



ABOUT THE NEWSLETTER

The EPRI Smart Grid Demonstration Initiative is a seven-year collaborative research effort focused on design, implementation, and assessment of field demonstrations to address prevalent challenges with **integrating distributed energy resources** in grid and market operations to create a “Virtual Power Plant.” This newsletter provides periodic updates on projects, relevant industry news, and events.

PROJECT UPDATE

Case Study “Takeaways” in Smart Grid Four Year Update

The *EPRI Smart Grid Demonstration Initiative Four Year Update: Case Study Brief* was released in July 2012. The booklet concisely describes results and lessons learned in 13 different smart grid demonstration-related case studies conducted by 10 Smart Grid Demonstration Initiative member utilities.

The document focuses on key findings or “takeaways” from each endeavor. Quotes from each case study below provide a glimpse of the content and results achieved:

AEP’s Community Energy Storage Simulation

“Dispatch of energy storage based on monitored kW will reduce the number of battery charge/discharge cycles needed to shift peak demand.”

Con Edison’s Remote Dispatch of Customer-Owned Resources

“Distribution operators can quickly and remotely activate customer generation resources. This has occurred within 3 minutes, and faster response is anticipated when customer acknowledgement is fully automated.”

Con Edison’s Assessment of Achieving Increased Reliability with Distributed Energy Resources

“Using distributed energy resources to achieve greater reliability at the Jamaica substation may be possible for about 2/3 the cost of adding additional capacity.”

Electricité de France’s Response Precision of PREMIO Virtual Power Plant

“Distributed energy can be aggregated in an optimized way in order to respond to load reduction requests during peak periods.”

ESB Networks Smart Green Circuits

“A ‘self healing’ circuit has operated successfully in over 12 separate incidents, with faulted sections isolated and supply recovered to remaining customers within seconds.”

ESB Networks Distribution Volt-VAR Control Integrated with Wind Turbine Inverter Control

“The reactive power capabilities of modern wind turbines can be used for a range of objectives, such as loss reduction, local voltage control and reactive power export.”

ESB Networks Smart- Meter Customer Behavior Trial

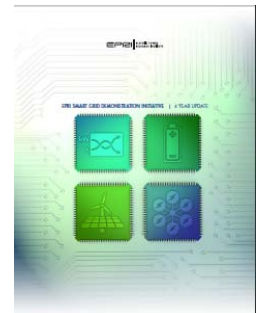
“The deployment of TOU rates and energy information services were found to reduce overall electricity usage by 2.5% and peak usage by 8.8%.”

Exelon: Commonwealth Edison

“Critical peak price and peak time rebate customers provided the largest demand reduction—up to 20%—while technology treatments added no measureable improvement.”

FirstEnergy

“Eighteen load-reduction events showed that aggregated resources can support distribution operations and achieve revenue goals for participating in the PJM power market.”



Kansas City Power & Light

“Opting in to receive a free device or information service does not, in itself, translate into customer engagement.”

Public Service Company of New Mexico

“A 1-second data capture rate of PV output proved essential to use storage for smoothing functions.”

Sacramento Municipal Utility District Conservation Voltage Reduction and Volt-VAR Optimization

“Volt-VAR optimization enabled efficient operation of the distribution system while conservation voltage reduction reduced peak demand by an average of 1.7%.”

Southern Company

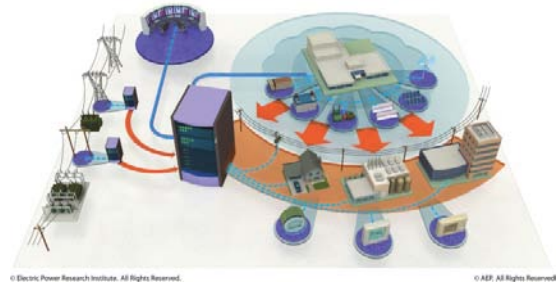
“AMI capacitor bank health monitors identified over 650 problems in the first 6 months and changed the inspection schedule from once a year to once a day.”

