

APS releases report on renewable energy and the electricity grid

EurekaAlert

WASHINGTON, D.C.—U.S. policymakers must focus more closely on developing new energy storage technologies as they consider a national renewable electricity standard, according to one of the principal recommendations in a newly released report, Integrating Renewable Electricity on the Grid, by the American Physical Society's Panel on Public Affairs (POPA). Establishing a national renewable electricity standard will help to unify the fragmented U.S. grid system—an important step in the wider adoption of using more wind and solar for energy generation.

But, without the focus on storage devices, it will be difficult to meet proposed renewable electricity standards, the report asserts. Wind and solar energy are variable by nature: The sun doesn't always shine, and the wind doesn't always blow. The amount of electricity a consumer has available to complete household chores could change in a matter of seconds, hours or days—placing great importance on the need for robust storage methods.

Another challenge facing the grid involves the long-distance transmission of renewable electricity from places that receive a lot of wind and sun to those that do not. "We need to move faster to have storage ready to accommodate, for example, 20 percent of renewable electricity on the grid by 2020," said George Crabtree, co-chairman of the POPA study panel and a senior scientist at Argonne National Laboratory. "And, by devoting the necessary resources to the problem, I am confident that we can solve it."

The report addresses variability and transmission issues by urging the U.S. Department of Energy (DOE) to increase research on materials to develop energy storage devices and by encouraging the DOE to focus on long-distance superconducting direct current cables to bring renewable electricity to load centers, lessening the chance that power will be disrupted. The report also calls for examining renewable electricity in light of a unified grid instead of one that is fragmented and improving the accuracy of weather forecasts to allow for better integration of renewable electricity on the grid.

The APS report is unique among grid studies: Its recommendations cover both scientific and business perspectives.

The specific recommendations follow:

Energy Storage

The U.S. Department of Energy (DOE) should:

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- Develop an overall strategy for energy storage in grid-level applications that provides guidance to regulators to recognize the value that energy storage brings to both transmission and generation services on the grid;
- Conduct a review of the technological potential for a range of battery chemistries, including those it supported during the 1980s and 1990s, with a view toward possible applications to grid energy and storage; and
- Increase its research and development in basic electrochemistry to identify materials and electrochemical mechanisms that have the highest potential use in grid-level energy storage devices.

Long-Distance Transmission

DOE should:

- Extend the Office of Electricity program on High Temperature Superconductivity for 10 years, with a focus on direct current superconducting cables for long-distance transmission of renewable electricity from source to market;
- Accelerate research and development on wide band gap power electronics for controlling power flow on the grid, including alternating to direct current conversion options and development of semiconductor based circuit breakers operating at 200 kilovolts and 50 kilo amperes.

Business Case

The Federal Energy Regulatory Commission and the North American Electric Reliability Corporation should:

- Develop an integrated business case that captures the full value of renewable generation and electricity storage in the context of transmission and distribution; and
- Adopt a uniform integrated business case as their official evaluation and regulatory structure, in concert with the state Public Utility Commissions.

Forecasting

The National Oceanic and Atmospheric Administration, the National Weather Service, the National Center for Atmospheric Research and private vendors should:

- Improve the accuracy of weather and wind forecasts on time scales from hours to days.

Forecast providers, wind plant operators and regulatory agencies should:

- Develop uniform standards for preparing and delivering wind and power

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generation forecasts.

Wind plant operators and regulatory agencies should:

- Develop operating procedures to respond to power generation forecasts.
- Develop criteria for contingencies, the response to up-and-down-ramps in generation and the response to large weather disturbances.
- Develop response other than maintaining conventional reserve, including electricity storage and transmission to distant load centers.

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