Smart Grid, Energy Efficiency and Policies to Unlock the Possibilities

EPA-DOE Webinar: What the Smart Grid Means for Energy Efficiency and EM&V: Opportunities and Challenges for States

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What Is the Smart Grid?

- An interconnected system of information and communication technologies that works with other technologies throughout the electricity system that can do good things:
  - Help consumers manage their energy use
  - Increase system reliability through automation
  - Improve integration of clean energy resources
- Distinguishing features of smart grid from standard practice: (1) engaging the customer and (2) integrating supply and demand
  - *Energy efficiency practitioners have a head start*

Potential Smart Grid Benefits

- Reduced labor costs
- Enhanced reliability
- Peak-load management (reduced energy, capacity and T&D costs)
- Ability to control ("dispatch") large new loads
  - e.g., plug-in vehicles and heat pumps
- Reduced energy consumption
  - Automation and behavioral changes that complement energy efficiency programs
- Ability to interconnect, balance and deliver high % renewable resources
  - Including distributed energy resources
- Reduced greenhouse gas emissions

Meters – An Entry Point to Customers

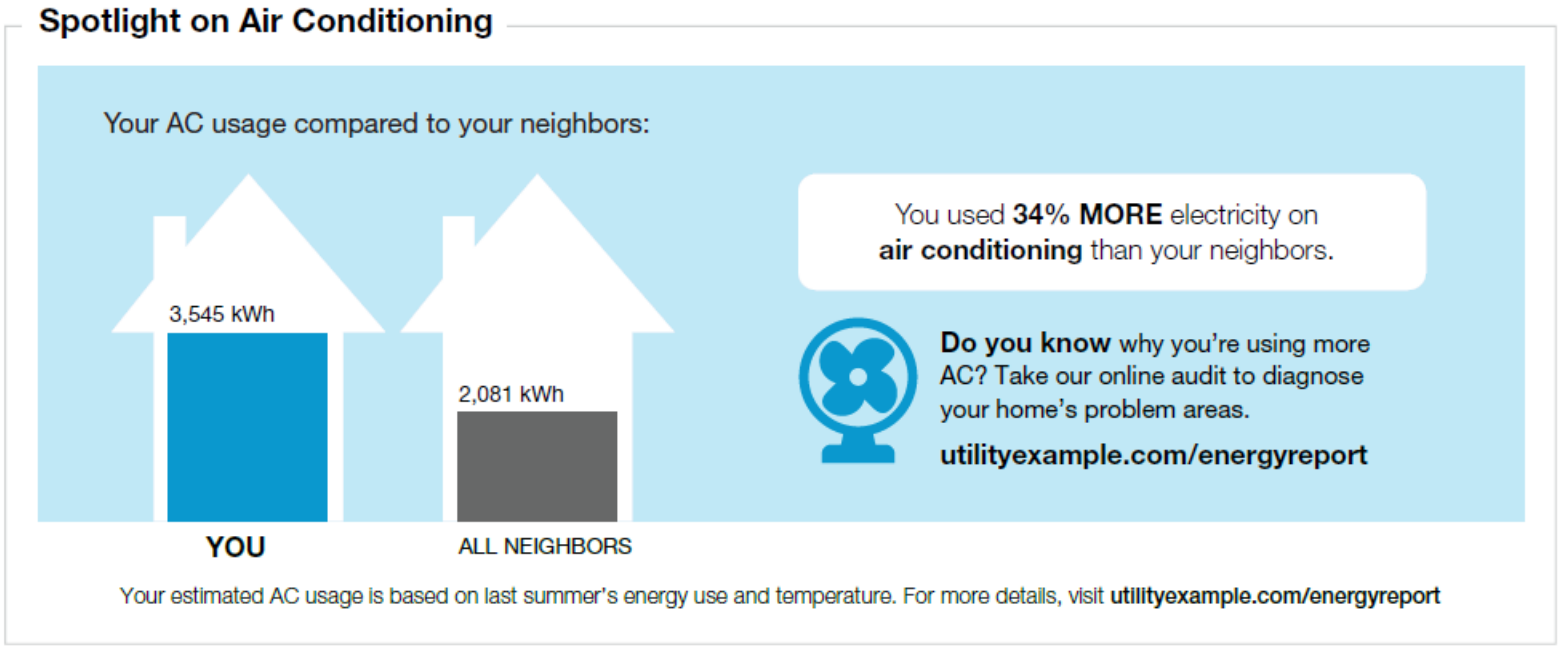
- Advanced metering infrastructure
  - AMI - Solid-state digital meters with two-way communications between the meter and utility

