EPRI Smart Grid Demonstration Update

An EPRI Progress Report **February 02, 2011**

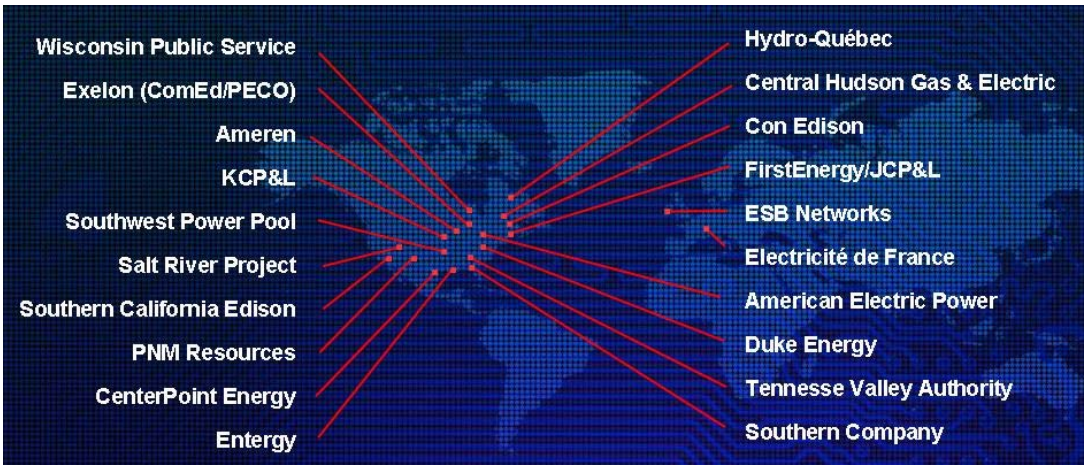
ABOUT THE NEWSLETTER

The EPRI Smart Grid Demonstration Initiative is a five-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 the project and relevant industry news and events.

PROJECT UPDATE

Welcome to CenterPoint Energy and Hydro-Québec as New Members of the EPRI Smart Grid Demonstration Initiative – Now 20 Members in the Smart Grid Demonstration Collaborative

Welcome to CenterPoint and Hydro-Québec as new members to the Smart Grid Demonstration Initiative – both joining in the 4th quarter of 2010. The extension of Initiative thru 2014 and the acceptance of new members thru 2011 enables the collaborative team to grow and with demonstration experiences and results benefiting not only the members, but the electric power industry as well.



ESB Networks Smart Grid Demonstration Project Selected as Smart Grid Project of the Year in "Best Grid Integration of Renewables" Category by *POWERGRID International* Magazine.

POWERGRID International Magazine Press Release, Feb 1st, 2010

Congratulations to ESB Networks (ESBN) Smart Grid Demonstration Project for being selected as Smart Grid Project of the Year in the "Best Grid Integration of Renewables" category *by POWERGRID International* Magazine. As one of EPRI's smart grid demonstration projects, ESBN's project in Ireland is pioneering and relevant to address the future of renewable energy generation and supply security. For more information, see the press release.

Teresa Fallon (ESB) Accepting the Award from Teresa Hansen (PennWell)

Electricité de France (EDF) Smart Grid Demonstration Project Selected as Finalist for "Best Smart Grid Project"

Also congratulations to EDF's PREMIO Smart Grid Demonstration project in the PACA region of southern France which was selected as a finalist in the "Best Smart Grid Project" category by POWERGRID International Magazine.

Congratulations to All the Winners and Finalists – Making Contributions to Advance the Smart Grid!

Smart Grid projects around the world are making contributions to advance the grid - taking advantage of known benefits and quantifying potential benefits. We can all continue to learn from these hundreds of valuable Smart Grid activities with common goals.

- *Best Energy Efficiency/Demand Response Project:* ***Winner –*** *National Grid;* ***Finalists –*** *Glendale Water & Power and California ISO*
- *Best Grid Integration of Renewables Project:* ***Winner –*** *ESB Networks;* ***Finalists –*** *PSE&G and Midwest ISO*
- *Best Smart Grid Project:* ***Winner –*** *Salt River Project (SRP);* ***Finalists –*** *Electricité de France and OG&E*
- *Best Smart Metering Project:* ***Winner –*** *Southern California Edison (SCE);* ***Finalists –*** *Portland General Electric and SDG&E*

Strategic Smart Grid Research Issues and Topics

Strategic Research Topics for Cross-Collaboration in 2011

Four strategic issues were identified as top priority research topics to collaborate across host-sites in 2011. Below is an update on the progress of the 2011 topics. Formal updates will occur at the next three EPRI Smart Grid Demonstration Advisory Meetings and selection of new topics will occur for 2012, 2013 & 2014.

