EPRI ELECTRIC POWER RESEARCH INSTITUTE

# IntelliGrid Newsletter

**An EPRI Progress Report** **September 2012**

## About the Newsletter

The IntelliGrid Program conducts research, development and demonstrations on the information and communications technologies that enable Smart Grid applications. Research areas include interoperability, communications, data management and Smart Grid implementation. The program provides results that can meet the near-term needs of our members and make 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.

## COORDINATION, ANALYSIS AND IMPLEMENTATION

### IntelliGrid – Project Set A: Coordination, Analysis and Technology Transfer

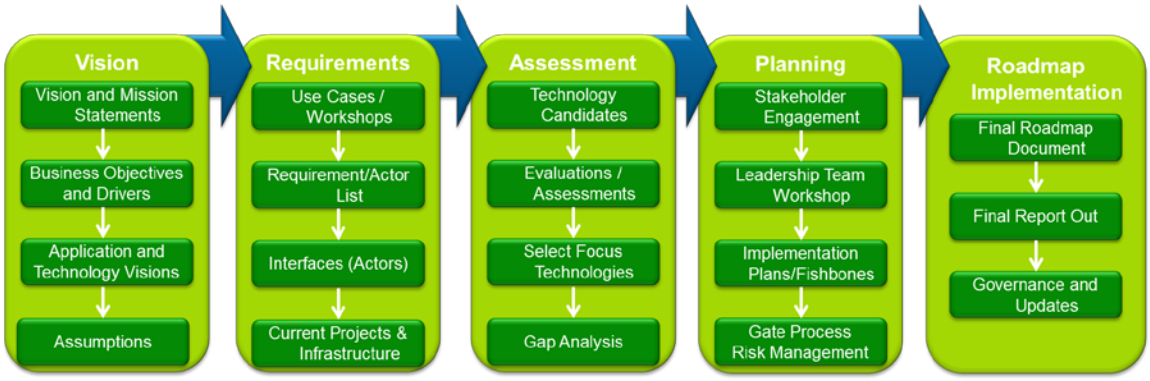
*Project Set A within the IntelliGrid program provides utilities with tools and information to help them plan, design and implement Smart Grid infrastructure and applications. It provides tracking and analysis of the rapid advances in Smart Grid standards and communications technologies so that utilities can minimize risk when planning and procuring equipment. It also provides utilities with lessons learned from industry Smart Grid deployments including cost / benefit assessment case studies and best practices, and provides members a forum to share experiences with Roadmap development and maintenance.*

### Smart Grid Roadmap Guidebook Summarizes EPRI's Roadmap Development Methodology and Lessons Learned from Utility Projects

In 2007, EPRI began working with utility members to develop company specific Smart Roadmaps. These roadmaps defined the company's vision for its Smart Grid and recommended actions for the company to take to achieve its vision. EPRI has now developed Smart Grid Roadmaps for FirstEnergy, Salt River Project, Duke Energy, Southern Company, California ISO, TVA and TVPPA (for the distribution companies served by TVA). EPRI also worked with PG&E, Southern California Edison and San Diego Gas & Electric to develop the Smart Grid Roadmap for California in 2020.

In August, EPRI published the Smart Grid Roadmap Guidebook (123) that describes the methodology that EPRI has created to develop roadmaps and the lessons learned and best practices collected from the roadmap development projects.

The EPRI Smart Grid Roadmap Methodology has five steps: Vision, Requirements, Assessment, Planning and Roadmap Implementation. Within each step there are three or four recommended tasks however, depending on the Roadmap objectives, some tasks are optional. The EPRI Methodology is summarized in the figure below.