- Interval meter data and communications offer new capabilities, including:
  - Next day or near real-time energy usage information
  - Dynamic pricing options (e.g., critical peak pricing)
    - Enabling technology such as smart communicating thermostats that automate the customer's response
  - Continuous building diagnostics
  - Improved outage detection and response

Energy Efficiency and Smart Grid

- Optimize voltage and reactive power on distribution systems
  - Reduced line losses and energy use in homes and businesses
- Continuous building diagnostics
  - Alert owners about problems with energy-consuming equipment

Energy Efficiency and Smart Grid *(cont.)*



OPOWER

- Information-driven behavior changes
  - Data from smart meters and smart thermostats
  - Customized analysis, comparisons, alerts, and recommendations to consumers via Web, in-premise devices, phone, e-mail, snail-mail, etc.

EM&V and Smart Grid

- Smart Grid benefits for energy efficiency EM&V stem from interval consumption data provided by smart meters, together with signals from smart thermostats:
  - Disaggregation of heating and cooling loads from other loads
  - Reduced data collection costs
  - Rapid feedback on new or expanded energy efficiency programs
  - More refined load-shape characteristics of individual energy efficiency measures
  - Better information for targeting programs to diverse customers
  - More accurate baselines and estimated savings – and how and why they happened

What Policies Can States Consider to Prepare for Smart Grids?

- Establish state objectives for smart grid deployments
  - If increasing energy efficiency and reducing peak demand are among the objectives, require utilities to consider that in their deployments, and incorporate smart grid capabilities in ratepayer-funded EE/DR programs
- Specify minimum technology functional requirements
  - With cost recovery dependent on enabling these services
- Adopt interoperability* standards
- Require smart grid transition plans and updates
  - Explain how the plan meets the state's objectives, discuss the state of technology, estimate costs and benefits, forecast phased deployments, establish an evaluation plan
- Engage consumers – enable, motivate, educate
  - Provide information, evaluation tools, targeted advice coupled with incentives

*Interoperability - The ability of systems or products to work with other systems or products without special effort by the customer.

What Policies Can States Consider to Prepare for Smart Grids?*(cont.)*

- Address information access issues
  - Ensure consumer access to own energy usage data and privacy
  - Enable open market for products and services by mandating 3rd party access to data with suitable privacy protections
- Integrate rate design with smart grid technologies/applications to optimize consumer behavior and system operations
  - Offer time-varying and dynamic pricing options for everyone
  - Important for peak demand reduction and right-time electric vehicle charging
- Specify business case requirements
  - Framework and parameters for benefit/cost analysis
  - Require analysis of uncertainties related to key assumptions
- Update reliability objectives and criteria, service quality measures and reporting requirements for utilities

Smart Policies Needed With – or Without – Smart Grids

- Treat energy efficiency and demand response at least on a par with supply-side alternatives in resource planning and acquisition, T&D planning and markets
  - Acquire all demand-side resources that represent best cost/risk
- Adopt mechanisms that align utility and consumer interests
  - Does state policy implicitly promote energy sales? Many states have adopted alternative regulation (e.g., decoupling), shareholder incentives or both.
- Rethink transmission policies designed to connect large thermal plants to load centers and enable competition – not to address climate change
- Review power sector policies for consistency with state environmental goals, balanced with price and reliability concerns*

**See* "Clean First: Aligning Power Sector Regulation With Environmental and Climate Goals," http://www.raponline.org/docs/RAP_CleanFirst_AligningPowerSector_2010_09.pdf. A paper due year-end will focus on state siting policies.