Conservation Voltage Reduction (CVR) and Volt/VAR Optimization (VVO)

The CVR and VVO Strategic Topic will focus on the following deliverables in 2011:

- Documenting and presenting CVR/VVO best practices.
- Listing and categorization of CVR/VVO benefits
- Documenting requirements for CVR/VVO line and/or equipment sensors and control devices
- A stretch goal for 2011 is to model CVR/VVO algorithms on a mix of typical and non-typical circuits in OpenDSS

During our Smart Grid Demonstration Advisory meeting in March, Bob Uluski, Technical Executive at EPRI, will be delivering a CVR/VVO Best Practices presentation followed by a presentation from Ameren about their CVR/VVO project and how they have incorporated the IntelliGrid Methodology to develop a use case on their control strategy. We also plan to have a presentation from a member concerning their CVR/VVO implementation and hopefully a presentation for CVR/VVO Lessons Learned. In 2011, there will be some modeling exercises incorporating CVR/VVO using OpenDSS with the Ameren Mini Demonstration project that will help us understand how the system will respond to CVR/VVO commands.

DMS Integration and Visualization

The DMS Integration and Visualization Strategic Topic has goals to deliver two survey documents as the main deliverable for this year. The first survey will be the functionality currently in place for systems that perform the DMS functionality at the host-site projects, but all members are encouraged to participate. The second survey will include a "wish list" of desired functionality. The goal of this strategic topic is to define what is available and what is desirable in a DMS. The results of these surveys may be used in individual utilities' roadmap efforts and also for development of RFP's for future purchases. The initial survey is drafted and is under review. After feedback is compiled, the resulting survey will be administered via an on-line survey tool with results presented at the March Smart Grid Advisory Meeting. Please contact John Simmins (865-218-8110) if you are interested in reviewing or participating in the survey and also to provide key contacts at your utility that are involved in your DMS-related activities.

Energy Storage Monetization

The Energy Storage Monetization Strategic Topic will address the issue that it is challenging to cost justify energy storage based on its use for a single application. The goals of this task are to identify the range of applications to apply energy storage and then identify the quantifiable benefits of each application. Understanding multiple applications and benefits will help to understand how energy storage applications can be "stacked" to achieve multiple benefit streams. Understanding how to apply multiple energy storage applications for both grid support and consumer applications along with the benefits will help justify the deployment of the technology. The EPRI Smart Grid Demonstration team is collaborating with the EPRI Energy Storage Team to accomplish these tasks and provide mutual benefits to both programs. The main deliverables of this task are to

- Document the applications, benefit and cost categories of energy storage applications
- Develop an "alpha-version" benefit assessment tool to help utilities assess energy storage deployment options
- Develop a white paper on the results of this effort expanding on existing knowledge from the EPRI Energy Storage team
- A stretch goal is to develop a formal benefit assessment software tool to support the cost benefit analysis

Initial results of this effort will be reported on at the March Smart Grid Advisory meeting levering existing work performed by the EPRI Energy Storage program and included in the following report: Electricity Energy Storage Technology Options: A White Paper Primer on Applications, Costs and Benefits This paper describes 10 key applications which can support the entire chain of the electrical system, from generation and system-level applications through T&D system applications to end-user applications. Included are: wholesale energy services, renewables integration, large and small storage and transportable systems for T&D grid support, ESCO aggregated systems, commercial and industrial power quality and reliability, commercial and industrial energy management, home energy management, and home back-up storage. Capturing multiple benefits—including transmission and distribution (T&D) deferral, local or system capacity, and frequency regulation—was found to be crucial for high-value applications and for supporting the business case for energy storage. Applications that achieve the highest revenues do so by aggregating several benefits across multiple categories.

Consumer Behavior and Engagement

The Consumer Behavior and Engagement Strategic Topic will focus on an accurate evaluation of customer perspectives toward smart grid technologies to further our understanding of customer motivators. The Smart Grid Demonstration members in attendance at the fall advisory meeting indicated a need to address what could be interpreted as a lack of customer interest in the smart grid technology. Understanding the customer will help drive effective design of educational materials that support various industry directives relating to the consumer. A question surfaced regarding whether it is conceivable to create a "pull" where customers are asking to become involved in smart grid technology.

The issues identified that are driving this focus on consumer behavior include:

- Lack ability to show value to customer.
- Preliminary studies have indicated a low customer demand for Smart Grid technologies.
- Assumed negative impact on consumer lifestyles.
- Incorrect assumptions or a general lack of knowledge regarding key customer motivation factors.
- Customer product manufacturers need a reason to develop and implement the Smart Grid technologies.
- Conflicting, and sometimes misleading, information has been disseminated about the smart grid from various sources.

The issues being approached are:

- Understanding the key drivers for customer adoption and motivation.

- Understanding the problem, in customer terms, related to the customer environment.
- Understanding how to approach the issues of customer education to be able to create a common industry message.

