Diamond Light Source Brings a Charitable Facet to U.K. Research

The materials research community in the United Kingdom has good reason to be grateful to an unusual patron, a medical charity whose main interest is in supporting "research to improve human and animal health." The Wellcome Trust currently invests about £450 million a year (around $840 million USD) in research. It provided part of the funding for the country's newest synchrotron radiation source, the Diamond Light Source (DLS).

The DLS, sitting on a platform "the size of 5 football pitches," is nearing completion on the Harwell Chilton Science Campus near Didcot in Oxfordshire. The site also houses two other major research machines that are much used by materials researchers: ISIS, the self-proclaimed "world's leading pulsed neutron and muon source," and the Central Laser Facility (CLF).

The government-funded Council for the Central Laboratory of the Research Councils (CCLRC) operates both ISIS and the CLF. But when it approved the DLS, the U.K. government opted for a different model. It formed a new stand-alone company to run the new synchrotron.

Diamond Light Source Ltd is responsible for the construction, commissioning, and operation of the new machine, the largest science facility to be built in the United Kingdom in almost 30 years. The CCLRC continues to have an interest in the venture as holder of the government's 86% share in the facility. The Wellcome Trust holds the remaining 14% share. The U.K. government's share of funding, through the CCLRC, comes from the science budget, which is managed by the Office of Science and Innovation.

Along with the CCLRC's Rutherford Laboratory, the Harwell Chilton Science Campus also holds the Radiation Protection Division of the government's Health Protection Agency and various units of the Medical Research Council responsible for radiation and genome stability and mammalian genetics. Most of these can trace their origins back to the site's original use as the United Kingdom's leading non-weapons nuclear research establishment, the U.K. Atomic Energy Authority.

The DLS replaces the CCLRC's Synchrotron Radiation Source (SRS) at the Daresbury Laboratory.

Wellcome's support for the DLS demonstrates the growing importance of large facilities, particularly synchrotron light sources, in the life sciences, for such work as analyzing protein structures. The trust is also funding other activities at the DLS, including a new membrane protein laboratory that started operation this summer.

The Diamond Light Source, under construction in the United Kingdom. Photo taken in January 2006. (Photo: Diamond Light Source Ltd.)

In recent years, Wellcome has played an increasingly influential role in the U.K. research scene. For example, it led the way in increasing grants paid to doctoral candidates, forcing the research councils, which channel government money into this activity, to match its stipends.

Through the Joint Infrastructure Fund (JIF), for example, Wellcome also backed government moves to reverse years of declining budgets for science in the United Kingdom. In all, the JIF handed out £750 million between 1998 and 2000.

The research community will not have much longer to wait before the DLS begins operations. Approved in March 2000, construction began in March 2003. The new accelerator produced its first synchrotron light at 2:00 a.m. during the night shift on a public holiday, May 30, 2006.

The DLS is due to open its doors to the research community at the beginning of 2007. The first phase of construction includes seven beamlines for experiments.

In October 2004, Lord David Sainsbury, the Minister for Science, announced funding for the 15 phase II beamlines. The timetable calls for these to be built between 2007 and 2011. In all, the DLS has room for 40 beamlines, but it will be some time before phase III comes up for discussion.

Jim Kay, head of engineering at the DLS, said that the beamlines serving similar scientific areas will be grouped into what he calls a "village" structure. The idea, he said, is to "encourage scientists from similar disciplines to mix with each other, share ideas, and collaborate."

The first such villages will include engineering and environmental science, materials, macromolecular crystallography, soft condensed matter, spectroscopy, and surfaces and interfaces.

The idea of the "materials and magnetism" beamline is that it will "probe the atomic structure of electronic and magnetic materials, and will be important for companies in the electronics, photonics, magnetic storage, and specialty chemical sectors."

The DLS is now soliciting bids internationally from the first round of researchers who want beam time on the machine. This first wave will be for academic researchers. Industry will get its chance to bid for time next year, probably in the fall.

The DLS is already working to build its links with industry. It established DISCo (the Diamond Industrial Science Committee) to advise on relations with industry. Chaired by Malcolm Skingle of GlaxoSmithKline, DISCo advises the DLS on opportunities for industry to engage in research at the facility and how to promote those opportunities. Another role for the committee is to "develop best practice for industrial engagement with Diamond, including the nature of research collaboration agreements, the handling of [intellectual property], and the dissemination of research outcomes."

MICHAEL KENWARD

U.S. House Energy Subcommittee Held Hearing on Climate Change Technology Program

On September 20, 2006, experts from academia and the business community told the Energy Subcommittee of the U.S. House of Representatives' Science Committee that the Bush administration's Climate Change Technology Program (CCTP) Strategic Plan provides a useful overview of carbon-reducing technologies but fails to adequately address the mechanisms that would force the deployment of those technologies. The strategic plan was released at the hearing.

Witnesses also testified that the aim of the administration's plan, to reduce carbon intensity by 18% by 2012, would still result in a significant increase in carbon emissions.

Energy Subcommittee Chair Judy Biggert (R-Ill.) opened the hearing. "Fundamentally," she said, "we want to know whether the strategic plan can be used to guide research and development investment decisions and whether it will enable the United States to achieve the

administration's stated goals. Most importantly, and I cannot stress this enough, we want to know how the CCTP plan and DOE planning process can be improved." Biggert said that the draft technology plan was originally to be released four years ago according to the deadline set by former Department of Energy (DOE) Undersecretary Robert Card. She said that, by now, the hearing should be examining a three-year progress report of that plan rather than the current, delayed, revised plan.