Some of the lessons learned from EPRI's Smart Grid Roadmap Development project are:

- There is as much value From the "journey" as in the end product – there is tremendous value from the shared experience of defining the future vision and developing use cases
- A successful roadmap must be driven from the top – you need an executive sponsor
- A successful roadmap must take a holistic view – you need to look across the entire enterprise
- A successful roadmap puts the stakeholders at the center - need to identify who are the stakeholders – both within the company and outside of the company
- It is tremendously important to define the company's current state – this is more difficult that you would imagine but very useful as you define the future state
- Don't get lost in technology – technology is a means to an end, you need to determine what you want to do before deciding how you will do it
- Developing enterprise policies for cybersecurity and integration and important early steps
- Communications technology is a BIG part of the Smart Grid
- Don't just add – think about replacement and transition
- A successful roadmap has a strong, well-defined governance structure

EPRI continues to work with utilities to develop company-specific Smart Grid Roadmaps. For more information, please contact Don Von Dollen at (650) 855-2210 or dvondoll@epri.com

## IntelliGrid Program Holds Third Smart Grid Roadmap Workshop

The IntelliGrid program hosted the third Smart Grid Roadmap Workshop on August 7 & 8, 2012 at EPRI's office in Palo Alto, CA. The objective of the workshop was to bring together the people responsible for developing and maintaining the Smart Grid roadmaps for their companies, to encourage dialogue about their experiences, share lessons learned and best practices, and discuss topics of mutual interest. Workshop participants made presentations on their company's roadmap and panel sessions were held on "roadmap development methodology", "living with and maintaining your roadmap" and on "cost benefit analysis for Smart Grid investments."

Representatives from the following utilities participated in the workshop:

- Pacific Gas & Electric Co.
- Southern California Edison Co.
- CPS Energy
- The United Illuminating Company
- San Diego Gas & Electric Co.
- Bonneville Power Administration (BPA)

- Southwest Power Pool, Inc.
- Southern Company Services, Inc.
- Salt River Project

Over the course of the two day workshop several common themes emerged as similar opportunities and challenges were echoed by workshop participants. Workshop participants reiterated the value and importance of roadmap documents as living documents that frame the Smart Grid vision for an organization. Communicating that the research conducted supports the business objectives and vision of the organization is one way to gain support for Smart Grid projects from senior leadership. The roadmap alone, however, is not enough to fulfill a company's Smart Grid vision. A comprehensive and holistic approach is needed to explain the value (for example, aligning the roadmap with the smart grid deployment plan). The roadmap should be presented in a way that illustrates how investments will be maximized and outlines a way to trace efforts from objectives to evaluation.

For more information, please contact Don Von Dollen at dvondoll@epri.com or (650) 855-2210.

## IntelliGrid Releases a White Paper that examines the adoption of the Inter Control Center Protocol standard by the electric utility industry

The IntelliGrid Program has released a White Paper entitled "Standards and Technology Adoption Case Study: Inter Control Center Protocol (ICCP/TASE.2). This white paper is the second in a series examining the implementation of standards within the electric utility industry. Specifically, the papers study the factors that a utility takes into consideration when selecting which standards to implement. The first paper in the series "A Utility Standards and Technology Adoption Roadmap" listed twelve factors that utilities consider when deciding if they will implement a standard:

- Clear Business Objective
- Technology Selection
- Impact on Existing Infrastructure
- Ability of Organization to Adapt
- Method of Implementation
- Reliability and Security Impacts
- Testing and Certification
- Metrics to Evaluate Implementation Effectiveness
- Cost Recovery and Other Regulatory Issues
- Business Risk Assessment and Overall Governance
- Life Cycle Management
- End of Life

The White Paper describes the development and deployment of the Inter- Control Center Protocol (ICCP), later to be known as IEC 60870- 6, the Telecontrol Application Service Element 2 (TASE.2). The enthusiastic acceptance of this communications suite by the power industry is one of the most successful stories of standards and technology adoption in a business area that is notorious for its resistance to change. Nearly every Energy Management System (EMS) in use today provides an ICCP connection for exchanging data either between utilities, or among entities within a utility.

This paper examines the factors that made ICCP successful when many of its contemporary technologies were not. As the industry wrestles with the concept of the "smart grid", the story of ICCP provides many lessons on what it takes to achieve interoperability.

For more information on this white paper series, please contact Don Von Dollen at dvondoll@epri.com or (650) 855-2210.