Read briefs on these projects in the *EPRI Smart Grid Demonstration Initiative Four Year Update*, Product number [1025781](#). A compendium of full case studies is also being readied and will be published in Q3 2012, product number 1026435. This volume of reports will be the first of a planned series of collected case studies for member reference. Case studies will also be provided as individual documents.

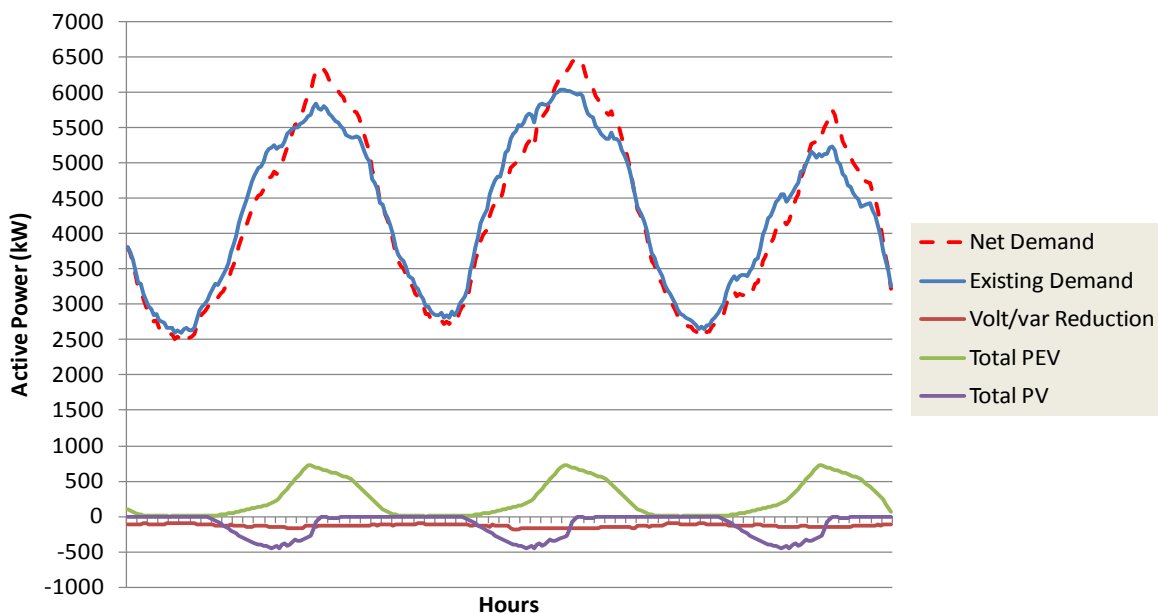
Smart Grid Demonstration Host-Site Updates

AEP Smart Grid Demonstration Update

AEP is progressing in development of an approach to concurrently manage several smart grid technologies (“cross-technologies”). The project team has studied the characteristics of several technologies and how they interact with each other. Certain technologies operate independently, while the operation of others may be optimized by applying knowledge of how the other components affect their performance or vice versa.



An example is shown in the graph below, the temporal interaction of three technologies: photovoltaic generation (PV), plug-in electric vehicles (PEV) and technology for volt-VAR optimization (VVO). How this interaction affects total net demand as seen at the head of the feeder is presented. The change to the net demand is estimated by adding the temporal profiles of these technologies to the existing demand. The intent here is to examine the influence evolving portfolios of distributed resources and energy efficiency applications may have on the peak shaving operation of community energy storage (CES).



From this point the team can start to assess if there is benefit from, or the necessity of, having a master controller and how the master controller would be managed. Looking from the head of the feeder, initial interactions are shown in the table below.