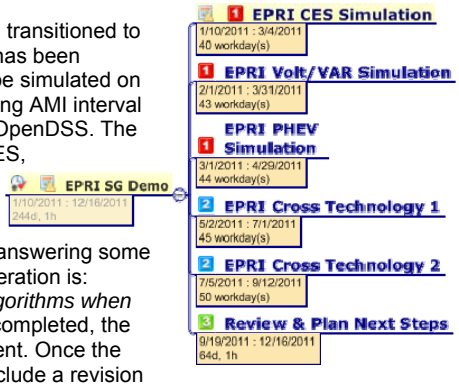
Currently, consumer engagement work is focused on a baseline topical scan. At the March Smart Grid Advisory Meeting, the presentation will include findings in terms of prior research and literature from a broad range of sources along with related projects and pilot updates. The program literature will be scanned to see if there are indications of regional differentiation and centers of influence. From there the intent is to identify gaps and opportunities for additional research that could be undertaken within the scope of the EPRI Smart Grid Demonstration Initiative.

EPRI Smart Grid Demonstration Host-Site Updates

This section provides a brief highlight of recent activities for each host-site.

American Electric Power (AEP) Smart Grid Demonstration Update

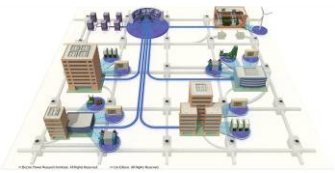
The AEP modeling and simulation efforts have been transitioned to the NE Columbus, OH project. A distribution circuit has been selected where the 3-phase analysis approach will be simulated on that circuit. The circuit data has been loaded, including AMI interval data, and validated through various methods using OpenDSS. The first three primary technologies for simulation are CES, Volt/VAR, and PHEV.



Later in 2011 the second phase of simulation will be initiated to look at the cross-technology impact. A set of hypothesis are under review to target the project work toward answering some specific questions and validating assumptions. For example, one hypothesis under consideration is: "*Operation of vehicle charging stations will necessitate a change in CES local dispatch algorithms when the technology is installed and operating on the same circuit.*" Once the first phase (1) is completed, the second phase (2) will be able to prove / disprove / or clarify this type of hypothesis statement. Once the simulation data are available, the project can review and plan the next steps which may include a revision and additional simulations to study management of the cross technology impacts that have been modeled.

The following year, 2012, may likely contain some algorithm changes and additional evaluation to review the cross-technology approach and provide additional data to understand the cross-utilization impacts where a particular technology could be called upon for a plurality of purposes, including economic dispatch as well as peak and reliability resources.

Consolidated Edison Smart Grid Demonstration Update



The Con Ed project is focused on the interfaces required to allow the project technology to function as envisioned. Today resources, such as demand response or other customer resources are called upon using basic communication for a non-automated response. Once the new interfaces are developed, the network operators will be able to interface, via bi-directional communications, to Demand Response Control Centers (DRCC). The DRCC will interface electronically to dispatch the customer resources directly, alleviating the human response element required in the older communication processes.

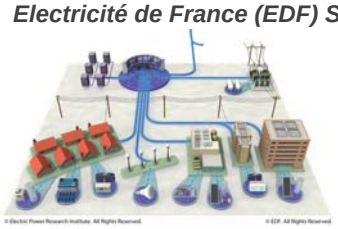
Most of the previously enrolled customers own on-site generation that will be included as automated dispatchable resources. In addition, these customers will be dispatched to supply ancillary services, which provide a quick response to help manage the stability of the system.

Over the past several months, several additional large commercial customers have been recruited for participation in the project for the purpose of demonstrating the use of demand response as a tool to support the reliability of a distribution network. The automated dispatch of the customer's generators and DR resources will be in response to activation signals initiated from the ISO, distribution network operators, or transmission operators, which will interact with the DRCC, serving as the gateway to multiple demand response resources. The project technology will allow customers to leverage incentives from emergency DR, demand bidding, capacity markets, ancillary services, and interruptible programs.

Duke Energy Smart Grid Demonstration Update

The early deployment project for the north side of Indianapolis is still waiting on regulatory approval; however, the PEV and infrastructure aspects of Project Plug-IN are moving ahead as planned. In December, Duke Energy received 10 Think City electric vehicles which will be driven by Duke Energy employees over the next two years. Duke participants were selected to give a variety of commuting patterns and electric load diversity for monitoring grid impacts of PEVs (electric vs. gas water heating, HVAC, etc.) In addition to Duke Energy, Indianapolis Power & Light also received vehicles in December, along with the state of Indiana. Level 2 charging infrastructure will be installed beginning in January at multiple locations around the region, including the homes of the owners of early vehicles and various non-residential locations. Infrastructure being deployed as part of this project will come from multiple Electrical Vehicle Supply Equipment (EVSE) companies and contain both "intelligent" and "standard" EVSE. Other Energy Systems Network partner companies will begin their participation in early 2011 including Purdue University, EnerDel, and MISO. The vehicles are outfitted with data recorders that will capture a large amount of data on vehicle, consumer, and electric load characteristics. Detailed project planning has begun with ITOCHU on the scope for the second-life battery evaluation component of this project. This testing will evaluate the second-life applications of lithium-ion automotive batteries.

