

BES Called to Lead Aggressive New Energy Initiatives

A secure energy future requires a major investment in basic energy research, technology, and engineering—an effort perhaps on level with the Manhattan Project or the Apollo effort to reach the moon. This is according to a December 2008 report from the Department of Energy's Office of Basic Energy Sciences (BES) Advisory Committee. The report, intended for an audience of opinion leaders and decision makers in government and the private sector, says that the BES must take an aggressive, leading role in developing energy systems of the future.

The report outlines four recommendations for BES:

- BES must lead a bold new initiative focused on solving the critical science roadblocks in next-generation, carbon-free energy technologies;
- BES must lead energy research efforts at the intersection of control science—directing matter and energy at the electronic, atomic, and molecular levels—with advanced materials and chemical phenomena;
- BES must organize the development of dream teams to include highly educated talent, equipped with forefront tools, to close the gap between needs and capabilities in synthesis, characterization, theory, and computation of advanced materials; and
- BES must lead a national effort to aggressively recruit the best talent through a series of workforce development and early career programs aimed at today's students and young researchers.

According to Harriet Kung, Associate Director of Science for Basic Energy Sciences, these recommendations provide high-level guidance on the program direction for BES, and will influence new initiatives across its portfolio.

Kung calls the report a visionary roadmap for basic research that aims to

convey to scientists and non-scientists alike the potential outcomes of a concerted investment in energy-related basic research. Such outcomes could include advances like materials that promote self-healing or resist corrosion, dramatically more efficient solid-state lighting, and the ability to inject emissions from fossil-fueled power stations safely underground.

Like many other countries, the United States is challenged by its unsustainable dependence on oil, the high cost of imported energy, and the environmental impact of carbon emissions. These challenges are so great that incremental advances in current technology will not be sufficient. According to the report, "The magnitude of the challenge is so immense that existing energy approaches—even with improvements from advanced engineering and improved technology based on known concepts—will not be enough to secure our energy future."

The report aims to communicate the long-range basic research needs for sustainable energy to Congress and other opinion makers. "There has been a tendency for Congress to fund implementation of energy technologies and not the basic science, even though fundamental advances are needed in most of the technologies, in order for them to achieve their full potential," said Marc Kastner, co-chair of the committee that authored the report.

Key research needs identified by the report include the ability to make fuels from sunlight, generate electricity without carbon dioxide emissions, and revolutionize energy efficiency and use.

With its ongoing investments in basic energy research, BES is uniquely positioned to lead paradigm-shifting discoveries in these areas.

Last April BES announced plans to invest approximately \$160 million in new awards for interdisciplinary Energy Frontier Research Centers, beginning in FY 2009. If funded, this will be a major step forward in addressing fundamental energy

science issues, said John Hemminger, chair of the BES Advisory Committee.

BES has studied roadblocks to widespread implementation of alternative energy technologies through a series of 10 *Basic Research Needs* workshops held during the last five years. These workshops identified specific technical roadblocks to progress in areas such as electrical energy storage, materials under extreme environments, and solid-state lighting. A related report, *Directing Matter and Energy*, discussed five overarching challenges related to the ability to direct and control matter on molecular, atomic, and electronic levels.

The workshops and corresponding reports showed many overlapping research needs, in particular, said Hemminger, the urgent and critical need for fundamental research addressing the coupled energy/environment crisis. "Dealing with these issues is critical to the country and new understanding, new materials, and new phenomena that will come from fundamental science will be required for success," he said.

The report, *New Science for a Secure and Sustainable Energy Future*, was put together by a subcommittee of the BES Advisory Committee and approved by the entire Committee in November 2008. The report can be downloaded from the BES Web site, www.sc.doe.gov/bes/reports/list.html.

"The message for the materials community is to read it, send it to their congressional representatives and senators and anyone who might have influence with Congress or the Obama Administration," said Kastner.

KENDRA RAND

Chairman Gordon Announces S&T Committee Agenda

Following the November 2008 election, Rep. Bart Gordon (D-Tenn.) was re-elected as chair of the Committee on Science and Technology for the 111th Congress. In December, he discussed the committee's agenda.

"There's a misperception that we cannot afford to invest in science because of the current economic conditions. I believe that investing in science and developing new technologies is the path to reinvigorating our economy, growing jobs, meeting our energy needs, and helping us address climate change," said Gordon.

The Chairman vowed to work with the new Administration to implement the Advanced Research Projects Agency for Energy (ARPA-E). ARPA-E is tasked with undertaking high-risk, high-reward energy technology development, especially research that is too cross-cutting or multidisciplinary to fit into the current

MATERA+ to Issue Call for Proposals in March

MATERA+, an ERA-NET+ Action focusing on materials science and engineering, is part of the larger ERA-NET+ actions of the European Commission aimed at providing additional EC financial support to national and regional programs that pool resources to organize a joint call for proposals. MATERA+ will open the call for proposals in March.

Topics to be addressed in 2009 are multifunctional materials, engineering structural materials, and bio-based materials and bio-inspired materials.

The Call is open to industry, universities, and research centers. The project consortia are challenged to demonstrate the whole chain from basic research to application-oriented research. Funding is done through national/regional funding programs.