The CCTP, established by President Bush in 2001, is a multi-agency research and development coordination activity led by DOE to focus R&D activities more effectively on the president's near- and long-term climate change goals. The CCTP strategic plan was originally slated for public release by July 2002. However, the first draft of the plan was not made available until September 2005, with the final plan released a year later, following a public comment period in which approximately 30 individuals and organizations commented on the plan.

Stephen Eule, director of the CCTP, testified, "The strategic plan provides a comprehensive, long-term look at the nature of climate change challenge and its potential solutions. It defines clear and promising roles for advanced technologies by grouping technologies for near-, mid-, and long-term deployment. Together, these technologies will facilitate meeting CCTP goals. It also outlines a process and criteria for setting priorities by organizing and aligning federal climate change R&D and discusses in detail the current climate change technology portfolio, with links to individual technology roadmaps and goals."

Eule said that the CCTP would "periodically conduct and support strategic planning exercises to identify gaps and opportunities in climate change technology and realign the portfolio as appropriate."

However, witnesses said there were significant opportunities for the administration to strengthen its climate technology effort, particularly in the area of greenhouse gas (GHG) emissions. "While the draft strategic plan provides a fine overview of GHG-reducing technologies and the opportunities each could present over the long term, it does not provide a plan for deploying these technologies, nor does it provide a path to stabilizing concentrations of GHGs," said Judi Greenwald, director of innovative solutions for the Pew Center on Global Climate Change. "The technologies considered in the plan are vitally important; however, merely compiling information about them is not sufficient to ensure their widespread penetration into the marketplace."

Greenwald told the subcommittee that the plan ought to encourage a combination of "pushing" and "pulling" activities that would force carbon-reducing technologies into the marketplace through the use of both R&D incentives and mandatory carbon caps.

Chris Mottershead, distinguished advisor on energy and the environment at BP, and a director of the Carbon Trust in the United Kingdom, said he viewed the CCTP strategic plan as "comprehensive and well considered," but also expressed concern that the plan gave insufficient attention to technology deployment. "Many technologies already exist, and we would like to see greater focus upon deployment and diffusion of these technologies, particularly engineering cost reduction, removal of institutional barriers, and the building of material new markets," he told the subcommittee.

Martin Hoffert, professor emeritus of physics at New York University, said the plan should focus on a broader array of technologies and the infrastructure needed to enable those technologies. "We are living in two parallel worlds: a world of potentially what we should be doing about climate change and energy security, and the real world of what we are doing. In regard to renewables, we're also building the wrong infrastructure. If we want renewable energy, then I think the greatest potential is from solar and wind, which are intermittent, dispersed, and low-power-density sources, but we don't have the right kind of electric utility grids to accommodate those energy sources. And if we're talking about rebuilding the national grids, such as to avoid blackouts, we're not talking about what types of grids will provide the transmission and storage capabilities to allow renewable energy to provide roughly 30% of our nation's energy."

Witnesses also testified that the aim of the plan, to achieve the president's stated goal of an 18% reduction in greenhouse gas intensity by 2012, is insufficient to adequately address the problem of global climate change. In written testimony submitted for the record, Daniel Kammen, director of the Renewable and Appropriate Energy Laboratory at the University of California, Berkeley, called the administration's carbon intensity reduction target "wholly inadequate to the challenge we face," adding, "The most significant shortcoming of the CCTP strategic plan is that the goal it seeks to reach is not commensurate with the magnitude of the challenges posed by climate change and other energy-related problems."

Kammen wrote, "Meeting the administration's current target will require only a slight change from the business-as-usual case. More relevant to the climate problem, reaching this target would actually allow emissions to grow by 12 to 16 percent. This target would thus represent a larger increase than the 10 percent increase that occurred in the previous decade."

Earlier in the day, prior to the subcommittee hearing, House Science Committee Chair Sherwood Boehlert (R-N.Y.) delivered a speech at the Climate Institute's Washington Summit on Climate Stabilization. Boehlert stated concern that Washington policy is slow to change regarding the controversial topic of greenhouse gas emissions reduction, and he discussed how scientists can help.

"Scientists have to be clear about what we know, and about what we don't. They need to be 'up front' about uncertainties—and about the potential costs of waiting until all uncertainties are resolved," Boehlert said.

He said, "In the House, many, perhaps even most, members still question whether climate change is a genuine phenomenon. The scientific consensus has simply not pierced through the ideological barriers. And there are briefings almost weekly sponsored by groups that argue that climate-change science is some kind of environmental conspiracy, and they bring seemingly credentialed people forward to make their claims."

"We need to lay out an argument for action, but we won't win by mimicking the opposition's tendencies toward rhetorical excess," said Boehlert. He said that the Senate has been a leader on climate change policy, but with little result. The administration, he said, understands the role it plays in developing technology and the country's infrastructure. However, he said, "I am not a big fan of the [CCTP] strategic plan, which is more of an inventory of existing programs and a wish list of possible future ones, than a planning document with clear priorities.

"Moreover," Boehlert said, "as is often the case with this administration, the plan is silent on what policies might be necessary to actually get new or improved technologies into the marketplace."