Electricité de France (EDF) Smart Grid Demonstration Update

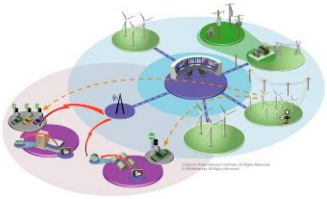


As part of the EPRI Smart Grid Demonstration Project, EDF has completed what is probably the first, complete description of a Virtual Power Plant (VPP) using the IntelliGrid Methodology. The use cases describe the interaction with the upstream Control Unit with the Upstream Operator and the individual Distributed Energy Resources (DER). The use cases are under final review and will likely be published in March in the next EDF Smart Grid Demonstration Progress Report.

The goal of the PREMIO VPP is to offer "day-ahead" and "day-of" (same-day) services for optimal load reduction. The VPP will respond to the needs of an upstream operator by controlling different distributed resources. The function of the VPP can be broken down into a sequence of exchanges between the Control Unit (CU) and different actors. The nominal sequence is launched as soon as a "day-ahead" weather forecast is received by the Control Unit. Following this, individual load reduction capacities (ILRC) are calculated by the systems and the System Learning Module (SLM) using the weather forecast. At the same time, the Upstream Operator Critical Period Generator (CPG) generates critical periods for the following day. The CU then aggregates the ILRC along with the critical periods and then submits an aggregated load reduction capacity to the Upstream Operator. The Upstream Operator, in turn, generates a request for load reduction capacity (in kW) and submits it back to the CU. These requests can be either 'day-ahead' or 'day-of' requests. After receiving this request, the CU separates it into individual load reduction requests (ILRR) through a process of economical optimization. Each individual request is shaped for the specific features of each individual System. The ILRR are dispatched to their Systems and, in return, the Systems will confirm whether they accept the ILRR or not. The acceptance of the ILRR impacts the overall capacity of the participating System; therefore changes to ILRC's must be updated by the System or SLM. ILRC's described in the EDF Use Case document includes:

- Direct Load control of PREMIO VPP (Control Unit)
- Individual load control of EDF heat pump and thermal storage
- Individual load control of EDF load shedding appliances
- Individual load control of EDF PV and electrical storage
- Interoperate communication between control unit and distributed resources (Gateway)
- Individual load control of Watteco Public lighting appliance
- Individual load control of Watteco Pulssi device

ESB Networks Smart Grid Demonstration Update



ESB Networks provided their host-site project update as the first in a series of monthly web casts providing a detailed update of their project. The web cast described each of the four main components of their demonstration including: 1) Wind Integration, 2) Smart Meters, 3) Electric Vehicles, and 4) Smart Green Networks. The web cast materials will be available in the EPRI "Cockpits" in mid-February, but members of the Smart Grid Demonstration Initiative can get copies of the presentations any time by contacting Matt Wakefield.

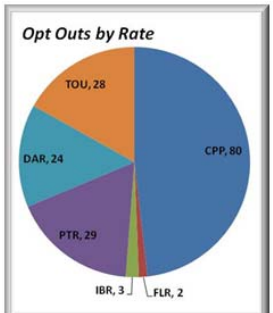
ESB ecars has announced the launch of their new website at: www.esb.ie/ecars with innovative and interactive features such as a Google map showing charge points, online video clips showing how ecars are charged, and video testimonials from those who have test driven the cars.

Also, a dedicated ESB ecars Facebook page at: www.facebook.com/ESBecars has also been established to create a forum where people can have discussions about ecars and create a buzz around this new technology. By linking to this page, you can keep up to date with the latest ecar information from ESB.

Exelon (ComEd/PECO) Smart Grid Demonstration Update

The EPRI and ComEd project teams are currently focused on analysis of data gathered during the summer season of 2010. The analysis will be formulated in a phase one analysis report on the CAP (Customer Applications Program) project.

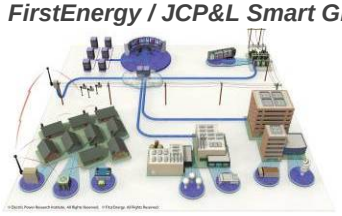
One interesting aspect of the analysis is looking at the application of the rates and technology over a group of customers at large. Rather than asking customers to enroll in a pilot, they were assigned to a rate and corresponding technology along with access to detailed information. As shown in the charts at the right, the opt-out rate has remained low (~2%) with the highest opt-outs in the critical peak pricing (CPP) group of customers. In the process of analyzing the data, in addition to the core hypotheses outlined in the method study report, the analysis team is looking to see which customers appear to have the most awareness of and response to the new rates and technologies. For example, if we look at the customers who show the most response, are there any particular identifiable characteristics? This may provide some extended learning of notable value in addition to the core approach. The phase one analysis is targeted to become available Q2 of 2011.