Expected Technology Impacts

	Peak Demand	Efficiency ¹	Consumption	Control Limitations
CES	Decrease	↓ Load losses ↑ No-load losses	Increase	Finite amount of capacity. Fixed control settings.
Volt/VAR	Decrease	↓ Load losses ↓ No-load losses	Decrease	Effectiveness influenced by voltage changes from other technologies and changing CVR
PEV	Increase ²	↑ Load losses ↓ No-load losses	Increase	Controllability dictated by customer behavior and use requirement dictate
PV	Decrease ³	↓ Load losses ↑ No-load losses	Decrease	Curtable but cannot be shifted

- 1- Expected impacts are feeder dependent and may contradict the expected response
- 2- Controlled charging may limit increases to peak demand
- 3- Reduction depends upon the temporal nature and variability of generation

Further study will clarify how one technology impacts the others and identify undesirable and desirable effects. A further step is to examine what control options are needed and if any real-time information about operation of one technology is required to manage operation of another technology. Weather, forecasting, and business strategy will come into play when the team looks further into “cross-utilization,” where the technology can be used for several potentially conflicting purposes and may require an operable approach to determine the appropriate utilization at any point in time.

Highlights of June 2012 Smart Grid Demonstration Advisory Meeting

Southern California Edison (SCE) hosted the second smart grid advisory meeting of 2012 in Westminster, California. The main program focused on lessons learned and results related to case studies, strategic topics, and conservation voltage reduction. An interactive exercise during which utility representatives presented visions of how their companies plan to integrate distributed energy resources was also conducted.

As part of the meeting, attendees toured the **SCE Advanced Technology Laboratory**, which consists of several individual labs. It has a power systems lab and facilities dedicated to situational awareness, communications and computing, distributed energy resources, distribution automation, and several other smart-grid related technologies and applications. A “Garage of the Future,” pictured at right, is part of the Advanced Technology Laboratory and is equipped with a plug-in electric vehicle, charging station, and an LG 4 kW, 10 kWh energy storage unit (shown on back wall) that will be part of the Irvine Smart Grid Demonstration. The storage unit can serve as back-up power for a home, and in the event of an outage, provides information on the amount of time the back-up power can be provided. A 2 MW lithium-ion battery storage installation being tested by SCE was also part of the tour.



Photos below are of the group lining up outside the battery container (below left) and the racks of battery cells inside the container (below right). The SCE tour guide reported that the lithium ion battery can do a 100% discharge, has a 10-year life and can undergo thousands of cycles.



The meeting's optional training session was on **IEC 61850**, which addresses communication networks and systems in substations (edition 1) and power utility automation (edition 2). The training was led by EPRI project manager Yuchen Lu, who covered the fundamentals of the standard, reviewed benefits and challenges of implementation, and shared the experiences of some utilities that have begun applying the standard. A video of the training session is available on DVD from EPRI (Contact the EPRI Order Center at 800-313-3774, Option 2 or 650-855-2121. Ask for IEC 61850 for the Smart Grid, product number 1025677.) Contents of the standard are available from the International Electrotechnical Commission (IEC). According to Yuchen Lu, Chapter 7 -1 is an important section to read to understand the standard.

Other EPRI researchers presented updates on their work on **strategic topics**, such as cost benefit analysis guidelines, distribution management system (DMS) integration, and cyber security of field equipment. In depth reviews of case studies were presented by member representatives Ellen Diskin of ESB Networks, Jon Hawkins of Public Service Company of New Mexico, and Gail Allen of Kansas City Power & Light.

Case studies were also addressed in the panel on **conservation voltage reduction (CVR)**, with panelists from AEP, Southern Company, and Sacramento Municipal Utility District discussing lessons learned from CVR tests. Panelists commented that the benefits of CVR depend on the loads on feeders, and that more study is needed to be able to predict demand savings that can be achieved with CVR. Establishing CVR test plan guidelines for utilities was also discussed. Development of such a plan is underway at EPRI; Jared Green is working on preliminary test procedures that are likely to be incorporated into a CVR guidebook within the next 12 months (contact jgreen@epri.com if you are interested in more information on this project).

