

A key to realizing the ESS is settling on a site. The host country would pay between €300 million and €400 million, and the contenders are all trying to attract partner countries to fully fund the facility. As Juan Urrutia, who leads Spain's bid to host the ESS, puts it, "We need to be very seductive."

Politics and science

Sweden's ESS site is in Lund, in the south of the country near Denmark and Germany. "It's a hidden jewel," says Carlile. "When I saw it I was stunned by the blend of ancient university and innovation." In April Denmark joined the Swedish bid, the first formal partnership for any of the sites.

Hungary is hoping to host the ESS in Debrecen, the country's second largest city. And the Spanish site is in the Basque city of Bilbao. Urrutia notes that Spain has created a national fund to pay for the ESS. "Once other countries have made their bids, the percentage they want to own, they can put that money in whenever they want," he says. That option to postpone payment "is the

main difference between our candidature and the others."

Even while their site bids are competing against each other, Spain and Hungary are collaborating: They share an ESS scientific director and international advisory board, and are comparing costing and other data.

"It is psychologically very important that small countries are taking the lead," says Allenspach. The ESS would be the largest scientific facility yet built in any of the contending countries. "Up to now, large facilities have been built with the initiative of large countries. It's funny for the large countries that they do not decide where to build the ESS," he adds. "I am sure that none of the countries who do neutron scattering can be absent from the project, because it will be orders of magnitude better than other sources in Europe and decisively better than the SNS [in the US] or [the spallation source under construction at] J-PARC in Japan." In Germany, adds Richter, "the position of our government at the moment is 'wait and see.' If [the ESS] happens, they will participate,

I presume, but not in a leading role."

"If [the site is] not decided in a year's time, we will lose steam and [the project will] fall back into a really deep sleep," says Allenspach. "The most important thing is to have it built. Where it is built is a second priority."

"In Europe there is no mechanism to decide on large-scale facilities," Allenspach continues. "As soon as you have a facility of a certain size, countries start bilateral negotiations. Somebody has to take the lead and try to get others on board." Adds Urrutia, "We are not only building a large scientific facility. We are building Europe and the way Europe takes decisions."

The new spallation sources in the US and Japan were also important in turning around the ESS's fortune, says Richter. "It's a mixture of politics and science which determines the situation at the moment. I thought [the ESS] would have been asleep for longer. I was surprised, but I can only welcome the development. I think there is a relatively good chance that this time it will work."

Toni Feder

Revamped grants program offers R&D funds for 'critical national needs'

The Technology Innovation Program replaces the controversial Advanced Technology Program for supporting high-risk R&D projects.

Exactly where would you spend taxpayer money if you were ordered by Congress to invest in R&D critical to the nation's future but you had only \$8 million?

That's the situation that faces Marc Stanley, who directs the Technology Innovation Program, a new cost-shared grants office housed in NIST. TIP replaces the 18-year-old Advanced Technology Program (ATP) and, like its predecessor, is meant to assist in the commercialization of high-payoff technologies that are considered too risky to attract private capital. Created by last year's America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science (COMPETES) Act, TIP has been given the added mission of steering its investments into "areas of critical national need." NIST has since identified seven such areas: water, energy, manufacturing, civil infrastructure, personalized medicine, communications, and complex networks.

It's a tall order for a few million bucks. But dozens of ATP reviews and case studies have measured impacts out of proportion to the program's modest means. A 2005 analysis of 40 completed

ATP projects commissioned by the program's in-house economic assessment unit identified more than \$18 billion worth of expected present-value social benefits, an 8-to-1 return on the \$2.3 billion total the ATP had spent up to that point. A 2006 case study compared the fortunes of two manufacturers of microdisplays, one a 1994 ATP grantee, the other a nongrant. With its \$1.7 million ATP grant, the one company shortened its time to market by two years and realized \$5 million to \$7 million in measura-

ble net economic gains, according to the analysis.

Winners and losers

But partly due to concern with having the government pick winners and losers, the ATP was controversial from its inception. The Bush administration, and until last year the Republican-controlled Congress, has repeatedly targeted the program for termination. Opposition has always been along political and ideological lines; ATP

Historical statistics on ATP awards (1990–2007)

Number of proposals received	7530
Number of participants in submitted proposals	10 915
Total ATP funding requested	\$15 921 M
Total industry cost-sharing proposed	\$14 847 M
Number of awards	824
Single applicants	597
Joint ventures	227
Number of participants in awarded projects	1581
Total ATP funds committed	\$2408 M
Total industry cost-sharing	\$2206 M
Range of project awards	\$434 K–\$31 M

Source: NIST

detractors also objected to its subsidizing large corporations.

Over the years, the ATP received at least 29 reviews by the Government Accountability Office or the Department of Commerce's Office of Inspector General. In a detailed 2002 audit, even the Office of Management and Budget gave the program high marks for its planning, program management, and results. But the OMB called for the ATP's termination on the grounds that it wasn't needed, that it was too small to have an impact, and that it overlapped with other federal programs.