Rate	Opt Outs	Percentage
CPP	80	3.60%
FLR	2	0.13%
IBR	3	0.42%
PTR	29	2.51%
DAR	24	1.78%
TOU	28	2.44%

As the phase 1 report nears finalization, the focus turns to the final consumer survey. A number of the hypotheses outlined in the method study will need customer feedback to be able to analyze the results in conjunction with the consumer usage data. The final survey will be conducted as the program wraps up in spring of 2011. EPRI is coordinating the development of the survey with additional directives from ComEd and the broader team that designed the study.

FirstEnergy / JCP&L Smart Grid Demonstration Update



FirstEnergy's Integrated Distributed Energy Resources (IDER) project has just completed installing distribution line sensors. Installation of sensors from two vendors, PowerSense and Grid Sentry, started in late 2010 and was completed in the first week of January 2011. The two prototype distribution line sensors are currently in various stages of development. FirstEnergy is working with the vendors to install, test, and evaluate the two types of line-sensing devices. As is typical where prototype systems are involved, there is opportunity for the results of the evaluation to provide data to the vendor that could impact the vendor's design for further product enhancements. For example, feedback has been provided to improve the sensor installation methods.

Steps needed for integration of the distribution line sensors have been completed and data are available to the integrated control platform. This will make the sensor information available to system operators for visualization and monitoring. FirstEnergy is also targeting integration of the permanent peak load shifting Ice Bear units into the integrated smart grid control platform allowing additional visibility and control by the distribution system operators. This is scheduled for completion spring of 2011.

KCP&L Smart Grid Demonstration Update

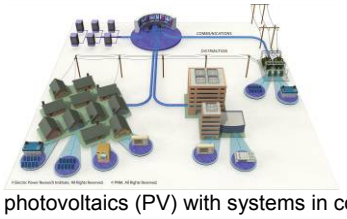
KCP&L signed their demonstration grant contract with the DOE on September 30th. Accordingly, they completed their Cyber Security & Interoperability Plan and Project Management Plan and submitted them to the DOE on October 31st, followed by their Metrics and Benefits Reporting Plan on December 31st.

After an early October start; KCP&L completed the AMI Smart Meter roll-out of the Green Impact Zone (with 4,300 meters) on December 13th. With the continuation of the AMI roll-out into the Blue Impact Zone with total installments approaching 9,000 AMI meters with a total of approximately 14,000 Smart Meters installed by the end of the project.

Customer Interaction in the Green Impact Zone is noteworthy. A "White Glove" approach has led to a high acceptance rate of In-Home Displays (IHD) ~80%. There are close to 700 In-Home Displays (IHD) installed with 50% of those now being fully functional where KCP&L can push prices to them.

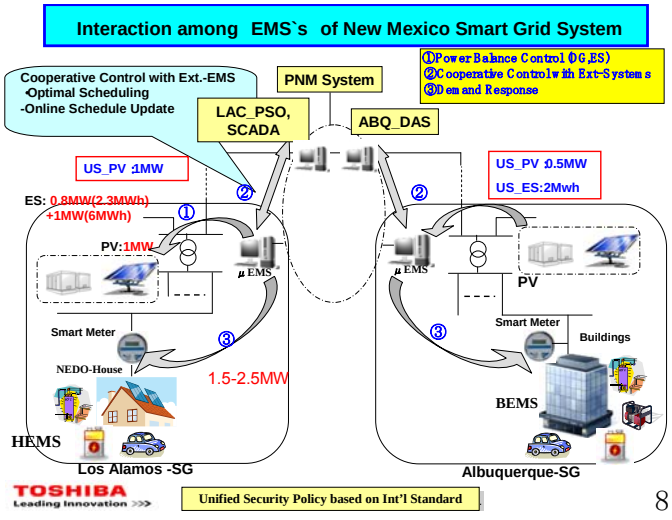
The initial EPRI-led Use Case Training and Workshops have allowed the KCP&L team to apply the IntelliGrid Methodology so they can develop use cases on their own. To support that effort, they are leveraging numerous use case contributions from other utilities and standards bodies in the Use Case Repository and additional sources that implemented similar functions. The process includes modifying existing use cases with vendor and KCP&L team participation to make the use cases "KCP&L Specific." They anticipate having 70+ use cases for their project and are hoping to compile these into a final document to aid other utilities in their own smart grid implementations. The Demonstration House (a recently renovated home in the Green Impact Zone) is now open for tours on Wednesdays and Saturdays and has already received some media coverage. The Grand Opening of the Demonstration House will occur in late March – early April 2011. To learn more, go to the Project Living Proof website: http://www.kcenergy.org/projectlivingproof.aspx

PNM Resources Smart Grid Demonstration Update



Cooperation between micro-grids and building EMS documented in Use Cases

PNM and the Department of New Energy and Industrial Technology Development Organization (NEDO) have developed Use Cases that describe the coordination of distributed generation (DG), in the form of photovoltaics (PV) with systems in commercial and residential buildings using a µEMS which interacts with Building Energy Management Systems (BEMS), Home Energy Management Systems (HEMS) and PNM's System Control and Data Acquisition (SCADA) system and Demand Response (DR) systems. Two scenarios are considered.



