

an identity shift for the lab, but rather a “shifting [of] the weight from one leg to another.” Germany will pay roughly 60% of the projected C795 million (roughly \$1 billion) construction cost for the DESY XFEL. So far, nine other European countries have signed on for a planning phase: Denmark, France, Greece, Italy, Poland, Spain, Sweden, Switzerland, and the UK. By mid-2006, the partners aim to set forth details on the mode of collaboration, technical design, schedule, cost breakdown, and financing for the project. The DESY XFEL is scheduled to start up in 2012.

Like SLAC, DESY will close a high-energy physics facility in the lead-up to building its XFEL. In this case, it's the Hadron Electron Ring Accelerator (see PHYSICS TODAY, September 2003, page 27); about one-eighth of HERA's injector, PETRA, is to be converted into a state-of-the-art synchrotron radiation source. Closing HERA in 2007 will free up manpower and money—about C50 million, or a third of DESY's operations budget.

The DESY XFEL will use superconducting, or “cold,” RF cavities—the technology agreed upon internationally for the ILC (see PHYSICS TODAY, October 2004, page 34). “The synergy we get from doing one job for two projects is really enormous,” says Robert Klanner, who until recently was DESY research director. Another difference, related to the cold technology, is that the DESY XFEL will deliver pulses in bunches of 3000, with a repetition rate of 10 Hz; the LCLS and Japan's SCSS (SPRING-8 Compact SASE Source; SASE stands for self-amplified spontaneous emission) will initially produce single pulses with repetition rates of 120 Hz and 60 Hz, respectively.

## Catching up

Japan made a late reentrance into the race for an XFEL, but its SCSS could open for experiments as early as 2010. The project was on hold when, early this year, the country's Ministry of Education, Culture, Sports, Science and Technology called for an international review. “To give you a flavor of the excitement,” says SLAC's Hastings, who served on the review panel, “the international review reported at 5pm on a Friday. The ministry called at 5:05 to find out how the review went. You wouldn't get that in the US.”

Size sets the SCSS apart. “Land cost is very, very high,” says project director Tetsuya Ishikawa, “so we cannot afford a very long accelerator.” To pack the needed punch into a linac only 350 m long—compared with

1 km for the LCLS and more than twice that for the DESY XFEL—the SCSS will use a high-gradient accelerator. Among the other tricks for keeping the SCSS compact is the placement of the undulator magnets inside the accelerator vacuum so that “shorter wavelengths are attainable with lower electron energies,” says Ishikawa. The SCSS will be built next to SPRING-8, a third-generation synchrotron light source 70 km west of Kobe. The estimated tab is \$250–330 million, depending on how many undulators are built.

## Accelerator gap

With no major high-energy experiment on site at SLAC and DESY, says SLAC's Herman Winick, “the intellectual culture will become more and more photon science.” One change, adds Klanner, “will be in the external visitors. Instead of particle physicists coming for months, the foreign visitors for the XFEL will come for just a few days. This will have a big impact in the corridors, the canteen, and the laboratories.”

But managers at DESY and SLAC insist particle physics will remain strong at their labs. For starters, the XFELs themselves rely on accelerators. Says Dorfman, “The central jewel in SLAC's accelerator-based program will be the LCLS.” SLAC has a growing particle astrophysics effort, an area DESY is also strengthening. DESY also plans to join a high-energy experiment off site.

Most important, says Wagner, “the future of particle physics at DESY is the [international] linear collider, independent of where it is.” The same goes for SLAC, which is ruled out as a host site by tight space and earthquake vulnerability. “[The ILC] won't, of course, be built at the SLAC site,” says Dorfman. “But we are the only people who have built a linear collider. As the international community goes forward

and does the design, they couldn't do it without SLAC people.”

“For high-energy physics generally, as a community, the number of spigots is decreasing,” says Persis Drell, SLAC's associate director for research. “The field has made a choice. We have said the linear collider is our future. We have to accept some consequences. I'd much rather have the linear collider than a bunch of smaller machines—even one in my back yard.” Nervousness among particle physicists, she adds, comes from the uncertainty of change and “anxiety that the linear collider is not signed, sealed, and delivered. Sometimes you have to gamble for what you want.”

The gamble is whether countries will get money and agreements together to realize the ILC. In the meantime, in addition to the impending shutdowns at SLAC and DESY, Cornell University's electron-positron experiment is slated to turn off in 2008 (the experiment's storage ring will continue as an x-ray synchrotron source), and plans for Fermilab's BTeV experimental facility were dashed in February by President Bush's proposed budget for FY 2006. “The problem is the real scientific and financial cut of particle physics and the large gap in time until a new machine comes,” says Max Klein, spokesman for one of the HERA detectors.

