

The EPRI Energy Efficiency Program

An EPRI Program to Advance the Efficient and Effective Use of Energy



Smart grids and communications infrastructures to enable end-use efficiency and demand response, distributed generation, and PHEVs

The Proposed Program

EPRI is launching a new research program on incorporating smart and efficient technology for energy management and end-use energy efficiency. This involves looking at energy efficiency and load management from a dynamic, integrated systems or networked perspective that simultaneously addresses permanent energy savings, permanent demand reductions, and temporary peak load reductions. This approach encompasses numerous system components that operate together, including:

- High Efficiency Electric Energy End-Use Devices
- Internet protocol (IP) addressable (smart) electro-technologies and devices
- Control systems to optimize device performance
- Two-way communications to allow automated control of devices in response to pricing or emergency demand reduction signals
- This program was engendered by discussions at the August 2006 EPRI Summer Seminar¹ and by member requests and priorities at a series of five regional workshops held in the last quarter of 2006.
- The program will accelerate and augment research, development, demonstration, and deployment of technologies to achieve greater end-use energy efficiency, greenhouse gas emission reduction, and demand response. This program will also provide near-

term support for utilities that are considering energy efficiency and demand response investments in programs and infrastructure.

Program Summary

The program has two broad elements: 1) analytics and 2) smart grid and communications infrastructure.

1) Analytics: Economic and Emissions Impacts

This focus area will deliver consistent methodologies and data for measuring the economic and environmental effects of dynamic energy management. Emphasis will be on providing analytics for financial decision making, regulatory policy compliance, and market- or policy-based CO₂ emissions control and trading. Projects include:

- Guidebook on demand planning. EPRI will lay out the process a utility or other market participant would use to determine which dynamic energy management measures, programs, and activities to pursue. Volumes for each customer sector will be developed, with initial delivery of an overview volume that includes a cost/benefit analysis of efficiency and demand response, the program design process, a guide to tools for technical system and design support, and relevant case studies.
- Repository of end-use technology application data and tools. To assist utilities in load management and sales, EPRI will create a repository of reference materials and tools including credible end-use load data and load profiles, with comparative assessment of electric and gas

¹ For more information on 2006 Summer Seminar visit EPRI's website www.epri.com

technologies. In the first year of the program, the focus is on selected applications in the commercial and industrial (C&I) sectors. Industrial-sector resources will include a web-based tool for energy management in high priority industries, and guides to the most promising next-generation electrotechnologies, including those that treat industrial waste. Commercial-sector materials will include a reference on efficient commercial building technologies and an application guide on ventilation and air quality control systems. C&I data will be based on results of several research projects from EPRI program 170, Advancing Energy Efficiency and End-Use Technology.

- Methods for calculating CO₂ emission reductions from efficiency, peak reduction, and load shifting. EPRI will assess existing methods to account for greenhouse gas emission reductions associated with energy efficiency and with varying types of load profiles and energy supply portfolios. EPRI will identify utility tools and resources, assessing their strengths and weaknesses and analyzing issues related to their application industry-wide.
- Integrating energy efficiency and demand response into T&D planning. This project is to develop a consistent process for integrating energy efficiency and demand response – with and without dynamic energy management – as part of T&D planning. This work will consider planning options exercised on the transmission level, on substation loading and at the feeder level. Decision criteria will be outlined for use by planners in assessing the impacts on all levels in the T&D system.
- Develop leveled cost of electricity data for demand reduction and efficiency options for comparative analysis with generation options. EPRI will develop credible cost data so that analysts can consider demand-side alternatives to generation in strategic planning and R&D investment decision making.
- Assess economic impact of dynamic energy management. The benefits from deployment of dynamic energy management systems will be assessed, including verifiable demand response levels. This analysis will quantify the ranges of potential value of dynamic energy management and develop guidelines for how these benefits can best be exploited.

1B. Smart grid and communications infrastructure

EPRI will develop the functionality and design basis for a smart grids infrastructure and components and assess interoperability. Projects include:

- Functionality and cost/benefit tradeoff assessment for advanced metering and demand response systems. EPRI will assess the potential applications of advanced metering and demand response systems and determine the requirements, costs and benefits of the applications. Results will include an online resource on available products, assessments of technologies and guidelines for developing system management and security policies.
- Dynamic energy management interoperability criteria. EPRI will develop a set of interoperability criteria for use when specifying and assessing commercially available advanced metering and demand response systems.
- Establish a living laboratory and vendor network. EPRI will establish a living laboratory to test intelligent “energy efficiency infrastructure to understand technical capabilities, and determine where gaps exist. EPRI’s Power Electronic Application Center (PEAC) laboratory in Knoxville would be the hub of the proposed laboratory, which will facilitate effective testing of components in joint efforts with equipment suppliers and utilities.
- Plans for dynamic energy management design basis. This project will develop a roadmap that will lay out a “no regrets” approach for developing the dynamic energy management infrastructure that can meet emerging requirements for customer communications in a way that will ensure that more advanced, later-generation systems will not make initial deployments obsolete.
- Research to accelerate protocols for key smart end-use devices and equipment. EPRI believes the power industry must be engaged in influencing the development of smart end-use equipment that can function in accordance with utility and consumer energy management needs. To help achieve this, EPRI will identify smart devices that will have the greatest impact, and identify engineering requirements and functionality needed for dynamic energy management of those devices. Standardized protocols and interfaces for end-use technologies will be developed, with first-year focus on specifications for building control systems, work that is a project planned for program 170.

Contact Information

For more information, contact the EPRI Customer Assistance Center at 800.313.3774 (askepri@epri.com).

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