Attendees at the June 2012 Smart Grid Demonstration Advisory Meeting



Smart Grid Demonstration Advisory Meeting – October 16-18, 2012

Where: The meeting will be hosted by the Sacramento Municipal Utility District (SMUD) at SMUD’s Customer Service Center office, located at 6301 S Street, Sacramento, California. Lodging will be at the Hyatt Regency Sacramento.

To Register: Advisors can register and obtain information on accommodations by visiting <http://smartgrid.epri.com> and clicking on the link to the meeting under Upcoming Events on the home page. You can also contact meeting planner Robin Pitts at rpitts@epri.com.

Agenda: The October meeting will focus on strategic topics, including presentations on two 2012 areas of focus: distribution management systems and cyber security of field equipment. A session to select 2013 strategic topics will also be conducted. Project updates will also be provided, and a tour of SMUD demonstration projects.



Photo of Sacramento River and skyline

Preliminary Agenda, October 2012 Smart Grid Advisory Meeting

	Tuesday, October 16	Wednesday, October 17	Thursday, October 18
<i>Morning</i>	Optional Training System Protection Implications with Distributed Energy Resources (DER) Bob Arritt and Roger Dugan, EPRI	Welcome & Introductions from EPRI Strategic Topic: Cyber Security for Field Equipment Project Updates: <ul style="list-style-type: none"> • Ergon • Hawaiian Electric Company (HECO) California Energy Commission (invited)	Three-hour Guided Tour of SMUD Smart Grid Demonstration Projects (See description on next page)
<i>Afternoon</i>	Welcome from SMUD Key Deliverables & Technology Transfer Strategic Topics <ul style="list-style-type: none"> • Distribution Management System (DMS) Applications • Distribution Management System (DMS) Integration 	Final Smart Grid Strategic Topic Selection – 2013 Top 3 Research Topics Research Charter Review Research Charter Breakout Sessions & Reports Training Topics Discussion General Roundtable Discussion Team Photo	ADJOURN
<i>Evening</i>	EPRI-Sponsored Dinner	Free Evening	

Tour: SMUD will be providing a three-hour guided bus tour on Thursday morning, October 18, to highlight the following smart grid demonstration projects:

- SMUD's East Campus** project is a 51-acre campus that will house SMUD's corporate yard, warehouse, transformer maintenance facility, and a six-story office. The campus will be an energy-efficient, LEED Platinum, zero net energy project with a 1 MW photovoltaic system and smart technologies. The project is under construction and is more than 50% complete.
- Anatolia SolarSmartSM Homes Community** is a 293-home, high-penetration solar development with PV ranging in size from 1.9 kW to 4 kW. SMUD has fifteen 10-kW/8.8-kWh lithium ion residential energy storage systems and three 30-kW/30-kWh lithium ion community energy storage systems (see photo lower right) in the development and plans to install an additional 500-kW/6-hour zinc bromine flow battery near the Anatolia substation just outside the community.
- A 15MW PV installation**, located between the Anatolia SolarSmartSM Homes Community and the Tollenaar Dairy, is one of SMUD's Feed-In Tariff (FIT) projects. The FIT projects provide SMUD a total of 90 MW of bulk photovoltaic generation.
- The Tollenaar Dairy digester** project utilizes methane gas produced from the waste of approximately 1,100 milk cows to run a 212-kW genset (photo on right). Dairy digesters produce a useful commodity, electricity, while mitigating the impacts of a troublesome waste stream.
- Pacific Housing** is building the first zero net energy community in Sacramento's midtown district. When complete, the community will contain 34 zero net energy, LEED certified homes with numerous advanced energy efficiency features, energy storage, photovoltaic systems, smart controls, home energy management systems and demand response technologies.
- A microgrid demonstration** project is located at SMUD's central utility plant. It consists of three 100-kW natural gas engines, a 10-kW photovoltaic system, a 500-kW zinc-bromine flow battery, and a smart switch to shift the central plant load from utility power to microgrid power.



