



**About the Newsletter**

This is the first issue of the IntelliGrid program newsletter. The IntelliGrid program conducts research and development in the area of communications, data integration and cyber security to support smart grid applications in the transmission, distribution and consumer domains. The program provides results that can meet the near-term needs of our members and makes contributions that will advance the industry towards an interoperable, integrated smart grid.

This newsletter provides results from on-going and recently completed projects, status reports on current projects, plans for future projects and information on relevant industry activities.



**TECHNOLOGY TRANSFER AND INDUSTRY COORDINATION**

**Summary and Analysis of the FERC Technical Conference on Smart Grid Interoperability Standards**

On January 31, 2011, the Federal Energy Regulatory Commission (FERC) held a technical conference for the purpose of determining if five families of standards that had been identified by the National Institute of Standards and Technology (NIST) had “sufficient consensus” for FERC to initiate rulemaking proceedings. Subsequent to the conference, FERC requested comments on several questions. In total, 46 sets of comments were submitted. The IntelliGrid program has released a white paper that provides a summary and analysis of the comments that were submitted.

The white paper describes 4 themes that emerged from the review of the comments:

1. The Need for Additional Review – all responders agreed with the presenters that the standards require a more robust review for reliability, security, functionality and interoperability.
2. Inclusion of Cyber Security – there was general consensus that cyber security is important for the smart grid and that security should be include at the initial design phase.
3. Impact of Cyber Security on the Smart Grid – Several responders expressed concern that significant focus on cyber security could negatively impact the performance and reliability of the smart grid.
4. Constantly Evolving Environment – need to address the constantly changing environment of technology, threats and vulnerabilities, particularly with the inclusion of IT and telecommunications technology in the smart grid

The white paper is available for download at the IntelliGrid program collaborative site that can be accessed from homepage at [www.EPRI.com](http://www.EPRI.com). On the homepage select the tab labeled EPRI Collaboration and select IntelliGrid Program.

**Smart Grid Roadmap Interest Group and Workshop**

The IntelliGrid program has an on-going supplemental project to develop company-specific smart grid roadmaps. The roadmaps define the company’s smart grid vision, documents existing systems and technologies used by the company and presents actions that the company should take to create its smart grid. EPRI has developed or is developing smart grid roadmaps for the following companies:

- First Energy
- Duke Energy
- Southern Company
- Tennessee Valley Authority
- Salt River Project
- California ISO
- Long Island Power Authority

The IntelliGrid program has conducted two smart grid roadmap workshops that bring together the people who have the responsibility for developing and maintaining their company's roadmap. These workshops have been a great opportunity for people to share experiences and lessons learned. Participants at the last workshop decided that it would be beneficial to meet more frequently. To accommodate this interest, the IntelliGrid program has launched a Smart Grid Roadmap Interest Group. This group is open to all utilities or ISO/RTOs. The group will hold webcasts every other month. The first webcast is scheduled for June 22 at 10 AM (pacific). Please contact Don Von Dollen at [dvondoll@epri.com](mailto:dvondoll@epri.com) or (650) 855-2210 if you would like to join the interest group or participate in the supplemental project.

The third smart grid roadmap workshop will be held on November 15-16 in Phoenix, AZ. Salt River Project has been kind enough to host this workshop.



## INTELLIGENT TRANSMISSION SYSTEMS

### Control Center Display of Asset Health Information Supplemental Project

A new supplemental project entitled "Control Center Display of Asset Health Information" is getting started that will focus on enhancing operations staff awareness of asset health. The project will be using real asset condition information from participating utilities that will be sent to EPRI's Smart Grid Substations Lab where it will be mapped into IEC61850 and the CIM standards (IEC61968 & 61970) as appropriate. It will then be analyzed using existing asset health algorithms and combined with other relevant information into an information display suitable for control center operations. This project will also investigate the feasibility of transferring the result to a tablet environment so that the display can be portable within the control center. If successful this project may set the stage for an "electric utility" application store. Keep an eye out for further updates in this newsletter. Please contact Paul Myrda at [pmyrda@epri.com](mailto:pmyrda@epri.com) or 708-479-5543 for more information.