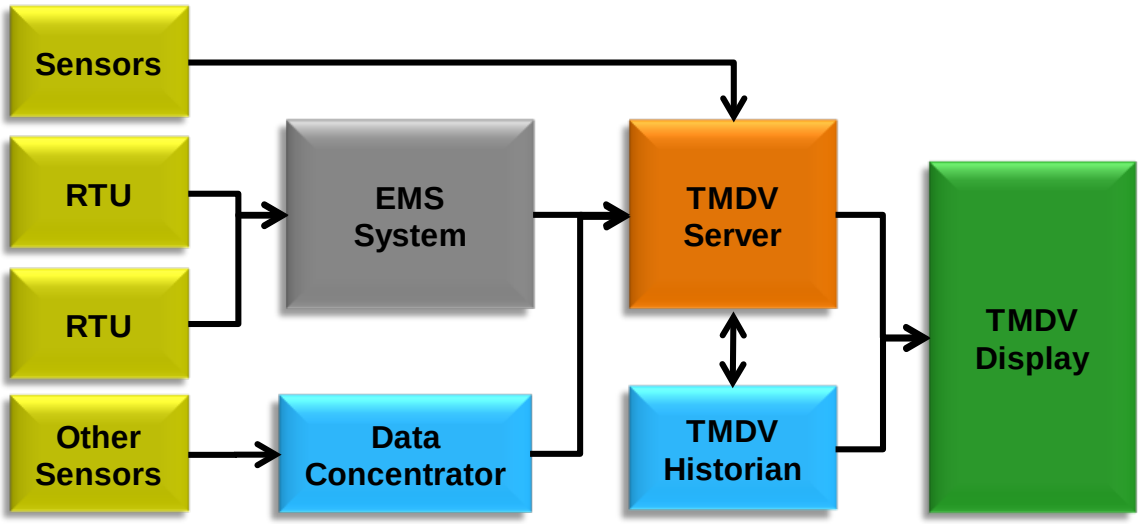
## IntelliGrid Project Set B: Information and Communications Technology for Smart Transmission Systems

*Project Set B within the IntelliGrid program focuses on the communications and information technology (IT) infrastructure needed to close technology gaps and achieve the interoperability required to support the transmission system of the future. It also addresses the migration strategies that will be essential to the successful transition from the systems of today to the systems of the future.*

## Transmission Monitoring, Diagnostics & Visualization Tool (TMDV)

A variety of products exist in the market place to automatically assess the condition of equipment and notify operations staff of impending problems needing their attention. These tools have been successfully applied to aircraft engines, power plants and other systems however they have not been successfully applied yet to power delivery. Two primary issues exist in power delivery that inhibits the application. First is the significant variability of the grid usage on a daily, weekly and yearly basis that "confuses" existing tools from being able to learn what is "normal" versus "abnormal". The second is the challenge to acquire and integrate the required data.

Prior discussions between utilities and EPRI staff have led to a hypothesis that these tools may have matured enough along with the data sources to warrant an investigation into their applicability. If successful, the new learning will be in the area of data management, analysis and integration such that these types of analytics may be applied to other power delivery systems.




Monitoring and diagnostics tools can be used to detect anomalies in the behavior of components and/or systems. These anomalies can provide very insightful information regarding the performance, integrity, efficiency or reliability of these systems or system components.

This project at Southern Company will develop the requirements for a transmission system monitoring, diagnostics and visualization. The purpose of this application will be to take mitigating measures to enhance system performance, efficiency and/or reliability. The project will make use of data from Substations, Transmission Lines and Grid Operations and will in turn be utilized in uniquely configured portals for these referenced stakeholders.

The table below is a summary of the types of devices the project will investigate.

**Transmission Focused Monitoring**

| Equipment/System | Relevant data points for monitoring |
|---|---|
| Transformers (LTC, bushing, Insulation) | Primary voltage, Secondary voltage, kVA loading level, insulation oil temperature, winding temperatures, fan operation |
| Circuit breakers | Phase currents, heater and pump current, SF6 pressure and temperature |
| Transmission Lines | MW, MVAR, Temperature, current |
| Cables | Temperature, insulation integrity |
| Capacitor bank | Phase voltages, phase currents, temperature, capacitor imbalance |
| Reactor Bank | Phase voltages, phase currents |
| System | Frequency, phase angle differences, voltages, load |

For more information on this project, please contact Paul Myrda at pmyrda@epri.com or 708-479-5543.

