion lab, the Princeton Plasma Physics Laboratory (PPPL) in New Jersey, would drop by 16%, to $61.8 million. "If all the cuts go through, we would have to lay off about 100 of 435 staff," says PPPL Director Stewart Prager, who notes that the lab has already shrunk by two-thirds since the 1990s. The proposed cut for 2013 would stretch by 6 months an ongoing upgrade of the lab's National Spherical Torus Experiment, delaying the tokamak's restart until 2015.

Obama's budget request, if adopted by Congress, would leave the United States with only one tokamak operating next year, the DIII-D at General Atomics in San Diego, California. But its running time would be reduced to 10 weeks—3 weeks less than this year and a far cry from the 25 weeks that would constitute full utilization, says Tony Taylor, vice president of the magnetic fusion energy division at General Atomics. The cuts would also require axing 30 of 180 DIII-D staff and postponing key upgrades.

Even the proposed $150 million contribution to ITER in 2013 won't keep the United States on pace to meet its commitment to the project, says Stephen Dean, a physicist and president of Fusion Power Associates, a nonprofit research and education foundation in Gaithersburg, Maryland. That would require about $200 million, he says.

The budgetary train wreck is exactly what some researchers have long feared. When the United States signed on to ITER in 2003—as a junior partner alongside the European Union, China, India, Japan, Russia, and South Korea—its projected cost was $5 billion, making the U.S. share roughly $500 million. Now the price tag tops $20 billion, and the U.S. share has ballooned to $2.2 billion or more. At the same time, DOE's fusion budget has been flat for the past decade when adjusted for inflation.

Oddly, although the proposed budget would provide just $40 million for running facilities, it still provides $154 million for research. A typical operations-to-research ratio for a DOE program is 1:1. Why the imbalance? One reason is that much of that research might be done overseas. Last summer William Brinkman, director of DOE's Office of Science, asked FESAC to study the idea of sending legions of researchers to South Korea and China to work on new tokamaks that those countries have built. Its report is due this month, but scientists already have misgivings about that approach.



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Lights out? With the device's glowing heart showing on the screen above them, students control MIT's tokamak, which could shut down next year.

If nothing else, it will make it harder to attract younger scientists, researchers say. (Already, the 2013 budget would slash the number of student positions from 325 to 263.) The scheme also exports the country's most valuable resource: knowledge. "It makes no sense for the United States to pay to ship our intellectual capital overseas and make ourselves less competitive," Taylor says.

The proposed budget isn't a done deal. "I can tell you that the community does not support this plan, does not support this budget, and is going to try to get Congress to overturn it," Dean says. Brinkman agrees that "it makes no sense to invest in ITER if there isn't a base program" and suggests that the department may also be looking for help from Congress.

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"This [budget] has to go to the Hill, and we'll see what the Hill does with it," he says.

Even if Congress kicks in the $50 million needed to shore up the domestic program next year, 2014 could be far worse. The United States will have to pony up $2 billion for ITER over 8 years, so its annual contribution will likely shoot up to $300 million, potentially consuming the whole domestic program.

Restructuring those payments may be the best short-term solution. Brinkman says that Office of Science staff members have begun talking to other Administration officials and ITER partners about such changes. "One thing you learn in this government town is you take it one year at a time," he says. But fusion physicists worry that such a tactical approach will only delay the demise of their research program.

Greenwald and other fusion scientists would like greater support from the Obama Administration. But presidential science adviser John Holdren says the Administration is doing what it can. "The cutting edge of fusion is determining whether we can create a burning plasma, and the only machine in the world that has a prospect of doing that is [ITER]," Holdren said last week during a rollout of the new budget when asked if ITER was being favored over the domestic program. But he added that "we are going to maintain a strong plasma science program and invest in ITER." **–ADRIAN CHO**

U.S. SCIENCE BUDGET

Advocates Win 'Exceptional' Boost for Alzheimer's Research

The 2013 budget proposed by President Barack Obama last week would give the National Institutes of Health (NIH) not a penny more than it received this year. But the Administration found a way to give special attention to one disease: Alzheimer's, which will receive $80 million in new research funding from a source outside NIH's budget. This month, the Administration also announced, to the surprise of many at NIH, that the agency will reprogram $50 million in its current budget for the disease.

