Hearing Charter

COMMITTEE ON SCIENCE AND TECHNOLOGY
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT
U.S. HOUSE OF REPRESENTATIVES

H.R. 364, Establishing the Advanced Research Projects Agency - Energy

Thursday, April 26, 2007
2:00 p.m. – 4:00 p.m.
2318 Rayburn House Office Building

Purpose

On Thursday, April 26, 2007 the House Committee on Science & Technology, Subcommittee on Energy and Environment will hold a hearing to receive testimony on H.R. 364, establishing an Advanced Research Projects Agency for Energy.

Chairman Gordon introduced H.R. 364 on January 10, 2007. H.R. 364 follows on the recommendation of the National Academies of Science report, *Rising Above the Gathering Storm*, which called for establishing a new energy research and technology development agency within Department of Energy patterned after the successful Defense Advanced Research Projects Agency (DARPA) within the Department of Defense. H.R. 364 establishes such an agency, known as the Advanced Research Projects Agency for Energy, or ARPA-E.

This hearing will seek to address the following issues relating to H.R. 364:

- What are the limitations of the current energy R&D enterprise in addressing the most pressing energy-related challenges? Is ARPA-E as laid out in H.R. 364 structured to address these limitations?
- Which areas of energy research should be explored by ARPA-E?
- What organizational elements of DARPA make it an attractive model for energy research and technology development? Are there advantages and drawbacks of other organizational models that should be examined in developing an ARPA-E?
- Does the level of investment prescribed in H.R. 364 match the magnitude of challenges in energy research and development?

Background

H.R. 364 establishes the Advanced Research Projects Agency – Energy (ARPA-E), and sets up an Energy Independence Acceleration Fund to conduct activities under the Act. H.R. 364 was first introduced as H.R. 4435 in the 109th Congress. In the 109th Congress the House Committee on Science held a hearing on March 9, 2006 examining the concept of an ARPA-E (HOUSE REPT. 109-39). H.R. 364 follows on the recommendation of the National Academies 2005 report, *Rising Above the Gathering Storm*, also known as the "Augustine Report" for its chair, retired Lockheed Martin CEO Norman Augustine. This report called on the federal government

to create a new energy research agency within Department of Energy patterned after the successful Defense Advanced Research Projects Agency (DARPA) within the Department of Defense. Several similar bills calling for an ARPA-E have since been introduced in both the House and Senate (including S. 696 and S. 761).

According to the *Gathering Storm* report, ARPA-E should be structured to "sponsor creative, out-of-the-box, transformational, generic energy research in those areas where industry itself cannot or will not undertake such sponsorships, where risks and potential payoffs are high, and where success could provide dramatic benefits for the Nation. ARPA-E would accelerate the process by which research is transformed to address economic, environmental, and security issues. It would be designed as a lean, effective, and agile – but largely independent – organization that can start and stop targeted programs based on performance and ultimate relevance. "

The primary motivations for establishing an ARPA-E are the need for the U.S. to obtain more energy from domestic sources, become more energy efficient, and become less reliant on energy sources and technologies that have an adverse effect on the environment. The drive for new technologies is especially urgent given the geo-political forces that threaten global energy supplies and economic stability, the looming threat of global climate change, and probable regulation of carbon dioxide emissions. In addition to addressing the nation's energy challenges, the *Gathering Storm* report concluded that ARPA-E should also contribute to U.S. competitiveness by playing an important role in "advancing research in engineering, the physical sciences, and mathematics; and in developing the next generation of researchers."

ARPA-E is intended to pursue energy research and technology development with a structure that is fundamentally different from the traditional energy research enterprise. Critics of the Department of Energy's management of research programs contend that the stovepiped and bureaucratic structure of DOE is not conducive to quickly developing cross-cutting energy solutions, or translating energy research into commercial technologies. ARPA-E will instead have a relatively flat organization, similar to the small, flexible, non-hierarchical reporting structure at DARPA that fostered a successful culture of innovation. Furthermore, because the director of ARPA-E reports directly to the Secretary of Energy, as is written in H.R. 364, it is not beholden to any one particular technology area or research program within DOE. To further insulate ARPA-E from bureaucratic impediments, some stakeholders have suggested that ARPA-E should not be housed within DOE at all, but may be more appropriate as an independent government corporation which can still choose to fund projects within DOE.