### Smart Transmission Newsletter

EPRI's Power Delivery and Utilization Group recently published the first issue of the "Smarter Transmission" newsletter. This newsletter will inform readers about what is happening in the smarter transmission system arena which cuts across a number of the Transmission & Substations, IntelliGrid and Grid Operations & Planning research areas at EPRI. The first issue has a feature article on the multi-vendor NASPInet Demonstration that EPRI participated in at the North American Synchrophasor Initiative meeting held in Fort Worth, TX on February 24, 2011. The Smart Transmission Newsletter can be downloaded at [http://my.epri.com/portal/server.pt?Abstract\\_id=00000000001022305](http://my.epri.com/portal/server.pt?Abstract_id=00000000001022305)



## INTELLIGENT DISTRIBUTION SYSTEMS

### Common Information Model (CIM) for Distribution

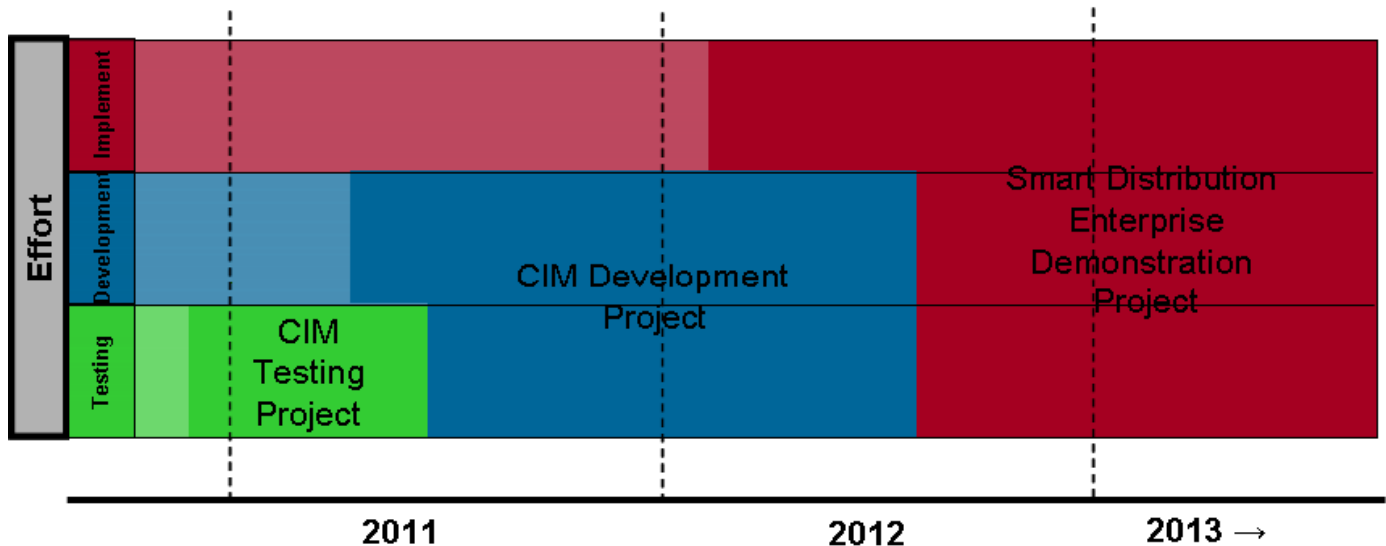
EPRI is rapidly approaching the completion of the first phase in its three phase strategy to accelerate the widespread adoption of the Common Information Model (CIM) for distribution. The EPRI strategy is to put in place a series of projects that will result in a wide selection of CIM compliant application that utilities can select from that will help increase reliability and decrease operational costs. The goal of the strategy is to provide the infrastructure and basic messaging needed to build a smart distribution enterprise built on a CIM-base common semantic model. Foundational to this is the development of a testing infrastructure for the

certification of product conformity to the CIM and interoperability testing. The first project that EPRI has undertaken is to provide this infrastructure by developing standard CIM tests for conformity and interoperability. The tests have been developed and several demonstrations of interoperability have been planned. Several labs have expressed interest in becoming testing labs for CIM. A growing list of vendors is participating as the vendor community recognizes the competitive advantage they would have being one of the first vendors to be "CIM Certified".