Even particle physicists who oppose killing the smaller experiments back the ILC. And even those who, like SLAC experimenter Martin Breidenbach, see x-ray light sources as “parasites” that “have basically swallowed up SLAC and taken over the world,” admit that the XFELs mean SLAC and DESY are “extremely well positioned” to survive as institutions. Or, as DOE's Staffin puts it, “as a scientific facility, without an LCLS, it's not clear where SLAC would go at all. It's pretty creative.” **Toni Feder**

# Nuclear Power Needs Government Incentives, Says Task Force

**C**iting economics, climate change, and the projected growth in global energy demand, a US Department of Energy (DOE) task force cochaired by former Nuclear Regulatory Commission (NRC) chairman Richard Meserve and former New Hampshire Governor John H. Sununu has recommended that the federal government help revitalize the US nuclear power industry by sharing the up-front costs

**A high-profile US government task force says it is in the national interest to use nuclear power as a clean and increasingly economical way to meet the growing demand for electricity.**

of the first few of a new generation of nuclear power plants. After citing three decades of increasing efficiency, decreasing operating costs, and solid

safety records at the 103 existing US nuclear power plants, the task force noted that “despite this . . . achievement, and the fact that nuclear power generation does not result in greenhouse gas emissions, no new US nuclear power plants have been ordered and subsequently built since 1973.”

### **Economic case**

To restart the nuclear industry, the authors of the report—the nuclear energy task force of the Secretary of Energy Advisory Board (SEAB)—say “there should be government-supported demonstration programs and financial incentives to overcome the uncertainties and economic hurdles that would otherwise prevent the first few new plants from being built.” Their key recommendation is a cost-sharing program for “first-of-a-kind engineering” (FOAKE) costs “inherent in building the first facility of a new design.”

The task force recommended fifty-fifty cost sharing up to a maximum of \$200 million in government money “for each of three major competing design types, with the secretary of energy being given discretion to select the types to be supported.” While the report does not call the cost-sharing program a government loan to industry, it does say that much of the money could be repaid

from the profits of future nuclear power plants built using the designs.

Although the report is essentially a document making an economic case for government subsidies to restart the US civilian nuclear power industry, task force member C. Paul Robinson, the former director of Sandia National Laboratories in Albuquerque, New Mexico, said the economic arguments “are just becoming very timely in terms of electrical needs. We have looked at all the alternatives and certainly if you believe in the threats of greenhouse gases, then it is important to have something that can produce electricity with good efficiency and cost, and be emission free.”

Another task force member, physicist Burton Richter, former director of SLAC, said that the FOAKE recommendation for cost sharing came because it “looks very much as if, once you get past the extra costs of a first-of-a-kind plant, then the costs of nuclear power are competitive with coal. That’s a surprise to most people. If you can replace coal, you do good for air pollution, the economy, energy supply, and competitiveness.”

Richter noted that the US, along with the rest of the globe, is “due for a big expansion in electricity demand, and we’re better off for environmental

and other reasons if we do it with nuclear power instead of coal. Government should lead industry to do the right thing rather than the wrong thing.”

In addition to urging legislative support and funding for FOAKE, the task force made two other recommendations to help rejuvenate the nuclear power industry:

► Early site permit and combined construction and operating license demonstration programs jointly funded by DOE and industry. In the past, one of the more significant barriers to new nuclear power plant construction was the two-step licensing process. The NRC issued a construction permit, and only after construction was substantially completed was an operating permit issued. Outside parties had numerous opportunities to intervene and delay or halt a project, which made the process of building a nuclear power plant a risky, high-stakes affair. The NRC has established a streamlined combined licensing procedure that significantly cuts the financial risk of building a nuclear plant, but the procedure has never been tested. The report recommends that DOE share the licensing costs with early applicants so that a real-world model can be developed.

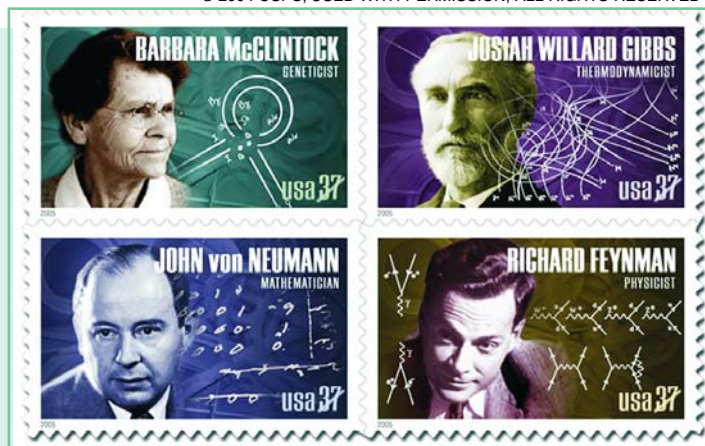
► A “basket of support programs for

## US Postage Stamps Feature Scientists

The US Postal Service is honoring four American scientists with stamps, to be issued on 4 May. Physicists Richard Feynman and Josiah Willard Gibbs, mathematician John von Neumann (who made significant contributions to quantum mechanics), and geneticist Barbara McClintock share the panel of first-class stamps.

