NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Lab Tests Demonstrate Effectiveness of Advanced Power Strips

Highlights in Research & Development

NREL engineers evaluate the functionalities of advanced power strips (APS) and help consumers choose the right one for their plug loads.

Many consumer electronics devices waste energy even after they are turned off via "vampire" loads, meaning they continue to draw current as long as they remain plugged into receptacles. In a typical home with 40 plug loads, vampire loads can account for nearly 10% of household electricity use. Advanced power strips (APS) are a convenient and inexpensive way to curb this type of energy waste, and are the focus of laboratory tests conducted by the Residential Buildings group at the National Renewable Energy Laboratory (NREL). By replacing ordinary power strips with APS, appliances that are not in use can be automatically shut off. APS are designed primarily for the home office and entertainment center, where the concentration of consumer electronics is typically high.

NREL researchers evaluated the technical performance of 20 APS currently available on the market. Photo by Bethany Sparn, NREL 26761

Despite the potential promise of this technology, the general public has little knowledge of how APS work and how to use them most effectively. The goal of NREL's testing was to evaluate the features and functionality of 20 APS products in order to provide guidance for consumers. In NREL's Automated Home Energy Management (AHEM) Laboratory, researchers investigated the control algorithms employed by each type of APS and whether they reliably shut off power as expected. While APS technology varies widely in basic control strategy, the team found that the majority of APS work as intended when used correctly and that the best choice of APS is dependent on the intended use case scenario. For example, a master/controlled APS has a special outlet for the master appliance, typically a TV or computer. When the master appliance is turned off, all the devices plugged into the controlled outlets, such as DVD players or game consoles, are automatically shut off. This strategy is effective for users who forget to turn off the DVD player, but it does not address the vampire loads associated with the TV. If vampire loads are the main concern, there are other APS that may be more appropriate, such as a masterless current-sensing APS. NREL researchers are developing a guide that outlines recommendations to help consumers choose the best APS for their needs.

Additionally, the NREL team is using a field study in base housing on a naval base in Guam to determine the energy-saving potential of APS, as the technology's performance is heavily dependent on how it is used. This demonstration project will provide valuable information about the range of energy savings that could be achieved with different APS.

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Reference: Earle, L.; Sparn, B. (2012). *Results of Laboratory Testing of Advanced Power Strips.* Washington, D.C.: ACEEE Summer Study on Energy Efficiency in Buildings.

Key Research Results

Achievement

A laboratory test of 20 APS was conducted in home entertainment center and home office environments. The functionality and usability of each APS were evaluated in order to provide guidance for consumers.

Key Result

NREL researchers tested the functionality of each APS to understand the best application for each different type of APS. The main goal was to understand how APS respond to different situations and evaluate how well their control algorithms perform. There is a wide variety of types of APS, but they generally all function as designed. Since there is diversity in the control strategies employed by APS, it is important for consumers to choose an APS based on their needs.

Potential Impact

The results of these laboratory tests are being used to create a simple buyer guide for the different types of APS. Field tests are also underway to evaluate the real-world energy savings that can be achieved with APS, which will be valuable to utilities and rebate programs.

NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

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