The second supplemental project, to be kicked off in June 2011, is to fund actual development of the standard messages for back office applications in a coordinated fashion with the vendor community and Working Group 14 of the IEC. In this effort, messages will be developed and testing procedures written. After WG 14 approval, these artifacts will then be provided to the vendor community for implementation and testing. By coordinating the development effort and publish a schedule of when messages will be available, utilities will be able to add "teeth" to the requirements in their requests for proposal for application implementation or integration services. Simultaneous to the message development will be harmonization with other important standards such as IEC 61850, MutliSpeak® and SEP 2.0.

With the proper infrastructure in place for testing and a growing list of available CIM messages and CIM certified vendors, the third project is the DMS and Smart Enterprise Demonstration project. This demonstration project, patterned on the very successful EPRI Smart Grid Demonstration Project will extend lessons learned in the Smart Grid Demo to the rest of the enterprise with a special focus on integration and DMS functionality and practice. The applications and messages that have been developed and tested in the previous two projects will be implemented and the lessons learned applied. Results of DMS implementations and human factor research will be developed in a collaborative environment.

By concentrating on the barriers to standard adoption at utilities, EPRI will lead the way to provide its members tools and methods to reduce costs and enhance reliability. For more information on EPRI's CIM for distribution work, please contact John Simmins at [jsimmins@epri.com](mailto:jsimmins@epri.com) or (865) 218-8110.



### The IntelliGrid Program's Role in the Development of the IEEE 802 Standards for Field Area Communications Networks

EPRI is involved in, or leading, several IEEE standards committees related to smart grid communications. The IEEE 802 Local Area Network (LAN) / Metropolitan Area Networks (MAN) Standards Committee (LMSC) has been developing many of the key standards used for enterprise and industrial communications networks for over 30 years. Well known communication technologies such as Ethernet (802.3), Token Ring (802.4), Wi-Fi (802.11), ZigBee™ (802.15.4), and WiMAX (802.16) have been developed in these committees.

Tim Godfrey, EPRI Project Manager for Communications, is chairing the IEEE 802.16n Task Group that is developing a higher reliability amendment to 802.16. The 802.16 standard is the basis for WiMAX, which has been commercially deployed worldwide as a metropolitan scale broadband network. The 802.16 committee just completed 802.16m, which introduces higher efficiencies and data rates up to 100Mbps per user. Two 802.16 amendments are under way to support the specific requirements of the Smart Grid Field Area Network (FAN): 802.16n (GRIDMAN) and 802.16p (M2M). Each of these amendments will provide complementary enhancements to 802.16, designed to address the requirements of Smart Grid applications.

The GRIDMAN task group is focusing on increasing the reliability of 802.16 networks. The task group is defining new capabilities to enable 802.16n-capable network devices to dynamically change their mode or role in case of failure or disruption. For example, if a base station loses its infrastructure connection (backhaul), it can become a relay, and relay data through another base station. Or, terminal devices can also serve as relays to extend range at cell edge or fill in the coverage hole left by a failed base station. These dynamic roles provide the network resilience against failure. In a smart grid deployment, not all devices would need to implement 802.16n enhancements. As part of network design, a subset of devices in specific locations will be identified to provide the maximum reliability benefit from the mode-changing capability.