## Report released on CIM Extensions for Environmental Data

The outdoor environment, good or bad, is a pervasive and ever-changing influence on the electrical system. Temperature and humidity drive load, storms damage distribution lines, sunshine powers photovoltaic panels, icing topples trees into service drops and makes restoration challenging, floods threaten riverside power plants, wind turns the turbine blades at wind farms and earthquakes damage equipment and disrupt crew mobilization.

For decades, utilities have leveraged environmental condition information to help in the operation of the electrical grid. Today, utilities routinely utilize information from a variety of sources and service providers. Some sources are better at forecast data, some at historic; some sources provide numeric data, some visual; some specialize in one type of data (like lightning strikes or current cloud cover), some provide general information (like storm warnings or weather alerts). And the data arrives in a variety of formats, often requiring in-house processing or custom software interfaces to make the information useful to the utility.

A recently completed EPRI project, sponsored by Southern California Edison, proposes extensions to the Common Information Model (CIM) to cover environmental data. The final report for this project "Modeling Environmental Data in the Common Information Model" (1024598) is available for download from the EPRI website www.epri.com .

The proposed extensions would support the exchange of a wide variety of environmental data (atmospheric, geospheric, hydrospheric and space) within a utility. Modeling requirements were based on use cases from multiple utilities and on the data and organization of several existing weather models. The creation of sample profiles and transformations from other data formats were utilized to validate the model.

The proposed CIM extensions have been formally presented to Working Group 16 (WG16) of Technical Committee 47 (TC57) of the International Technical Commission (IEC). WG16 supports CIM modeling for Markets and represents a domain where weather information has major significance. The proposal was positively received by WG16 is currently under discussion and review for inclusion into the CIM standard.

For more information, contact Pat Brown at pbrown@epri.com or (913-449-0736).

## CIM Users Group Spring Meeting - CIM Implementation and Application To Support the European Smart Grid

May, 2012 was a noteworthy month in Great Britain: the Olympic torch arrived in Cornwall to begin its 8000 mile journey to the London summer games, the Queen celebrated her Diamond Jubilee and the CIM User Group conference was held for the first time in England. Sponsored by National Grid, and located at a hotel just across the street from Windsor Castle, the conference had an attendance of about 70 people, with representation from 12 utilities, 14 vendors, 10 consulting companies, 4 universities, 4 research or standards groups and 1 regulatory agency. Participants came from 18 countries across 6 continents.

As usual, the conference opened with a day-long CIM University, which was followed by the two-and-half conference, full of interesting presentations, an evening of vendor demonstrations and a tour of the National Grid Control Center.

Presentations featured numerous utility success stories and covered multiple projects implementing and/or extending the CIM. Status reports were given on US and European Smart Grid initiatives, IEC TC57 Working Group activities and CIM testing plans and results. Specific highlights included:

- The network model integration and management occurring at ENTSO-E and several of its member TSOs which will support the coordination of the European transmission network as very significant volumes of new generation, including fluctuating renewable generation are integrated into the system
- Distribution initiatives addressing demand response, model exchange and provision of customer information
- Proposed improvements to the CIM including the modeling of environmental data and the dynamic behavior of generators and loads and the extension of the CIM into generation from the plant perspective
- The important role of information architecture in supporting integration efforts.

Slides from CIM University and the CIMug sessions can be downloaded from CIMug website using the following link: London CIMug Meeting Presentations (or click Meetings under Activities on the left quick launch menu on the CIMug website www.cimug.org, then select London 2012, then CIMug Presentations – London 2012). Viewing access is public, download access requires a UCA International Users Group website user ID, which can be created for no cost at www.ucaiug.org. For more information, contact Pat Brown at pbrown@epri.com or (913-449-0736).

