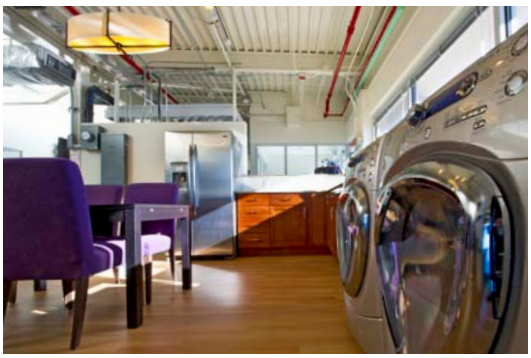
NREL
NATIONAL RENEWABLE ENERGY LABORATORY

AHEM Lab Opens Doors to New Technology Test Bed at NREL

Highlights in Research & Development

NREL studies smart sensors and dynamic control systems to help homeowners conserve energy, save money, and live comfortably.

For busy Americans who don't have time to manage their energy use and costs, home automation can be the key to energy conservation. Everyone knows their thermostat already controls the furnace and air conditioner to deliver comfort with minimal input from the home's occupants. An automated home energy management (AHEM) system can do the same with any energy-consuming component of the home. For example, these systems can turn off lights or adjust the water heater set point when occupants go on vacation, or deliver plug-and-play smart phone connectivity to the home's components. The integration of whole-home energy management through an AHEM system allows other energy management products to use input from homeowners, sensors, and utility data to minimize utility costs while maintaining—or improving—comfort and usability of the home.



NREL's AHEM Lab is a flexible test environment that mimics a home so researchers can study diverse sensor technologies and energy-saving control strategies. Photo by Dennis Schroeder, NREL/PIX 20007

Consumers are confused about the benefits of AHEM products, their functionality and what energy savings they can deliver, leading to a slow adoption of these promising technologies. To help the consumer electronics industry's efforts to develop AHEM systems with clear cost-benefit trade-offs, the National Renewable Energy Laboratory (NREL) has commissioned a unique lab capable of studying integration of whole-house energy management with other home systems.

NREL's AHEM Laboratory is configured as a home of the future—complete with demand-response-enabled appliances, an entertainment center, lighting controls, a home office, and a smart electric meter to communicate between advanced energy management systems and the utility company. Equipped with 3.2 kW of photovoltaics on the roof and an integrated electrical vehicle charging station, the lab is a test bed for evaluating cost-benefit and interoperability of a variety of efficiency innovations. These features allow a broad range of experiments, from whole-house energy management systems to simpler efficiency products such as advanced power strips, lighting controls, or efficient appliances.

Research in the AHEM Lab began with a broad survey of the savings potential of advanced power strips. These power strips can turn off several connected end uses and eliminate the associate "vampire load" when not in use, but a uniform test and rating method did not exist. NREL led an industry consortium to develop a standard test method, which was demonstrated in the AHEM Lab.

NREL's Residential Buildings group (*www.nrel.gov/buildings/residential.html*) provides extensive technical support to research programs such as the U.S. Department of Energy's Building America Program (*www.buildingamerica.gov*). This team will leverage the AHEM Lab to develop best practices for integrating AHEM products to maximize cost-effective energy savings for all U.S. homes. This lab provides opportunity for research programs and industry to learn about and resolve key barriers to quickly implementing AHEM systems on a community scale. AHEM will enable homeowners to reap the benefits of the Smart Grid in the form of energy cost savings, and will help utilities manage peak demand.

Key Research Results

Achievement

A unique laboratory capability—the AHEM Lab—offers neutral, third-party expert evaluation of home energy management, demand response, and sensor technologies.

Key Result

Emerging products can be rapidly analyzed for cost-effective whole-home energy savings, and opportunities for improvement can be identified. Products' ability to be easily and seamlessly integrated into existing homes, including device-to-device interoperability, can be evaluated. Standard test methods can be quickly developed and demonstrated for comparison of new technologies and products.

Potential Impact

Seamless integration of AHEM products will enable cost-effective energy savings to be broadly and unobtrusively adopted. These systems will be the primary bridge technology connecting consumers to the Smart Grid.

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Reference: *NREL Thermal Test Facility Fact Sheet.* (2012). NREL Report No. FS-5500-53657. *www.nrel.gov/docs/fy12osti/53657.pdf.*

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