The Machine-to-Machine (M2M) task group (802.16p) is developing enhancements to support large numbers of devices, low power consumption, low duty cycle operation, and secure operation for embedded devices. The M2M 802.16 devices can be a combination of FAN applications (control and sensor devices used for distribution automation and smart distribution), and communication from Smart Meters. The combination of enhanced capabilities provided by 802.16n and 802.16p, which can be integrated into operational WiMAX networks, will provide specific support needed for Smart Grid FAN applications. WiMAX can be used by utilities to build a converged, multi-service FAN that can provide backhaul for AMI, data services to field workers, replace LMR communications, and provide security video from substations. These tailored utility-centric solutions are not yet planned by operators of cellular networks, where the business focus is on the retail mobile phone customer.

For more information on the work that EPRI is doing in the IEEE 802.16 standards, please contact Tim Godfrey at [tgodfrey@epri.com](mailto:tgodfrey@epri.com) or 913-706-3777.

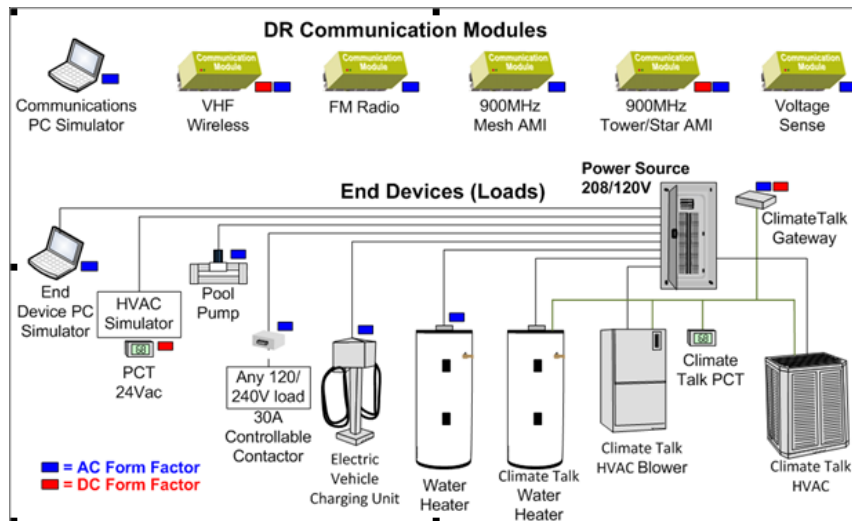


#### ADVANCED METERS, DEMAND RESPONSE & ENERGY EFFICIENCY

### Milestone in the Modular Communication Initiative

On May 5th, 2011, a number of residential device manufacturers and demand-response communication system providers participated in an interoperability workshop (hosted by Southern Company) that marked an important milestone in the industry effort to connect residential appliances with the smart grid. As illustrated in the figure below, the workshop demonstrated how a modular communication interface can enable any end device to work with any communication system through user installed plug-in communication modules (similar to a Wi-Fi card in a laptop PCMCIA slot). This practical approach eliminates the problem of rapidly evolving communication technologies and allows products to be produced today, at negligible incremental cost that can work in demand response systems of the future.

Since 2008, EPRI has been facilitating a collaborative industry project that has engaged more than 150 individuals representing 65 companies, including appliance manufacturers, communication system providers, and utilities. These participants worked together to develop a specification for a modular interface that meets the needs of each stakeholder group. This specification served as the basis for the prototype products that were successfully tested for interoperability in the recent workshop. A whitepaper has been released that describes the workshop and the project overall. The paper is publicly available and can be downloaded at: [http://my.epri.com/portal/server.pt?Product\\_id=00000000001023245](http://my.epri.com/portal/server.pt?Product_id=00000000001023245)



In coordination with the NIST Home-to-Grid Domain Expert Working Group, EPRI has also been facilitating the merging of this specification with a contribution from the usnap.org. The resulting document is slated to be introduced to a Standards Development Organization (SDO) such as the IEEE in the coming weeks. EPRI's IntelliGrid program is presently launching a phase 2 supplemental project that will run in parallel with the SDO activity. The project is designed to accelerate product availability and to assure that member's demand-response system requirements are met in the final standard. It will focus on iterative prototyping and interoperability testing of products and will also develop a test-harness that will ultimately be contributed to a certification agency for the future standard. For more information on this project, please contact Brian Seal at [bseal@epri.com](mailto:bseal@epri.com) or (865) 218-8181.