EXTRA SLIDES

DOE Dynamic Pricing/ Consumer Behavior Studies

- Part of some smart grid grants under ARRA
- Emphasize randomization in experimental design, robust treatment and control group sizes
  - Some PUCs and stakeholders view results from prior studies skeptically. Experimental designs vary in quality, some have limited objectives, and some have small sample sizes.
- Focus on dynamic pricing that comes closest to aligning customer incentives with true costs of providing power (e.g., critical peak pricing)
- Technical Advisory Groups work collaboratively with utilities to ensure well-designed, methodologically sound studies consistent with DOE guidelines and utility interests.
- Studying demand response and efficiency impacts, customer acceptance of rates, information and technology treatments, attrition
- Interim report 2013, final report late 2014

Adapted from Peter Cappers, Lawrence Berkeley National Laboratory, presentation to Demand Response Coordinating Committee, Sept. 10, 2010

Example State Policies on Smart Grid So Far*

- Minimum AMI functional requirements
  - *TX, CA, PA*
- Direct deployment and cost recovery
  - TX Legislature required PUC to establish a cost-recovery mechanism for AMI and required utilities to deploy it as rapidly as possible
- Guidelines for analysis of benefits/costs – *TX, CA*
- Balancing remote connect/disconnect benefits of AMI with consumer protection requirements
  - OR PUC updated rules for notifying customers of pending disconnection
- Legislatively mandated smart grid plans – *CA, IL, MA, PA*
  - IL established Smart Grid Collaborative to develop strategic plan and recommend policies (*link to Collaborative report at end of these slides*)
  - OH legislation allows utilities to propose a Distribution Infrastructure Modernization Plan with single issue rate-making and incentives
- Consumer and 3rd party access to energy usage information – *CA*

*Not a comprehensive list of all policies or all states with similar policies

For More Information

- David Moskovitz and Lisa Schwartz, "Smart Grid or Smart Policies: Which Comes First?" July 2009, http://raponline.org/docs/RAP_IssuesletterSmartGridPolicy_2009_07.pdf
- Lisa Schwartz, "Smart Policies Before Smart Grids: How State Regulators Can Steer Investments Toward Customer-Side Solutions," 2010 ACEEE Summer Study on Energy Efficiency in Buildings, http://raponline.org/docs/RAP_Schwartz_SmartGrid_ACEEE_paper_2010_08_23.pdf
- Lisa Schwartz and William Steinhurst, "Is It Smart if It's Not Clean? Questions Regulators Can Ask About Smart Grid and Energy Efficiency. Pt 1: Strategies for Utility Distribution Systems," May 2010, http://www.raponline.org/docs/RAP_Schwartz_SmartGridDistributionEfficiency_2010_05_06.pdf
- Lisa Schwartz, "Tour of Smart Grid Projects and State Policies," Sept. 9, 2009, http://raponline.org/docs/RAP_Schwartz_SmartGridProjectsandPoliciesORwks_2009_09_09.pdf
- Pacific Northwest National Laboratory, *The Smart Grid: An Estimation of the Energy and CO_2 Benefits, prepared for the US Department of Energy, January 2010, at http://energyenvironment.pnl.gov/news/pdf/PNNL-19112_Revision_1_Final.pdf*
- Illinois Statewide Smart Grid Collaborative Report, Sept. 30, 2010, http://www.ilgridplan.org/Shared%20Documents/ISSGC%20Collaborative%20Report.pdf
- NARUC/FERC Smart Response Collaborative Webinar on NIST smart grid interoperability standards, Nov. 5, 2010, http://www.smartgridlistserv.org/presentations/naruc/index.html (or http://vimeo.com/16831719 for a simplified version that works on all computer operating systems)

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RAP is committed to fostering regulatory policies for the electric industry that encourage economic efficiency, protect environmental quality, assure system reliability, and allocate system benefits fairly to all customers.