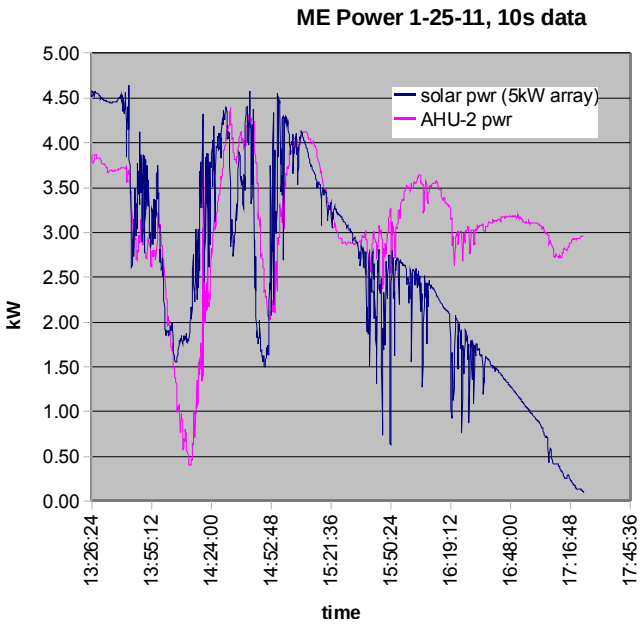
The use case describes a localized power network consisting of DG's/ Loads with bi-directional Information and Communications Technology (ICT). Energy usage inside of Smart grid is optimized by an Energy Management system (EMS), we call this special EMS a "µEMS". This can be extended to the total optimization of the entire power network by cooperating µEMS with the external Energy management. Inside a facility, on the other hand, there may be a small smart grid such as BEMS, HEMS etc. µEMS can also cooperate with these inner EMS's so that they can realize optimal energy usage in a hierarchical manner.

Storage can be utilized a couple of ways. One scenario assumes 1 day ahead scheduling and the use of a battery system. Another scenario assumes the battery system is used for smoothing fluctuations in PV based on high speed commutations with the DR system and the BEMS. PV forecasting is an elemental technology for the stable and optimal energy control in the smart grid by µEMS. For the demand-supply balance planning, PV forecast from 1 day ahead up to 1 week ahead or so ("long range PV forecast") is needed. On the other hand, the demand-supply balance control and voltage control for the day requires PV forecast up to 3 hours ahead or more by minutes ("short range PV forecast").

Description of building-scale high-frequency PV demand response

The UNM ME building is used to investigate the use of variable frequency drive (VFD) on air handling unit (AHU) fans to compensate the high-frequency component of PV intermittency. The building has 70,000 sq.ft. of conditioned surface area, split in four floors. The peak cooling load for the building is approximately 100 tons, which can be supplied by a 40-50 kW electric chiller, although in the present case chilled water is stored at night in large chilled water storage tanks. The peak power consumption of the AHU fans is approximately 50 kW. Thus, there is abundant opportunity to adjust the load of the building in real time, by adjusting the VFD speed of the fan motors.

The premise being used is that PV production on a clear, sunny day with no clouds does not need smoothing - it may need shifting by a couple of hours, but that is not the purpose of this exercise. The rapid changes in power output of a PV system resulting from variable cloud cover are what need investigation. The solar flux for the afternoon of January 20, 2011 is plotted in the figure and is compared to the fan power in the figure. Only compensation for rapid variation, not the normal daily variation is being investigated. It is apparent that the control algorithm results in close correlation between PV production changes and corresponding fan power adjustment. Further tuning is ongoing, but it is clear that the majority of the variation on the scale of several seconds to one minute is captured, leaving very-high-frequency components of variability, which can be compensated for with a much smaller battery-inverter, flywheel or capacitor.
The long-term average fan speed remains constant and does not produce noticeable effects on the building temperature.



Southern California Edison Smart Grid Demonstration Update

Southern California Edison's Irvine Smart Grid Demonstration (ISGD) Project is in the process of completing their Metrics & Benefits Reporting plan. In addition to the Metrics & Benefits required by DOE, SCE has worked systematically to develop a research plan to guide the demonstration to ensure the study provides value not only to SCE and the EPRI Smart Grid Demonstration initiative, but to the industry. This well orchestrated research plan involves a wide range of technology implementation and identifies testable hypotheses that will aid the team in observing and analyzing project impacts. In the coming months SCE will finalize baseline testing procedures and EPRI will provide support in regards to modeling expertise for several of the baseline measurements. The ISGD project can essentially be divided into eight sub-projects.