That the ATP survived as long as it did speaks to the power of at least one well-placed lawmaker. From his perch as the top Democrat on the relevant appropriations subcommittee, Senator Ernest Hollings (D-SC) singlehandedly rescued the ATP more than once. When Hollings retired in 2005, opponents almost killed the program; no new grants were awarded in fiscal years 2005 and 2006, but the ATP was left to complete projects begun in prior years.

Congress appropriated \$65.2 million for TIP this fiscal year, with most of that going to finish work on the 56 ATP grants that were awarded in 2007.

To ease the corporate subsidy concerns, TIP will exclude bids from large companies, defined as those listed among the Fortune 1000. Universities, which previously could participate in the ATP only as part of an industry-led team, will be eligible in 2009 to compete for TIP grants on their own. The maximum grant size for TIP awards to single companies has been raised to \$3 million over three years, compared with the ATP's \$2 million maximum. But joint ventures can receive up to \$9 million in TIP funds over five years. President Bush's FY 2009 budget request includes zero for TIP, but lawmakers are likely to continue funding it.

No shortage of advice

TIP managers do not lack for advice on how to spend the meager budget. At a 24 April symposium convened at the National Academies, Stanley heard two dozen presenters from industry, government, national laboratories, and universities pitch their ideas about critical national technological needs. Stanley said he will also be tapping his eight program managers, an external TIP advisory committee, the National Research Council, and other sources for advice, in addition to studying papers he's commissioned from three NIST fellows.

At the National Academies event, Peter Lee, head of the computer science

department at Carnegie Mellon University, said TIP could consider funding new technological approaches to shrink microprocessor feature size. He suspected that the gambles Intel Corp and other chip manufacturers have made in taking a multicore architecture approach may not pay off as they hope. Anna Barker, deputy director of the National Cancer Institute, saw a critical national need in getting cancer biologists and clinicians to appreciate the potential of nanoscience to fight the disease. The NCI has established several university-based interdisciplinary centers for cancer nanotechnology excellence, where researchers are trying to put nanomaterials to work diagnosing and treating the disease.

Thomas Bowles, science adviser to New Mexico Governor Bill Richardson, recommended that TIP projects contribute to workforce development and to improving public understanding of science, technology, engineering, and mathematics. Richard Stulen, chief technical officer at Sandia National Laboratories, noted a pressing national need for all sorts of remote sensors and power sources for them. New methods

for deterring cyberattacks are also needed, he said, as is greater use of models and simulations to cut US manufacturers' product development times.

Stanley admitted that the task of picking a few projects to address a mountain of challenges will be daunting. Plans call for focusing on one of the seven needs categories for this year's TIP competition. A request for proposals should be issued sometime this summer, with awards expected in November.

Begun during President George H. W. Bush's term, the ATP thrived in the early Clinton years, peaking at \$414 million in 1995. But the Republican takeover of Congress that year brought a reversal, and with the exception of one year, funding never topped \$200 million again. Through September 2007, a total of \$2.4 billion in ATP money had been committed for 824 projects involving 1581 participants, with the awardees contributing \$2.2 billion in matching funds (see table on page 23). Small businesses of fewer than 500 employees took half of all awards, but their share increased in recent years; 53 of the 70 awards made last year were to small firms.

David Kramer

Lawmakers fret over health, safety impacts of nanotechnology

As Congress reauthorizes the National Nanotechnology Initiative, groups petition the Environmental Protection Agency to step up its regulation of nanomaterials.

Congressional overseers and outside experts are pressing the Bush administration to direct more of the \$1.5 billion nanotechnology research program toward resolving the environmental, health, and safety issues raised by the manufacture and use of a rapidly growing number of nanoscale materials.

Since its 2000 inception, the multi-agency National Nanotechnology Initiative has included an R&D component for EHS concerns. But the NNI has yet to come up with a well-designed plan that is both adequately funded and effectively executed, says Representative Bart Gordon (D-TN), chairman of the House Committee on Science and Technology. Although Gordon threatened to mandate that 10% of the NNI funding go to EHS research, the provision was not part of legislation approved by the committee on 7 May to reauthorize the NNI. The White House had opposed the mandate, but it has proposed upping EHS spending to \$76 million in the next fiscal year. That would be twice the FY 2005 level and 5% of the NNI.

Meanwhile, a coalition of environmental groups headed by the International Center for Technology Assessment (ICTA) filed a petition with the Environmental Protection Agency (EPA) on 1 May demanding that the agency begin to regulate the most widely used nanomaterial today. Silver particles are used in a wide range of consumer products, mostly to impart an antimicrobial surface. But two recent studies have found that socks impregnated with nanoparticles of silver leach the particles when laundered. Silver is toxic to fish and other aquatic organisms, and researchers have found the nanoparticles in streambeds. What isn't known is the extent to which the nanoscale form increases silver's toxicity.

The ICTA's petition came less than two months after the EPA fined Iogear Inc, a California maker of computer mice and keyboards, more than \$200 000 for failing to register its nano-silver products as required by federal law and for making unsubstantiated claims about their products' antimicrobial properties.

By the ICTA's count, more than