gressional Budget Office that estimated a cost per household of 48 cents per day to meet the greenhouse gas targets in the House bill. The CBO estimate did not include the economic benefits that will come with either the reduction in greenhouse gases or the slowing of climate change.

In his analysis, Mark Muro, policy director of the metropolitan policy program at the Brookings Institution, lamented that under Waxman–Markey just 1.5% of the revenues generated from emissions permits would be devoted to R&D on renewable and other clean-energy sources. That's roughly $1.4 billion annually, based on generally accepted price forecasts. Muro argued that the government ought to be spending $20 billion to $30 billion annually, compared with its current level of around $5 billion. **David Kramer**

SLAC free-electron laser sparkles into life

"It was a thrill of a lifetime for guys like me," says John Galayda about this spring's smooth startup of SLAC's free-electron laser, the Linac Coherent Light Source (LCLS), whose construction he oversees. "Accelerator guys thought it would be less trouble to lase at 15 Å, and that we would struggle at shorter wavelengths. As it turned out, we lased at 1.5 Å on the first attempt." The secret to success? "A jillion things had to be done exactly right."

"It's very rare that you turn on something of this complexity and it just works. It annihilated our expectations," says SLAC director Persis Drell. People expected it would take months to optimize the LCLS. "Some 112 meters of undulators, which generate the fields that accelerate electrons so they emit x rays, had to be aligned to 5 microns," says Drell. "The electron beam had to be high quality, with low emittance. There was technical hurdle after technical hurdle. But they started the lasing campaign, and two hours later it performed just beautifully."

The on-time startup of the $420 million LCLS is all the more impressive in light of the $8 million budget cut it suffered with the federal budget's 2007 continuing resolution. To deal with the cut, says Galayda, "we delayed civil construction in the second experimental hall. And we spent every dime we had authority to spend in 2008." The second experimental hall is scheduled to be completed next July.

Meanwhile, the first experiments, set to begin next month, will focus on interactions of roughly 80-femtosecond pulses with atoms and molecules. "You have a gas of atoms or molecules, fire the laser, and measure the products. The interaction is with the core electrons, and you can kick out not one but two. So it's multiphoton, nonlinear physics," says Jochen Schneider, head of the LCLS experimental facilities division. Researchers want to study the resulting molecular explosions. Other experiments will involve coherent

The undulator system in SLAC's free-electron laser creates x-ray pulses tens of femtoseconds in duration; each pulse consists of around 10^{12} photons. The horizontal bar with a lower lip is 1 of 33 titanium undulator magnets, each 3.4 meters long. The dark blue insulated supporting columns are designed for low vibration and thermal stability.

BRAD PLUMMER/SLAC

imaging of single particles and nanocrystallography, "getting a diffraction pattern from each individual flash, shot by shot, before the sample explodes," says Schneider. The first set of experiments, he adds, "takes us out to Christmas."

Veit Elser, a physicist at Cornell University who simulates the interactions of light pulses with proteins, says, "Biologists want to know what a protein looks and acts like in the preexploded form, and that only works if the pulse passes through the protein in a shorter time than it takes to explode." From studies, he adds, protein explosion is expected within 20–100 fs of exposure to the LCLS x rays. "So we were all nervous. It was great when [the LCLS] announced that, without trying too hard, they'd gotten pulses under 20 fs. If you have the mentality of a physicist, to get this short pulse length is incredible."

The startup of the LCLS is a milestone in the reinvention of SLAC from primarily a high-energy physics laboratory to a multiprogram one that emphasizes light sources, astroparticle physics, accelerator R&D, and accelerator-based particle physics. "The LCLS was turned on a year to the week after the April 2008 early turning off of the B factory, the last on-site user facility dedicated to particle physics," says Drell. "The lab has gone through an enormous transition, and it hasn't ended yet." The best science, she adds, "will come when we have built a stronger in-house program in photon science.