- Two sub-projects of the Irvine Smart Grid Demonstration project will explore the impact of advanced customer-sided technologies and energy efficiency measures including the evaluation of Zero Net Energy Homes on the Grid, and Plug-in Electric Vehicle Charging at work.
- Four sub-projects involve technologies representative of a year 2020 distribution system including Distribution Circuit Constraint Management Using Energy Storage, Enhanced Circuit Efficiency and Power Quality through Volt/VAR Control, Self-Healing Distribution Circuits, and Deep Grid Situational Awareness for Transmission Operators using Phasor Technology.
- Information and communications technologies are the enabling backbone of the Smart Grid and are the focus of another sub-project referred to as the Secure Energy Network (SENet).
- The eighth sub-project will research the expected impact of the smart grid to utility organization and workforce requirements.

SCE's demonstration will utilize a mix of both mature and emerging technologies in a creative application designed to determine the technical viability of each element individually as well as their interactive affect on each other and on the overall performance of a Smart Grid.

Southern Company Smart Grid Demonstration Update

Southern Company Distributed PV Demonstration

The installation of distributed PV panels across seven regions in Georgia is well underway with environmental and operational data being collected and aggregated. These are small pole mounted devices that are being used to gather information to determine impacts and expected performance of future PV installations in the region. The overall project has recently been expanded to include the same type pole mounted PV systems across all of Alabama bringing the total units installed to 100 devices. Installation and information collection best practices are being documented for future applications.

Energy Storage Demonstration

Southern Company and EPRI have teamed up to test and demonstrate energy storage units from Greensmith. Each unit is capable of producing 6kW and storing a total of 24kWh. Southern Company's demonstration has two goals: performance and technology verification, and utility integration. While many utilities agree that energy storage will play a key role in a fully functional Smart Grid, there are few concrete plans and business models in place. This testing, along with EPRI's insight, hopes to address the issues facing utilities with storage questions. The demonstration includes a total of ten units, nine in field trials and one in lab testing.

Key Deliverables and Information since Last Newsletter

Smart Grid Technologies Report

Product ID 1020415

The electric utility industry is pushing forward into advanced automation and communication systems that are becoming the base of the Smart Grid. Each new deployment adds more intelligence to the grid and expands the information gathering capability available to energy suppliers and system operators. It also brings new challenges in the form of standards, data mining, and automated control. New technologies for electric energy storage and demand response open opportunities to integrate distributed generation more effectively, reduce peak demands, and allow end users to become active participants in managing energy use.

This report focuses on recent advances in products, methods, and software available today or currently in field testing that would potentially be incorporated in a modern power system. It is organized based on the fundamental technologies that drive the Smart Grid: integrated communications, energy storage, advanced control, sensing and measurement technologies, distributed generation, home and building systems, electric transportation, and situational awareness and decision support. The topic is so vast that a detailed examination of all advances is impractical in a single document. This report provides an overview with a collection of examples for each of the topic areas.

Regional Profiles for Distributed Resource Integration

Product ID 1020312

This report characterizes regional drivers and challenges for distributed resource integration. Information gathered includes research and demonstration activities being conducted to integrate distributed resources into grid and market systems. The report summarizes lessons learned from literature review, workshops, and surveys conducted by EPRI in 2009 and 2010. The information gathered through these various channels is applied in this report towards identifying regional trends, demonstration needs, and gaps to overcome integration barriers.

Commonwealth Edison Company Customer Applications Program – Objectives, Research Design and Implementation Details

Product ID 1022266

This comprehensive pilot program was designed to resolve uncertainties about how advanced metering infrastructure (AMI) technology can be used to stimulate changes in residential electricity consumption. Determination of the impacts of AMI technology was deemed incomplete because previous studies involved only two or three applications operated under varying design protocols resulting in generalized conclusions. The Customer Applications Program (CAP) was designed as a comprehensive and scientific pilot to test alternative price structures and enabling technologies via an 8,500-customer field trial of dynamic rates, enabling technology, customer education, and customer experience. The CAP program uses an opt-out enrollment methodology in which customers were assigned randomly to applications (treatments) that include alternative rate structures in combination with enabling technologies such as in home displays and individualized customer reports. The ComEd Method Study provides a detailed description of how the CAP was designed, constructed, implemented, and deployed, including a depiction of the testable hypotheses that enable subsequent analyses of the results. This report covers the methods used and the design of the study. A Phase 1 Analysis, covering the results of the first 3 months (summer of 2010) will be the next report to follow this one. The analysis report is being developed and targeted for release in the April 2011 timeframe.

5-Steps to Performing a Smart Grid Cost Benefit Analysis

Christina Haddad, Technical Research Assistant at EPRI, was a Guest Editor in SmartGridNews.com and provided an overview of EPRI's methodology as a series of 5 Steps to Performing a Smart Grid Cost Benefit Analysis. Here is a summary of the steps and link to article.

Step 1: Define the Research Problem
Step 2: Identify Technology to be Deployed
Step 3: Develop a Research Plan and Measurement and Verification Protocols
Step 4: Measure Project Benefits and Costs
Step 5: Perform a Cost/Benefit Analysis and Communicate Results

4th International Conference on Integration of Renewable and Distributed Energy Resources

The week-long 4th International Conference on the Integration of Renewable and Distributed Energy Resources was a success with over 350 international attendees. The Post-conference Workshop was connected to the EPRI Smart Grid Demonstration Initiative with 17 international smart grid demonstration presentations that are publicly available. You are encouraged to visit the conference website (http://www.4thintegrationconference.com/index.asp) to download and review all of the materials exchanged and presented during the conference. The 5th International Conference is slated for **Berlin, Germany in 2012**, while the 6th International Conference is tentatively scheduled for **Tokyo, Japan in 2014**. We hope to see you there!

