Stewardship Gravy Train Could Prove a Short Trip

These should be tumultuous times for the $1.2 billion National Ignition Facility (NIF)—and the $40 billion stockpile stewardship program of which it is a part. Critics of the giant fusion laser are questioning whether it can live up to its goals (see main text). And with dollars tight, Congress is wary of expensive new fusion projects. Just last week, for example, a whiff of technical and political difficulties nearly killed funding for the proposed $10 billion International Thermonuclear Experimental Reactor. It took a last-ditch effort by Energy Secretary Federico Peña to persuade a House spending panel to match the president's request for a paltry $55 million to continue design work. So why did NIF and the stockpile-stewardship program sail through the same congressional committees last week with barely a discouraging word?

The answer, in a phrase, is the Comprehensive Test Ban Treaty. President Clinton is about to ask the Senate to ratify the treaty, which would convert the current moratorium on underground testing into law. Liberals who support the treaty aren't about to jeopardize its passage by raising questions about the nation's ability to keep its nuclear arsenal in good shape without testing. And conservatives who might otherwise see the test ban as a sellout are hard pressed to defend the need for such tests when the directors of the nuclear weapons labs solemnly swear that stewardship facilities like NIF will work just as well. But this unlikely alliance of Republicans who are arms control skeptics and Democrats pressing for more radical nuclear arms reductions may not last, warn Administration officials and members of Congress.

LLNL

Groundbreaking work. A bulldozer begins preparing Livermore site for NIF.

NIF is only the most visible portion of a stewardship program at the Department of Energy (DOE) that would bestow sophisticated computer systems, experimental facilities, and a new reason for being on Lawrence Livermore, Los Alamos, and Sandia national laboratories. During Cold War days, the labs oversaw nuclear weapons design, engineering, and testing. Now, "if we want a safe and reliable deterrent [in the absence of testing], it's going to take a certain level of support," says Sig Hecker, the director of Los Alamos, who, with his two colleagues, is responsible for assuring the president each year that the nuclear stockpile is in working order.

But the program's $4-billion-a-year price tag is rising. The Senate Appropriations Committee approved $4.3 billion for 1998 to meet a string of unanticipated costs, while the House nearly matched the request. The original estimates did not include the cost of a new facility to provide tritium, a weapons component that has to be replenished, for example, and DOE has failed to reap some of the administrative savings it envisioned in 1992.

DOE had also expected to realize substantial savings by consolidating weapons-production facilities—in case new bombs ever prove necessary—at the labs. But some members of Congress are fighting the consolidation because they fear it will hurt private companies in their states, and any delay will eat up some of the planned savings. Also, Russia's continuing failure to ratify the START 2 arms control treaty means that the United States must maintain, at least for the moment, the larger and therefore more expensive START 1 stockpile. Some critics of the stewardship effort also say that DOE and lab officials are not exercising restraint in selecting an ambitious array of projects. "They're certainly going first-class; there's no doubt about it," says Spurgeon Keeny, president of the Arms Control Association.

Even the labs' staunchest ally, Senator Pete Domenici (R–NM), who chairs the panel with DOE oversight, shares the concern about rising costs. "This is a very difficult issue," he warned fellow senators last week. Domenici said he intends to press Administration officials for a clearer idea of the program's scope and costs. He is also concerned that NIF funding will eat into projects at the two labs in his home state, staffers add.

DOE headquarters' managers declined to comment on budget issues, but lab directors say they are aware of the problem. "There will be a careful counting of our pennies," says Sandia director Paul Robinson. Livermore's Bruce Tartar adds that a more detailed plan is needed. He says, "You get different [cost] estimates from different people. We ought to collectively come to a decision." Hecker agrees that "we need to revise the overall game plan," but he attributes some of the difference to uncertainty over what it will take to ensure the stockpile's readiness.

What is certain is that the program's scope and costs will be targets if and when the Senate ratifies the test ban. Neither House nor Senate is willing to approve funding for NIF beyond 1998, for example, as the White House requested. That almost guarantees a debate next year over the project. "They shouldn't buy everything in the candy shop," warns Lee Halterman, a minority House National Security Committee staffer. And if tougher budget restraints are imposed, look for intense jockeying among the labs to keep their share of the stewardship pie. **–Andrew Lawler**

adds extra neutrons to those generated by the fissioning plutonium. X-rays from the primary are channeled—the details are of course classified—so that their pressure implodes the secondary capsule, compressing and heating it enough for D and T nuclei to overcome their mutual repulsion and fuse.

NIF exploits a tamer version of this principle of radiation-driven implosion. In pulses several billionths of a second long, its 192 ultraviolet laser beams would shine through windows at the ends of a gold case called a hohlraum, about the size of a cold capsule. Clusters of four beams illuminate 48 separate spots inside, pouring in a total of 1.8 million joules of energy, while the pressure of hydrogen and helium gas sealed inside the hohlraum helps to keep the gold walls steady as they are blasted. In the instant before it explodes, the gold hohlraum emits a uniform surge of x-rays, which crush a pellet of frozen deuterium and tritium at its center, compressing it to 20 times the density of lead and heating it to 100 million degrees Celsius.

The replacement of the fission primary with a blast of laser light at much lower energy means NIF "is not a minibomb," says DOE's Reis. For this reason, even most of those who oppose the project doubt that it could lead to the development of even more advanced weapons. But Reis, who is the stockpile stewardship program's chief architect, says "we're in the ballpark" of weapons conditions in temperature, turbulence, and the jostling of radiation and plasma. Studies of those effects could validate the computer codes used to simulate nuclear explosions and model how aging and deterioration might affect them. Ignition is the ticket to that ballpark, however, says DOE's David Crandall. "We feel pretty strongly that ignition is needed for weapons physics."

Researchers at Livermore are now racing