"Right now we are celebrating," Drell says. "But a little over a year ago, we had just completed a layoff of 13% of the staff. In the bigger context, the center of the universe for particle physics is going to be CERN, and we are fortunate to have been able to reinvent ourselves so quickly. The LCLS puts us right back at the forefront of physics."

Toni Feder

US public likes scientists, poll finds

While scientists rank near the top of the professions that Americans admire the most, a large fraction of the public chooses to ignore what scientists have to say on evolution and human-caused climate change, according to a study released last month. The US public also holds highly favorable views of science itself, with 84% of those surveyed believing that its benefits to society are mostly positive and only 6% thinking the opposite. But the study by the nonprofit Pew Research Center for the People and the Press found that a surprisingly low 17% of nonscientist participants regard their country's scientific achievements as the best in the world, and it gauged the public support for increased federal funding for science to be lukewarm.

Perhaps most strikingly, only 32% of those surveyed agree that humans and other living things have evolved over time through evolution by natural selection, compared with 87% of the surveyed scientists who believe so. A large gap also exists between scientists and the public on the issue of climate change, where just 49% of the public agree that Earth is growing warmer because of human activity, compared with 84% of scientists.

Scientists stuck with the science

"I'm fond of saying that the purpose of science is to tell us about the nature of the natural world, whether you like the answer or not," says Alan Leshner, executive director of the American Association for the Advancement of Science, which paid for the survey. "The public at large or policymakers are free to deny, disagree, or just disregard what the science is showing," he told reporters. "Scientists don't have that luxury."

The Pew study comprised three surveys: a Web-based questionnaire of randomly selected members of AAAS who are scientists, and two telephone surveys of the general public.

One of the public polls was aimed at assessing the scientific acumen of the general US population. It found that Americans are knowledgeable about basic scientific facts that affect their health and their daily lives, but they are less able to answer questions about other science topics. For example, 91% are aware that aspirin is an over-the-counter drug recommended to prevent heart attacks, but just 46% know that electrons are smaller than atoms.

The study found that only members of the military and teachers are more admired by the public than scientists. The 70% of survey respondents who viewed scientists as contributing a lot to society's well-being even edged out by 1% those who feel that way about physicians. Large majorities of the public survey group think that government investments in basic scientific research (73%) and engineering and technology (74%) pay off in the long run, and 60% believe that government investment in research is essential for scientific progress.

But when it comes to public funding, science is viewed as a mid-tier priority, says Scott Keeter, Pew's director of survey research. The 39% of participants who say that federal spending on science should be increased compares with 67% who favor more for education and 61% who want more for health care. Coming in below science are defenses against terrorism, where 35% favor more spending, and aid to the world's needy, where 26% want greater support. The good news, says Keeter, is that support for science funding has not eroded on the priority scale since Pew last studied the issue in 2001. At that time, the percentages of the surveyed population wanting more for education and health care were 9 points and 10 points higher, respectively, than they are today.

Scientists blamed the news media for much of the public's poor understanding of science, with more than 76% agreeing that news reports failing to distinguish between findings that are well-founded and those that are not constitute a major problem for science. Nearly half of the scientists described the media's oversimplification of science as a major problem. Leshner, who is the publisher of the AAAS-owned *Science* magazine, says he "was struck" that scientists put "less focus . . . on the education system in the US, which surely has responsibility for what people know and don't know."

Interestingly, although most scientists were aware of allegations that the Bush administration had suppressed scientific results that conflicted with its ideology and 87% of them believed those charges were true, that controversy was largely invisible outside the science community: Of the public respondents, 54% said they had heard nothing about the suppression.

Public education needed

Leshner says the results point to the need for improved science education at the K–12 level and for more and deeper interactions between scientists and the public. "I would argue that it's the general public that needs a basic understanding of science, not just those who go on to higher education. You can't live in modern society and not have a fundamental comfort and familiarity with the nature of science and what it is, because it pervades every aspect of modern life," he says. "The scientific community has a tremendous responsibility to not only produce useful, interesting, and provocative science but to go out to the public and work with the public" to ensure that the science is useful and