KEY EPRI SMART GRID DATES

EPRI Smart Grid Demonstration Advisory Meeting – March 8-10, 2011

When/Where: Hosted by Southern Company, Atlanta GA, March 8-10, Link to Invitation
Invitations were sent recently, contact Robin Pitts (865-218-8057) if you are a member of the Smart Grid Demonstration Initiative, but did not receive an invitation. This meeting will include the following:

This meeting will introduce an optional 1/2 day smart grid training session the morning of March 8th focused on Advanced DMS Smart Grid Application. The resulting training will be recorded and made available as a formal deliverable to the members.

The focus for this meeting will include an update on the four strategic topics of 2011 including presentations from host-sites on these topics:

- Consumer Behavior

- DMS Integration/Visualization
- Conservation Voltage Reduction & Volt VAR Optimization
- Energy Storage Monetization

This meeting will also provide an update and review of the final deliverable - "Smart Grid Reference Guide to Integrate Distributed Energy Resources" along with key updates on significant project activities. The meeting will wrap up on Thursday with updates on Southern Company's Demonstration and a tour of their Control Center and Solar Installation.

Future EPRI Smart Grid Demonstration Advisory Meetings

All Smart Grid Demonstration Members (not just Host-Sites) are invited to host future meetings. Members interested in hosting one of the upcoming meetings, Contact Matt Wakefield.

2011	June28-30 –	Meeting Hosted by **Duke Energy**, Cincinnati, OH
	Oct/Nov –	Meeting Hosted by **KCPL**, Kansas City, MO
2012	Feb/March –	Meeting Host TBD
	June/July –	Meeting Hosted by **Southern California Edison**, Westminster, CA
	Oct/Nov –	Meeting Host TBD
2013	Feb/March –	Meeting Host TBD
	June/July –	Meeting Host TBD
	Oct/Nov –	Meeting Host TBD
2014	Feb/March –	Meeting Host TBD
	June/July –	Meeting Host TBD
	Oct/Nov –	Meeting Host TBD

Smart Grid Demonstration Host-Site "Deep Dive" Web Casts for Members

Throughout 2011, each host site will provide an update on their project to facilitate deeper learning and reporting on the individual projects. ESB Networks gave their web cast in January. Members of the Smart Grid Initiative should have received an invitation to these web casts. Contact Matt Wakefield for more information.

2011 Smart Grid Demonstration Host-Site Webcast Schedule (3rd Thursday of the Month at 11am (Eastern) for 1 ½ to 3 hours)

- January 20th, ESB Networks (COMPLETE)
- February 17th, FirstEnergy
- March 17th, Electricité de France
- April 21st, American Electric Power
- May 19th, PNM Resources
- June 16th, Southern California Edison
- July 21st, Southern Company
- August 18th, Duke Energy
- September 15th, Exelon (ComEd/PECO)
- October 20th, Con Edison
- November 17th, KCP&L
- December 15th, TBD

EPRI Power Quality and Smart Distribution Conference and Exhibition 2011 – Harmonizing with the Grid of the Future – CALL FOR CONTRIBUTIONS

When/Where: August 15-17, 2011, Hilton Nashville, Downtown Nashville, TN
Come join us this summer in Music City, USA as we seek to bring harmony to the emerging Smart Grid. EPRI and TVA, along with the Tennessee Valley Public Power Association (TVPPA) and local conference host, the Nashville Electric Service (NES), invite you to the 2011 EPRI Power Quality (PQ) and Smart Distribution Conference and Exhibition. With the accelerating pace of the Smart Grid, there is a need to ensure that the future grid is robust, manageable, and effective from transmission and distribution down to the end use loads. We encourage you to join us in Nashville to learn all the possibilities for your own applications.

Utilities, industry representatives, and electric power end users are invited to participate in the PQ & Smart Distribution 2011 Conference by sharing their unique perspectives on the importance of the following areas in addressing quality, reliability, and optimization of the power delivery system. Abstracts for presentations that stress applications and challenges related to smart power delivery systems, power quality, electric transportation and increased penetration of distributed resources are desired.

TVA, TVPPA, NES and EPRI invite you to submit abstracts on proposed topics that are included in the Event Sheet located on the conference website. Send your abstract submission or proposed presentation topic via email to: Lisa Wolfenbarger, lwolfenbarger@epri.com by February 25, 2011. For more information or to register for the conference, click here.

Other Smart Grid Related Meetings and Conferences

For a full list of national and international smart grid meetings and conferences, visit EPRI's Smart Grid Calendar of Events.
