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Hearing Charter

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

Utility-Scale Solar Power: Opportunities and Obstacles

Monday, March 17, 2008
12:30 p.m. – 2:30 p.m.
Pima County Administration Building Hearing Room, 1st Floor
130 W. Congress Street, Tucson, Arizona 85701

Purpose

On Monday, March 17, 2008 the House Committee on Science & Technology, Subcommittee on Energy and Environment will hold a hearing entitled, "***Utility-Scale Solar Power: Opportunities and Obstacles***," at the Pima County Administration Building Hearing Room, Tucson, Arizona.

The Subcommittee's hearing will explore the potential for utility-scale solar power to provide a significant fraction of U.S. electric generating capacity and the challenges to achieving this goal. The specific technologies to be discussed include solar thermal technology, concentrating photovoltaics and distributed solar power. Transmission, regulatory and financial issues will also be examined, along with a look at the government and private industry roles in the development of utility-scale solar power – and enabling productive partnerships between them.

Witnesses

- **Mr. Mark Mehos** is the Program Manager for the Concentrating Solar Power Program at the National Renewable Energy Laboratory. Mr. Mehos will provide an overall assessment of the available resource size for solar energy in the U.S. and an introduction to the known technologies that may take advantage of solar power on a large scale.

- **Mr. Tom Hansen** is the Vice President of Environmental Services, Conservation and Renewable Energy at Tucson Electric Power. Mr. Hansen will describe a "Solar Grand Plan" to provide more than half of the U.S.'s electricity from solar power by 2050.

- **Ms. Kate Maracas** is the Vice President of Arizona operations at Abengoa Solar. Ms. Maracas will describe the current state of solar thermal technology and the near- and long-term economic costs and benefits of large-scale solar power in general.

- **Ms. Valerie Rauluk** is the Founder and CEO of Venture Catalyst, Inc. Ms. Rauluk will describe the current state of distributed and concentrating photovoltaics and provide an assessment of how the marketplace for solar energy will change over the next 10 years.

- **Ms. Barbara Lockwood** is the Manager of Renewable Energy for Arizona Public Service. Ms. Lockwood will provide the perspective of utilities on the ability for large-scale solar power to be a significant competitor in the U.S. energy sector over the next 50 years.

- **Mr. Joe Kastner** is the Vice President of Implementation and Operations for MMA Renewable Ventures LLC. Mr. Kastner will describe his company's experience with installing and managing the Nellis Air Force Base solar array and ways to enable productive partnerships between government and renewable energy industries in general.

Background

An article in the January 2008 issue of Scientific American titled "A Solar Grand Plan" outlined a potential path to providing nearly 70 percent of U.S. electricity demand and 35 percent of its total energy demand, including transportation, with solar power by 2050. It is also estimated that if fully implemented, the plan would reduce U.S. carbon dioxide emissions to 62 percent below 2005 levels. Approximately $420 billion in various government subsidies from 2011 to 2050 would be required to fund the necessary infrastructure and make solar power cost-competitive.

Several types of technology would be needed to follow through on such a plan. Photovoltaics (PV), which convert sunlight directly to electricity, are the most familiar. Vast arrays of PV cells can be deployed in the Southwest covering multiple square miles to generate hundreds of megawatts of electricity per field. A variation on this technology, known as concentrating photovoltaics (CPV), uses lenses or mirrors to concentrate sunlight onto high-efficiency solar cells. These solar cells are typically more expensive than conventional cells used for flat-plate PV systems. However, the concentration decreases the required cell area while also increasing the cell efficiency. PV and CPV systems may employ any of a number of electrical energy storage technologies for use during periods of passing clouds or into the evening.

An alternate technology could also be used. Solar thermal technology produces electric power by converting the sun's energy into high-temperature heat with various mirror configurations. The heat is then used to power a conventional generator. Solar thermal plants consist of two parts: one that collects solar energy and converts it to heat and another that converts heat energy to electricity. Just as batteries may assist PV systems, molten salts and other forms of thermal energy storage technology allow this heat to be retained for later use in generating electric power.

An expansive new transmission and distribution system would be required for the remainder of the country to take full advantage of the immense solar resource in the American Southwest. A 2005 study commissioned by the Western Governors' Association estimated that solar energy from the Southwest alone could provide up to 6,800 GW of electricity to the U.S. To put this in perspective, the electric generating capacity of the entire country is currently about 1,000 GW.

However, the existing system of alternating-current (AC) power lines would lose a significant fraction of its energy over long hauls so the Solar Grand Plan recommends building a new backbone of high-voltage, direct current (HVDC) power transmission lines and coupling this to sites near population centers that may utilize another form of electrical energy storage technology known as compressed air energy storage (CAES).

Under this scheme, electricity generated from solar power plants hundreds of miles away compresses air and pumps it into vacant underground caverns, abandoned mines, aquifers and depleted natural gas wells. The pressurized air is released on demand to turn a turbine that generates electricity, aided by burning small amounts of natural gas. Citing a study by the Electric Power Research Institute (EPRI) and the natural gas industry, the Plan affirms that suitable geologic formations exist in 75 percent of the country often close to metropolitan areas, and that a national CAES system would look similar to the current U.S. natural gas storage system.

The Plan assumes relatively small increases in PV solar-to-electric efficiency from 10 percent today to 14 percent in 2050 and increases in efficiency for solar thermal technology from 13 to 17 percent. The Plan also assumes significant reductions in installed cost and electricity price based on economies of scale reaching 5-9 cents/kWh. (Today's rates for these systems in the U.S. are 16-18 cents/kWh and average overall electricity rates are currently 5-15 cents/kWh depending on the region.)

Though not directly addressed by the Solar Grand Plan, one other method to generate solar power on a large scale is distributed generation (DG) which consists of smaller facilities on otherwise unused real estate (roof-tops and sites of 10 to 500 acres) located near the load demand and dispersed throughout many communities. DG systems typically produce under 20MW of power and may consist of PV and CPV components. By providing power near or directly at the point of use, DG may offer a more cost-effective near-term solution in many areas of the country.