Jackpot. HHS Secretary Kathleen Sebelius announces $156 million for Alzheimer's.

Alzheimer's research advocates credit the new focus to several years of organized lobbying. "It's persistence," says Harvard University's Rudolph Tanzi, who like many researchers in the Alzheimer's field has taken part in this effort to boost the roughly $450 million NIH already spends on the disease. Advocates say they've finally hammered home the message that the growing costs to Medicaid and Medicare of caring for Alzheimer's patients could eventually swamp the federal budget. "We kept pushing and saying, 'You guys are asleep here. You need to wake up,' " Tanzi says.

But in addition to such "compelling facts," says Robert Egge, vice president of public policy and advocacy for the Alzheimer's Association, this month's victory also reflects a series of steps that built bipartisan support in Congress and the Administration. "Congress is a stimulus-response organization," says Representative Edward Markey (D–MA), an Alzheimer's champion. Compared with cancer and AIDS, advocacy was hampered because the disease doesn't leave survivors, and families were reluctant to discuss it. "Recently, the Alzheimer's advocacy community has risen to overcome this unique challenge," Markey says.

Momentum began to build 5 years ago when current Republican presidential candidate Newt Gingrich, who has an interest in brain diseases, and George Vradenburg, a former television and AOL executive who became an Alzheimer's fundraiser, began working with Markey and a nonpartisan panel. Deliberately "independent," Vradenburg says, the Alzheimer's Study Group was co-chaired by Gingrich and Senator John Kerry (D–MA), and included former NIH Director Harold Varmus and former U.S. Supreme Court Justice Sandra Day O'Connor. Its 2009 report called for $1 billion in annual research funding.

Relentless lobbying led to the National Alzheimer's Project Act. It passed in December 2010 "in a very divided Congress" with strong White House support, notes Daniel Perry, president of the Alliance for Aging Research. The Department of Health and Human Services (HHS) has since formed a federal advisory committee; it recently set a deadline of 2025 for preventing and treating the disease. Last December, advocates met with White House officials, who said they were trying to find new funding for Alzheimer's in the 2013 budget, Perry says.

On 7 February, HHS Secretary Kathleen Sebelius announced that HHS had found $50 million in 2012 and $80 million in 2013 (and $26 million for related programs). Last week, HHS officials explained that the 2013 funding will come from the HHS Public Health and Prevention Fund, created by the 2010 health care law. "It took real budget legerdemain" to find the money, Perry says. It may run into opposition; some say the fund wasn't meant for this use.

NIH officials, meanwhile, are still working out the details of redirecting $50 million this year to Alzheimer's. About half of that sum—possibly from large DNA sequencing centers—will go for genetics. The other $25 million or so will likely fund high-quality grant proposals across institutes that fund Alzheimer's, says National Institute on Aging Director Richard Hodes. That will mean less money to fund research in other areas, Hodes says. He said that although $50 million out of NIH's $31 billion budget "is not very large" (it's 0.16%), at a time of record-low grant success rates, "there will undoubtedly be people who will be concerned." He added: "This is something that should happen only in the most exceptional of circumstances, and in this case the Administration has determined this urgency of Alzheimer's and its demographics to be such a circumstance."

Tanzi acknowledges that squeezing other areas is a "downside" to the 2012 funding. And he admits that the wildly ambitious 2025 goal is "not scientific." (The Alzheimer's advisory panel plans to release its plan for getting there in time for an Alzheimer's summit at NIH in May.) But to mobilize advocates and policymakers, "you have to do things like this," Tanzi says. **–JOCELYN KAISER**

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