



DOE adds five program areas to ARPA-E funding opportunities

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The U.S. Department of Energy Secretary Steven Chu announced in April that up to \$130 million from the Advanced Research Projects Agency-Energy (ARPA-E) will be made available to develop five new program areas that could spark critical breakthrough technologies.

The announcement is ARPA-E's fourth round of funding opportunities, focusing on rare earth alternatives and breakthroughs in biofuels, thermal storage, grid controls, and solar power electronics.

The new program area of **plants engineered to replace oil (PETRO)**, aims to create plants that capture more energy from sunlight and convert that energy directly into fuels. Technologies for low-cost production of advanced biofuels are limited by the small amount of available energy captured by photosynthesis and the inefficient processes used to convert plant matter to fuel. ARPA-E seeks to fund technologies that optimize the biochemical processes of energy capture and conversion to develop robust, farm-ready crops that deliver more energy per acre with less processing prior to the pump. If successful, PETRO will create biofuels for half their current cost, rendering them cost-competitive with fuels from oil. Up to \$30 million will be made available for this program area.

More than 90% of energy technologies involve the transport and conversion of thermal energy. Therefore, advancements in thermal energy storage—both hot and cold—would dramatically improve performance for a variety of critical energy applications. In its new program on **high energy advanced thermal storage (HEAT)**, ARPA-E seeks to develop revolutionary cost-effective thermal energy stor-

age technologies in three focus areas: (1) high-temperature storage systems to deliver solar electricity more efficiently around the clock and allow nuclear and fossil base-load resources the flexibility to meet peak demand, (2) fuel produced from the sun's heat, and (3) HVAC systems that use thermal storage to improve the driving range of electric vehicles by up to 40%. Up to \$30 million will be made available for this program area.

Rare earths are naturally occurring minerals with unique magnetic properties that are used in many emerging energy technologies. As demand for these technologies continues to increase, rare earths are rapidly becoming more expensive due to limited global supply—prices of many have increased 300–700% in the past year. Rising rare earth prices have already escalated costs for some energy technologies and may jeopardize the widespread adoption of many critical energy solutions by U.S. manufacturers. In its new technology area **rare earth alternatives in critical technologies (REACT)**, ARPA-E seeks to fund early-stage technology alternatives that reduce or eliminate the dependence on rare earth materials by developing substitutes in two key areas: electric vehicle motors and wind generators. Up to \$30 million will be made available for this program area.

Recent advances in computation, networking, and grid monitoring have

shed light on potential ways to deliver electricity more efficiently and reliably. Currently, however, the equivalent of one out of every five electricity dollars is lost to power outages and 30% of the grid's hardware needs replacing. In the **green electricity network integration (GENI)** program, ARPA-E seeks to fund innovative control software and high-voltage hardware to reliably control the grid, specifically: (1) controls able to manage 10 times more sporadically available wind and solar electricity than currently on the grid, and (2) resilient power flow control hardware—or the energy equivalent of an internet router—to enable significantly more electricity through the existing network of transmission lines. Up to \$30 million will be made available for this program area.



Photo: Ken Shipp/DOE

Steven Chu, U.S. Secretary of Energy.

The fifth new technology area is on solar **agile delivery of electrical power technology (Solar ADEPT)**. The DOE SunShot Initiative leverages the unique strengths across DOE to reduce the total cost of utility-scale solar systems by 75% by the end of the decade. If successful, this collaboration would deliver solar electricity at roughly six cents per kilowatt hour—a cost competitive with electricity from fossil fuels. This would enable solar electricity to scale without subsidies and make the United States globally competitive in solar technology. ARPA-E's portion of the collaboration—the Solar ADEPT program—focuses on integrating advanced power electronics into solar panels and solar farms to ex-

tract and deliver energy more efficiently. Specifically, ARPA-E aims to invest in key advances in magnetics, semiconductor switches, and charge storage, which could reduce power conversion costs by up to 50% for utilities and 80% for homeowners. Up to \$10 million will be made available for this program area.

The five technology areas announced in April will join ARPA-E's seven ex-

isting programs in power electronics (ADEPT), battery technologies (BEEST), building cooling (BEETIT), non-photosynthetic biofuels (Electrofuels), grid energy storage (GRIDS), carbon capture (IMPACCT), and its initial open solicitation.

In its first year, ARPA-E awarded \$363 million in Recovery Act funding to 121 groundbreaking energy projects

based in 30 states, with approximately 39% of projects led by universities, 33% by small businesses, 20% by large businesses, 5% by national laboratories, and 3% by non-profits.

More information about ARPA-E, current funding opportunities, and previously announced awards can be accessed at <http://arpa-e.energy.gov/>.

Nuclear Safety Convention Meeting commits to learn lessons from Fukushima nuclear accident

The 5th Review Meeting of the Convention on Nuclear Safety (CNS), under the auspices of the International Atomic Energy Agency (IAEA), was held in Vienna, Austria, and concluded on April 14, 2011.

During the 10 days of meetings, delegations from 61 of the 72 countries that are "contracting parties" to the Convention discussed long-term safety issues, as well as the unfolding nuclear emergency at the Fukushima Daiichi power plant in Japan.

In a statement adopted at the meeting, the contracting parties said, "The Contracting Parties affirm their solidarity with the Japanese people and continue to offer support to the Japanese in their efforts to respond to the nuclear accident at the Fukushima Daiichi power plant.

"The international community recognizes the significance of the Fukushima nuclear accident, which highlights the need to consider new challenges and

underlines the paramount importance of safety in the use of nuclear energy."

As a result of the Fukushima accident, the contracting parties are carrying out safety reviews of their nuclear installations, including reexamining the nuclear power plants' safety measures that defend against extreme external events.

The Review Meeting's conclusions included detailed technical discussions about enhancing safety culture; overcoming challenges in recruiting a new generation of nuclear professionals; managing ageing nuclear facilities and safely extending their lifetimes; nuclear power plant designs; siting of new plants; periodic safety reviews; countries new to nuclear power; international cooperation; as well as networking on emergency management and operating experience.

In addition, the conference attendees discussed country reports on nuclear safety that every contracting party is obliged to submit. All countries with op-

erating nuclear power plants are among the CNS' contracting parties.

The contracting parties stated that the learning process following the Fukushima accident will continue as more information is acquired and analyzed.

They also welcomed IAEA Director General Yukiya Amano's initiative to convene a Ministerial Conference on Nuclear Safety on June 20–24, 2011, and pledged their support.

Although the CNS is scheduled to meet every three years, it was agreed that they would convene a meeting next year to analyze the Fukushima accident.

CNS, which entered into force on October 24, 1996, was designed to enhance nuclear safety. Its objectives are to achieve and maintain a high level of nuclear safety worldwide, to establish and maintain effective defenses in nuclear installations against potential radiological hazards, and to prevent accidents having radiological consequences.

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