**SECURITY FOR POWER SYSTEM COMMUNICATIONS, INFORMATION & CONTROL**

**EPRI Launching the National Electric Sector Cybersecurity Organization Resource (NESCOR) Project**

EPRI has been awarded a contract from the U.S. Department of Energy (DOE) to establish a National Electric Sector Cybersecurity Organization Resource (NESCOR) that has the knowledge and capacity to enhance the effort of the National Electric Sector Cybersecurity Organization (NESCO) by providing technical assessments of power system and cybersecurity standards to meet power system security requirements; provide recommendations for incident response, and participate in testing emerging security technologies in labs and pilot projects. The EPRI led NESCOR team will work collaboratively with NESCO, asset owners/operators, DOE and other industry stakeholders to focus cyber security research and development priorities and to analyze various failure scenarios, organize the collection, analysis and dissemination of infrastructure vulnerabilities and threats and identify and disseminate best practices and metric for cybersecurity posture. The NESCOR team will also work cooperatively with DOE and other Federal agencies to identify areas where they may best support efforts to enhance cyber security of the bulk power electric grid and electric infrastructure.

The NESCOR team has formed three Technical Working Groups:

1. Threat & Vulnerability Assessment & Mitigation
2. Cybersecurity Requirements and Standards Assessment
3. Cybersecurity Technology Testing & Validation

The three Working Groups will focus their R&D efforts in Year 1 on securing the following 6 critical grid functions end-to-end:

1. Advanced Metering Infrastructure
2. Demand Response
3. Electric Transportation
4. Distributed Energy Resources
5. Distribution Grid Management
6. Wide Area Monitoring, Protection & Control

NESCOR has bi-weekly conference calls for 90 minutes for each of the three Technical Working Groups to discuss the issues, build consensus on the technical approach and assign tasks to the team members to achieve tangible results. Several utilities have cybersecurity experts attend these calls.

NESCOR is holding an Annual Summit June 29<sup>th</sup> – July 1<sup>st</sup> in Arlington VA at the Crystal Gateway Marriott to invite a wider group of electric sector stakeholders to review the 1<sup>st</sup> year plans and build consensus. The Summit is open to any interested party and free to register. For more information, please contact Erfan Ibrahim, at [eibrahim@epri.com](mailto:eibrahim@epri.com)