ARPA-E's unique role is best described as a "marriage broker" that can identify people and capabilities within industry, universities, and the national labs, and put them together in hybrid teams, coordinate research, and quickly develop novel solutions to pressing energy problems. Key to this function is the program manager. As with DARPA, these individuals would ostensibly be very talented, knowledgeable, experienced in industry, and passionate in pursuing their mission. Because of the flexible hiring authority that is written into Section 2 of the bill, talented program managers can be recruited from a variety of fields and experiences, hired for a term of approximately 2-5 years, and paid a salary commensurate with what they would make in the private sector. Program managers and their superiors are given extraordinary freedoms and

resources to pursue technologies quickly, as well as freedom to just as quickly stop research if it does not look fruitful. This is probably the biggest departure from the current DOE model.

There is some disagreement on which stage of research and development ARPA-E should be focused – early stage basic research, or late stage demonstrations and commercial applications. This assumes that one is exclusive of the other, as is usually the case in the traditional energy R&D enterprise. However, a truly mission-driven ARPA-E will leverage its resources and institutional capabilities to pursue multiple stages of R&D in a "whatever it takes" approach to moving a potentially transformational technology from the laboratory bench to the marketplace. If adequately funded and directed, ARPA-E would engage in basic research into fundamental concepts with possible technology applications, and later-stage technology prototyping and large-scale demonstrations.

Both critics and proponents of an ARPA-E agree that, for the program to be successful, it must be funded at levels to match the magnitude of energy challenges, and the high costs of energy research and technology demonstration. Despite the recent attention to energy challenges, R&D investment in energy remains far below the historically high levels of the 1970's. A recent GAO report commissioned by Chairman Gordon and Congressman Honda noted that "DOE's total budget authority for energy R&D dropped by over 85 percent (in real terms) from 1978 to 2005, peaking in the late 1970's but falling sharply when oil prices returned to lower levels in the mid-1980's." (GAO-07-106) Investment in ARPA-E should be seen in the context of increasing overall energy R&D expenditures enough to truly address the challenge. The *Gathering Storm* report calls for ARPA-E to be authorized at $300 million in the first year, and quickly escalate to $1 billion within five years. H.R. 364 currently has a similar funding profile. Some suggest that the only way a high-cost, risk-tolerant program like ARPA-E would survive is if it has dedicated funding of some kind, and therefore would not be subject to annual appropriations or other political/financial pressures and resource fluctuations that stifle innovation.

Witnesses

- **Mr. William Bonvillian** is the Director of the Washington Office of the Massachusetts Institute of Technology. Previously he served as Legislative Director and Chief Counsel to Sen. Joseph Lieberman, where he worked on a wide range of science & technology issues including those related to DARPA, and the establishment of a similar program at the Department of Homeland Security. Mr. Bonvillian will testify on the strengths and weaknesses of the DARPA model as it applies to energy research, and experiences with other models that should be considered in establishing an ARPA-E.

- **Mr. John Denniston** is a partner in the venture capital firm of Kleiner Perkins Caufield and Byers, based in Silicon Valley California, where his portfolio includes investments in clean energy and "greentech" businesses. Mr. Denniston previously served as Salomon Smith Barney's Managing Director and head of Technology Investment for Western U.S. He will address the role of the investment community in working with industry, universities, and DOE to commercialize promising energy technologies, and the policies that will spur innovation in this field.

- **Dr. Stephen Forrest** is the Vice President for Research at the University of Michigan, which recently established the Michigan Memorial Phoenix Energy Institute. Prior to joining the university, Dr. Forrest held positions at Bell Laboratories, University of Southern California, and Princeton. He will to testify on the proposed structure of ARPA-E, and how the role of university/industry partnerships can enhance energy R&D in the U.S.

- **Dr. Richard Van Atta** is at the Science & Technology Policy Institute of the Institute for Defense Analysis. Dr. Van Atta has conducted several studies on DARPA's research programs and their impact, as well as defense research projects under DARPA sponsorship. He will to testify on the organizational aspects of DARPA that fostered a successful culture of innovation.