Each stamp depicts a scientist with graphics relevant to his or her work, which is described on the stamp's sticky side. The stamps also bear hidden symbols to protect against counterfeiting; look for a physical constant in miniature on the Feynman stamp, for example. The panel is the first in what may become a philatelic series of scientists.

Ralph Leighton, who played drums with Feynman and helped write several of his popular books, had lobbied for a Feynman stamp for a decade. To celebrate, Leighton—the son of Robert B. Leighton, a coauthor of the ubiquitous *Feynman Lectures on Physics*—has organized a party at the post office in Far Rockaway, the New York City neighborhood where Feynman grew up. A few blocks away, the street where Feynman lived will be renamed in his honor. Both events will take place on 11 May, Feynman's birthday. All are invited (see <http://www.nyas.org/snc/calendar.asp>).



Toni Feder

the first few reactors of each new supported design to provide efficient financial options.” This basket would include secured loan guarantees, tax credits, accelerated depreciation, and other economic incentives from which a nuclear power plant builder could pick and choose. The incentives package could not exceed \$250 million in government money for each nuclear reactor.

In the leadership issues section of the report, the task force warns nuclear-industry leaders that they must “recognize that the federal government should not and cannot eliminate all the risks and vagaries of the energy markets for them.” The nuclear industry, the report says, “must clarify its needs and prioritize its requests” and “must also convey information to federal policymakers in clear, sharply defined terms with specific recommendations.”

### Industry reaction

Richard Myers, senior director of business and environmental policy at the Nuclear Energy Institute, said the task force report was a “well thought out piece of work.” The nuclear industry, which NEI represents, is looking at \$400 to \$500 million as the FOAKE cost of a new nuclear plant, he said, so the report's fifty-fifty cost-sharing proposal with a \$200 million limit was reasonable. “We think the report, on balance, is pretty sensible. . . . Once the first ones are done, we think Wall Street and the companies will recognize the licensing process is manageable, costs are predictable . . . and we can move forward from that point on and finance them conventionally.”

Policymakers in both the administration and Congress must develop “a clear commitment to a national energy policy” that gives nuclear power

a strong role, the report says. “We urge that the president identify this as a critical priority for the nation and that Congress take the necessary steps to meet this priority.” The report doesn't mention the controversy surrounding the Yucca Mountain radioactive waste storage project in Nevada (see the story on page 32), but it does say the waste storage problem must be resolved. But the authors make clear that “the absence of a licensed repository is not a valid reason for postponing additional nuclear construction.”

Another critical aspect of encouraging a new generation of power plants is the concern over nuclear proliferation, especially in the wake of September 11th. The task force's bottom-line conclusion is that the rest of the world is going to move forward with energy generation from nuclear power regardless of what the US does, and the US would be better off participating than sitting on the sidelines.

An increase in the use of nuclear power in the US would actually “serve our non-proliferation objectives,” the report says, because “one of the most efficient and certainly the most thorough ways of disposing of that nuclear material is to burn it as fuel in com-

mercial nuclear reactors.”

Robinson said task force members “had several discussions with the folks over at the White House to understand what the traffic would bear” in terms of government support for the nuclear industry. “We've been getting the right words to do at least one such [reactor construction and startup].” That would shore up the confidence that all of the work that was done to speed up the regulatory process has worked, he said. “The object is . . . to show that nuclear power is a good investment.”

And it is economics, not safety, that killed nuclear power development in the US, Robinson said. “Nuclear power was grossly overbuilt because of predictions that energy growth was going to double every seven or eight years,” he said. When that didn't happen, it became uneconomical, especially with the uncertain licensing procedures, to invest in nuclear power, he said.

“So it's going to take a big infusion of courage for the next person in the finance community to take the first step,” he said. That courage will be easier to find if it is bolstered by a federal cost-sharing program, the report concludes.

Jim Dawson

## Iran Hints of Nuclear Flexibility

In a March statement marking 35 years since the signing of the nuclear Nonproliferation Treaty, President Bush called on signatories to adhere to the treaty. “We cannot allow rogue states that violate their commitments and defy the international community to undermine the NPT's fundamental role in strengthening international security,” he said. “We must therefore close loopholes that allow states to pro-

duce nuclear materials that can be used to build bombs under the cover of civilian nuclear programs.” The statement was aimed at Iran, which had failed to inform the International Atomic Energy Agency (IAEA) of the depth of its nuclear activities.

Despite the president's words, the administration appears to have little faith in using the NPT as a mechanism for restricting Iran. Typically the US