The call for proposals will open on March 16, 2009, with a pre-proposal deadline of **May 15, 2009**.

system, and partnering with the best talent in the private sector, universities, and the national laboratories.

"Innovation will play a critical role in maintaining our competitiveness," said Gordon. "About half of the growth of GDP [growth domestic product] over the past 50 years is a result of developing and adopting new technologies. ARPA-E will foster innovation that will lead to technological breakthroughs. It is uniquely positioned to be the bridge to the new energy economy."

The Chairman also discussed the role of the Committee in some of the larger issues facing the 111th Congress, such as emissions regulations. "R&D will play a critical role in the effectiveness of any regulations," said Gordon. "If we pass cap and trade, we'll need reliable technologies to monitor reporting and compliance with greenhouse gas emission limits."

The Committee also plans to oversee the implementation of energy technology programs authorized in the Energy Independence and Security Act (EISA) 2007, and address new energy technology challenges, including nuclear reactors and reprocessing, vehicles including heavy trucks, and pipelines for new fuels and CO₂.

In terms of innovation, the Committee plans to reauthorize the National Nanotechnology Initiative and to work with the new Administration and Congress to fully fund the America COMPETES Act. The Committee also wants to develop updated policies for encouraging Federally-supported research at laboratories and universities to be brought into the marketplace.

The Committee also has on its agenda to focus on the workforce and math and science education, new technologies to address global environmental problems, building new types of infrastructure for transportation, and emerging technologies for security, among other priorities.

A copy of the full agenda can be downloaded from the Committee's Web site: <http://democrats.science.house.gov>.

Department of Energy Approves Construction Start of NSLS-II Project

To advance its science mission that focuses on critical national challenges, the U.S. Department of Energy (DOE) has approved the construction start of the state-of-the-art National Synchrotron Light Source II (NSLS-II) at Brookhaven National Laboratory. The start of construction is approved for fiscal year (FY) 2009, with completion scheduled for FY 2015. DOE has approved a total project cost for NSLS-II of \$912 million.

NSLS-II will be a medium-energy storage ring with a unique design that will deliver world-leading brightness and flux and exceptional beam stability. The machine will be the newest member of a suite of advanced light sources and neutron facilities operated by DOE's Office of Science that are used by more than 9,000 researchers from all disciplines annually. The NSLS-II will advance exploration of the scientific challenges faced in developing new materials with advanced properties, enabling their study, particularly at the nanoscale, at a level of detail and precision previously not possible.

"NSLS-II will provide the world's finest capabilities for x-ray imaging, with unprecedented spatial and energy resolution and the ability to detect single atoms," said Steven Dierker, Associate Laboratory Director for Light Sources. "It will provide advanced tools for discovery—class science in condensed-matter and materials physics, chemistry, and biology—science that ultimately will enhance national and energy security and help drive abundant, safe, and clean energy technologies."

The scientific advances resulting from research at the new facility will support technological and economic development in multiple sectors of the economy, from next-generation energy technologies to new drugs for fighting disease, Dierker said.

NSLS-II will replace the existing NSLS, which began operations in 1982. NSLS provides essential scientific tools for 2,300 scientists each year from more than 400 academic, industrial, and government institutions.

European Union Adopts Climate and Energy Package

In December 2008, the European Parliament voted on the climate and energy package, finalizing a deal that will help Europe transform into a low-carbon economy and increase energy security. Fully in line with the European Commission's proposals in January 2008, agreement has been reached on legally binding targets to cut greenhouse gas emissions by 20%, to establish a 20% share for renewable energy, and to improve energy efficiency by 20% by 2020. Deals were hammered out on revisions to the emissions trading system, the distribution of the reduction effort outside of the emissions trading system, and a legal framework for environmentally safe carbon capture and storage as well as on the related proposals on CO₂ emissions from cars and on fuel quality.

José Manuel Barroso, who served as

Commission President during the time of the vote, said, "The EU's climate and energy package is part of the solution both to the climate crisis and to the current economic and financial crisis. It represents a green 'new deal' which will enhance the competitiveness of EU industry in an increasingly carbon-constrained world. Moving to a low carbon economy will encourage innovation, provide new business opportunities and create new green jobs."

The directive sets legally binding targets for each Member State, in order to reach the EU target of a 20% share of renewable energy in 2020. It creates cooperation mechanisms so that the targets can be achieved in a cost-effective way. It removes administrative barriers and other burdens, confirms the 10% target for renewables in transport, and fixes biofuels sustainability criteria to ensure that the EU only supports biofuels that have no negative environmental impact.

A directive on geological storage of CO₂ provides a legal framework to manage possible environmental risks and liability issues. The reinforced carbon market will provide a long-term incentive for investment, while up to 300 million allowances in the new entrants reserve under the EU emission trading scheme will be made available to stimulate the construction and operation of up to 12 commercial demonstration projects to capture and store CO₂, and for innovative renewable energy demonstration technologies in the EU. □

Correction

In the December 2008 issue of *MRS Bulletin* 33 (12) (2008), "Observing Interfacial Sliding Processes in Solid-Solid Contacts," K.J. Wahl and W.G. Sawyer, Figure 2 was adapted, in part, from Reference 52 (p. 1162); Figure 3 was adapted, in part, from Reference 35 (p. 1163); and Figure 4 was adapted, in part, from Reference 32 (p. 1164).



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