

**U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY**

HEARING CHARTER

Department of Energy Oversight: Energy Innovation Hubs

Wednesday, June 17, 2015
10:30 a.m. – 12:00 p.m.
2318 Rayburn House Office Building

PURPOSE

The Subcommittee on Energy will hold a hearing titled *Department of Energy Oversight: Energy Innovation Hubs* on Wednesday, June 17, 2015, starting at 10:30 a.m. in Room 2318 of the Rayburn House Office Building. The purpose of this subcommittee hearing is to conduct oversight for the Department of Energy's (DOE) Energy Innovation Hubs. This hearing will focus on evaluating the integrated research approach employed in the four existing hubs, and the impact the hubs have had in their targeted research fields and on existing programs in the Office of Science and the DOE applied energy programs.

WITNESS LIST

- **Dr. Harry A. Atwater**, *Director*, Joint Center for Artificial Photosynthesis (JCAP)
- **Dr. Jess Gehin**, *Director*, Consortium for Advanced Simulation of Light Water Reactors (CASL)
- **Dr. George Crabtree**, *Director*, Joint Center for Energy Storage Research (JCESR)
- **Dr. Alex King**, *Director*, Critical Materials Institute (CMI)

BACKGROUND

The DOE Energy Innovation Hubs were established in 2010, following the management model of collaborative research conducted in the Manhattan Project and AT&T Bell Laboratories.¹ The hubs are integrated research centers that combine basic and applied research with engineering to accelerate scientific discovery and technology development in key energy fields.

The America COMPETES Reauthorization Act of 2015 (as amended) authorized the DOE's four existing Energy Innovation Hubs, which include the Joint Center for Artificial Photosynthesis (JCAP), the Consortium for Advanced Simulation of Light Water Reactors (CASL), the Joint Center for Energy Storage Research (JCESR), and the Critical Materials Institute (CMI). Funds were authorized at approximately \$25 million per year per hub. These integrated research platforms are hosted by national labs or universities, and connect multidisciplinary teams of researchers to meet scientific challenges in the areas of (1) artificial photosynthesis to create synthetic fuels; (2) the simulation of reactors through supercomputing to enhance safety and

¹ Department of Energy, Available at <http://energy.gov/science-innovation/innovation/hubs>

improve performance; (3) to improve battery technology performance; and (4) to enhance recovery and utilization of critical materials.²

The Department first established the innovation hub model in 2010 with the Consortium for Advanced Simulation of Light Water Reactors (CASL). CASL is funded through the Department of Energy's Office of Nuclear Energy at approximately \$25 million per year. This Hub coordinates among academia, industry, and the national labs to develop a virtual environment for reactor applications (VERA).³ This set of tools uses DOE super computers to take modeling and simulation capabilities to address CASL's primary technical challenges: (1) enabling power uprates;⁴ increasing fuel burn-up and cycle length;⁵ and lifetime extensions for U.S. nuclear plants.⁶ CASL engages with the Nuclear Regulatory Commission (NRC) on a regular basis to keep the Commission informed of CASL activities and progress.

Funded through the Office of Energy Efficiency and Renewable Energy, the Critical Materials Institute was established in 2011 at Ames National Laboratory to address domestic shortages of rare earth metals and other materials critical for American energy security. Goals for this hub include: diversifying and expanding production of critical materials by designing separation agents to improve production efficiency, reduce costs, and minimize the environmental impact of rare-earth mines; developing transformative and environmentally benign technologies that allow for domestic manufacturing of rare-earth metals, alloys, and other products; and designing chemical extractants that allow for the recovery of lithium from highly concentrated brines.⁷ CMI also conducts research into increasing energy efficiency by reducing waste and research designed to create substitute materials to replace existing rare-earth uses.

The Office of Science sponsors two hubs which focus on basic research for energy produced from sunlight and advancing battery storage. The Joint Center for Artificial Photosynthesis (JCAP), led by the California Institute of Technology and funded at \$15 million per year, conducts basic research with the goal of designing efficient energy conversion technology that can generate fuels directly from sunlight, water, and carbon dioxide. JCAP projects that it will produce full-system hydrogen-generating solar-fuels prototypes by the end of 2015.⁸ During its second phase, JCAP will focus on artificial photosynthetic systems that produce carbon-based fuels by consuming CO₂.

The Joint Center for Energy Storage Research (JCESR) hub, led by Argonne National Lab, develops new battery storage technology through mission-driven basic research, engineering,

² Department of Energy, Available at <http://energy.gov/science-innovation/innovation/hubs>

³ Consortium for Advanced Simulation of Light-Water Reactors, Available at <http://www.casl.gov/mission.shtml>

⁴ Nuclear Regulatory Commission, defining "power uprate" as "the process of increasing the maximum power level at which a commercial nuclear power plant may operate," Available at <http://www.nrc.gov/reactors/operating/licensing/power-uprates.html>

⁵ Nuclear Regulatory Commission, Available at <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/bg-high-burnup-spent-fuel.html>

⁶ Nuclear Regulatory Commission, "The Atomic Energy Act and NRC regulations limit commercial power reactor licenses to an initial 40 years but also permit such licenses to be renewed," Available at <http://www.nrc.gov/reactors/operating/licensing/renewal/overview.html>

⁷ Critical Materials Institute, Available at <https://cmi.ameslab.gov/what-CMI-does>

⁸ Joint Center for Artificial Photosynthesis, Available at <http://solarfuelshub.org/downloads/2015%20JCAP%20Brochure.pdf>

technology development, entrepreneurial experience, and commercialization work conducted in collaboration between the lab and private sector and university partners. JCESR research includes: addressing the efficacy of materials architectures and structure in energy storage; charge transfer and transport; and development/utilization of novel computational and measurement techniques.⁹ JCESR's current five-year research goals include surpassing lithium-ion systems to provide five times the energy storage at one-fifth the cost within five years.

While DOE Energy Innovation Hubs have existed since 2010, the hubs program has not been authorized by Congress, despite Congressional appropriations of approximately \$25 million per year for CMI, JCESR, and CASL, and \$15 million per year for JCAP. In FY 2015 appropriations, two Energy Innovation Hubs were renewed for another five-year term, while funds were provided to support continued operations at the other two existing hubs. This hearing will provide additional Congressional oversight for the hubs program.

Important questions and key issues to be discussed at the hearing include:

- What are the primary research and development goals of the four hubs? In the time since each hub was organized by DOE, what progress has been made towards achieving those goals?
- How does the integrated research model employed at the hubs advance research goals within the Office of Science and applied energy programs at DOE?
- How does the private sector interact with each hub? In what way do the hubs prioritize technology transfer of technologies developed at the hub?

⁹ Joint Center for Energy Storage Research, Available at <http://www.jcesr.org/research/>