## KEY DATES & CURRENT DELIVERABLES

### Key Dates

<i>IntelliGrid Advisors Meeting (EPRI, Palo Alto)</i>	<i>June 1-3, 2011</i>
<i>NIST Tracking Call (161A) (60 minutes)</i>	<i>June 9, 2011 (9 am pacific)</i>
<i>Smart Grid Roadmap Interest Group Webcast</i>	<i>June 22, 2011 (10 am pacific)</i>
<i>NESCOR Annual Summit (Crystal City)</i>	<i>June 29-July 1, 2011</i>
<i>Project Set C Webcast (161C) (60 minutes)</i>	<i>July 12, 2011 (10 am pacific)</i>
<i>Project Set D Webcast (161D) (60 minutes)</i>	<i>July 12, 2011 (8 am pacific)</i>
<i>Project Set E Webcast (161E) (60 minutes)</i>	<i>July 13, 2011 (8 am pacific)</i>
<i>NIST Tracking Call (161A) (60 minutes)</i>	<i>July 15, 2011 (9 am pacific)</i>
<i>NIST Tracking Call (161A) (60 minutes)</i>	<i>August 11, 2011 (9 am pacific)</i>
<i>IntelliGrid Steering Committee Meeting (Boston)</i>	<i>September 12, 2011</i>
<i>Project Set D Webcast (161D) (60 minutes)</i>	<i>October 4, 2011 (8 am pacific)</i>
<i>Project Set E Webcast (161E) (60 minutes)</i>	<i>October 5, 2011 (8 am pacific)</i>
<i>NIST Tracking Call (161A) (60 minutes)</i>	<i>October 13, 2011 (9 am pacific)</i>
<i>EE/SG Public Advisory Group Meeting (Kansas City)</i>	<i>October 18-19, 2011</i>
<i>Project Set C (161C) (60 minutes)</i>	<i>November 2, 2011 (10 am pacific)</i>
<i>NIST Tracking Call (161A)(60 minutes)</i>	<i>November 10, 2011 (9 am pacific)</i>
<i>Smart Grid Roadmap Workshop (Phoenix)</i>	<i>November 15-16, 2011</i>
<i>Project Set B Webcast (161B) (60 minutes)</i>	<i>December 6, 2011 (8 am pacific)</i>
<i>NIST Tracking Call (161A) (60 minutes)</i>	<i>December 9, 2011 (9 am pacific)</i>
<i>Project Set D Webcast (161D) (60 minutes)</i>	<i>December 13, 2011 (8 am pacific)</i>
<i>Project Set E Webcast (161E) (60 minutes)</i>	<i>December 14, 2011 (8 am pacific)</i>

Please contact Ashley Eldredge for details regarding the key dates, [aeldredge@epri.com](mailto:aeldredge@epri.com).

## Recently Released Deliverables

### *Lessons Learned from Existing Internet Protocol Based Technologies in Shared Networks*

#### [1023052](#)

The Metering, Network, On the Field Operations, and Information System (MENOFIS) platform, developed by EdF Research and Development (R&D), tested the technology aspects of three R&D projects of the Measurement and Information System for the EdF R&D Electric Network Department. These projects focus on three business needs of French distribution system operators: 1) metering issues, 2) new issues associated with network monitoring, and 3) mobility needs.

The MENOFIS platform deploys an automated meter management infrastructure composed of smart meters, network monitoring materials, information systems, and communication networks for field services staff.

This document describes all MENOFIS platform steps and results. It also gives a perspective on the project and the future of MENOFIS. The main highlights are:

- A use-case approach that helped to create a shared vision
- Internet protocol integration from material to information system
- An integration of heterogeneous materials (meters, digital control relays, data collectors, etc.)
- The co-existence of different communication technologies (radio frequency- and power line carrier-based)

### *Best Practices in the Control Center*

#### [1021948](#)

Written in interview format, this EPRI Whitepaper discusses the techniques being used by some asset owners to deploy physical and cyber security in their substations. Topics include the following:

- IT in the Substation
- The Danger of Mingling Missions
- Leveraging SCADA for Security
- The Control System Operator
- Consequential Impact Assessment
- The Engineering Life-cycle
- The Budget
- Restoration

A critical finding is that the techniques to secure substations are radically different from techniques in use at the Control Center even though many of the technologies are identical.

### *Customer Communications Architecture Development: Metrics for Standards and Product Assessment*

#### [1020105](#)

This study outlines a process for integrating requirements for the Smart Grid from representative sources and provides a structure for categorizing requirements. The process then provides an approach to the development of a tool that can be used for evaluating current and emerging standards as well as products in the marketplace.

### *Home Area Network Performance Metrics and Monitoring — Phase 2: Test Tools Guide for PET, WET, and Central Site Programs*

#### [1020106](#)

This project focuses on two specific communication technologies ZigBee (a wireless technology) and HomePlug AV (HPAV) (a power line communication technology); by developing two new tools called the Wireless Evaluation Tool (WET) and the Power Line Communication Evaluation tool (PET).

Both WET and PET test tools concentrate on layer 1 (Physical layer or PHY) and layer 2 (Data link) (MAC) by simulating other layers.

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Together...Shaping the Future of Electricity®

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