Schedule of Upcoming EPRI Smart Grid Demonstration Advisory Meetings

2012	March 6-8	Meeting hosted by CenterPoint Energy , in Houston, Texas
	June 12-14	Meeting hosted by Southern California Edison in Westminster, California
	October 16-18	Meeting hosted by Sacramento Municipal Utility District in Sacramento, California
2013	March 5-7	Meeting hosted by Salt River Project in Phoenix, AZ
	June 3-6	Meeting hosted by Commonwealth Edison in Chicago in conjunction with EPRI Smart Distribution Power Quality Conference
	October	Meeting hosted by Hydro-Quebec in Montreal, Canada (Dates TBD)
2014	March 2 Meetings	Meeting hoisted by Hawaiian Electric Company (HECO) (date and location TBD) TBD



All Smart Grid Demonstration Members (not just host-sites) are invited to host future meetings. Members interested in hosting should contact Matt Wakefield (mwakefield@epri.com) or Gale Horst (ghorst@epri.com).

Smart Grid Demonstration Host-Site “Deep Dive” Webcasts Schedule

Deep Dive meetings are typically held on the 3rd Thursday of the month at 11am (Eastern) for 1 ½ to 3 hours.

- February 2, Hydro-Québec (COMPLETE)
- February 23, ESB Networks (COMPLETE)
- March 15, Exelon (COMPLETE)
- May 24, Electricité de France (COMPLETE)
- June 20, American Electric Power (COMPLETE)
- August 2, PNM Resources (COMPLETE)
- August 16, Southern California Edison (COMPLETE)
- **September 27, Southern Company**
- **October 25, Duke Energy**
- **November 15, Consolidated Edison**
- **December 20, Kansas City Power & Light**
- **January 17, Ergon**

RESOURCES

“Deep Dive” Webcast Recordings

Recordings and copies of presentations of Deep Dive webcasts conducted since the last newsletter are available to members at the Smart Grid Demonstration Program Cockpit (log on to www.epri.com, select Program Cockpits and Smart Grid Demonstration and go to Past Meetings & Webcasts.).

- A recording of the **Southern California Edison (SCE)** Smart Grid Demonstration Host Site “Deep Dive” conducted on August 16, 2012, is available for downloading, as well as a PDF of the slides. The webcast covered the status of subprojects associated with the Irvine Smart Grid Demonstration, zero net energy homes, plug-in hybrid vehicles, volt-VAR control, self-healing circuits, interoperability, and more.
- Recordings of the **Public Service of New Mexico (PNM)** Smart Grid Demonstration Project Deep Dive Webcast, which was conducted on August 2, 2012, are also available. The PNM Deep Dive is available according to individual topics addressed during the webcast such as the new Energy and Industrial Technology Development Organization (NEDO) microgrid and various aspects of the Prosperity Energy Storage Project, ranging from modeling to algorithms to use of storage for smoothing and peak shifting.



Deliverables Published Since Last Newsletter

Product ID	Name	Published
1025677	IEC 61850 for the Smart Grid - Smart Grid Training Session #6	15-Aug-12
1025764	Hawaiian Electric Company (HECO) Smart Grid (SG) Demonstration Project Description	13-Aug-12
1025760	Strategic Intelligence Update: Smart Grid Conferences and Events	06-Aug-12
1025688	Southern California Edison Smart Grid Host Site Progress Report	31-Jul-12
1025676	Cost Benefit Analysis for the Smart Grid - Smart Grid Training Session #5	25-Jun-12



A continuous thank you to the 23 member utilities of EPRI's Smart Grid Demonstration Initiative

American Electric Power | Ameren | Central Hudson Gas & Electric | CenterPoint Energy | Consolidated Edison | Duke Energy
 Electricité de France | Entergy | Ergon | ESB Networks | Exelon (ComEd & PECO) | HECO | Hydro-Québec | FirstEnergy | KCP&L | PNM
 Resources | Sacramento Municipal Utility District | Southern California Edison | Southern Company | Southwest Power Pool | Salt River
 Project | Tennessee Valley Authority | Wisconsin Public Service Corporation

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