**INFRASTRUCTURE FOR INITELLIGENT DISTRIBUTION SYSTEMS**

## IntelliGrid Project Set C: Information and Communications Technology for Smart Distribution Systems

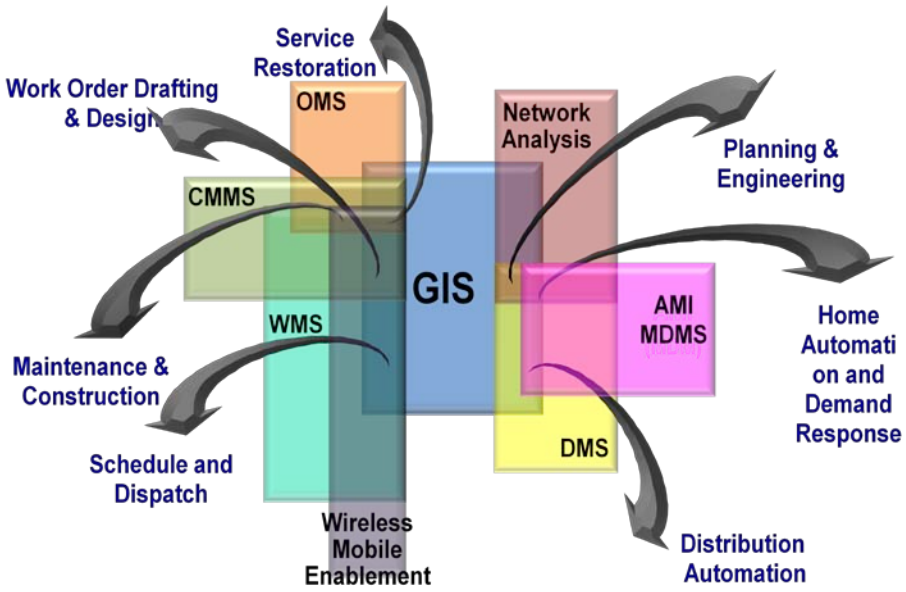
*Project Set C within the IntelliGrid program focuses on the communications and IT infrastructure necessary to achieve fully integrated distribution operations. The research is focused on obtaining, sharing, using, and updating information that is critical for distribution applications. The standards for back-office application integration and communications are evolving rapidly. This project set seeks to track this evolution and provide value to the participating members with analysis and ancillary information in the form of training, tools, and media. The project set further seeks to utilize back-office*

*standards and communications protocols to provide near-term value to utilities in the form of tools and techniques for using information.*

## Preliminary Results are Available from the IntelliGrid GIS Data Quality Project

GIS is no longer a novel technology for utilities. It has been in place for two decades at some companies and is entering its third generation of functionality. The mystique is long gone and GIS is viewed as another enterprise system. However, the role and importance of GIS data and the quality of the data has come to the forefront with the advent of the smart grid. The intelligence of the smart grid is critically reliant on geospatial data to represent and track numerous devices' location within the connected model of the distribution system. The quality of GIS data has become increasingly important as the smart grid matures. Although conceptually understood to be a vital enabler of smart grid functionality, the true value of quality data is not widely understood. Poor quality data can be a frustration, an impediment, or even a danger to the utility and its staff, but the actual cost of poor data is elusive.

The figure below shows that GIS is the central source for geospatial data for the enterprise and enables efficient smart grid functionality.




The GIS Data Quality Project attempts to monetize the cost of missing or inaccurate data on the enterprise. The goal is to deliver a benefit calculator for utilities to use to determine the return on investment of data quality improvement projects. Monetization of the benefits of data improvements is challenging. Many of the costs are very direct, but the benefits are more widespread: reductions of existing workflows, improved forecasting and planning, data integration. Therefore, the data benefits must realize the processes which data leverages and facilitates, not just direct cost savings.

The project attempts to ascertain the most critical parameters that must be accurate to achieve maximum value. The methodology being used is a two-part survey to look at the critical parameters and understanding what the likely hood is of the utility achieving benefit from data improvement. The initial survey results have been collected. Thirteen utilities participated in the survey. Outage management and engineering analysis were the most common consumers of GIS data. While integration of GIS data into the enterprise varied significantly amongst the participants, no correlation between the level of integration and the GIS data quality could be made. Users seemed generally confident in the GIS data with more confidence in the 'completeness' of the data than the 'accuracy' of the data. In general, the survey participants felt they had seen the benefit of 'good' GIS data but not the repercussions of 'bad' GIS data. Other results are as follows:

- 36% store all distribution data in GIS, but 66% make use of an asset management system.
- 66% have unique asset IDs, only 27% physically tag the asset in the field.
- 54% felt that data accuracy was 75-90% (64% user confidence in data).
- 63% felt that data completeness was 75-90% (72% user confidence in data).
- Only 9% of utilities have experienced a catastrophic problem due to data, but 56% have enjoyed a benefit of good data.
- While 91% have programs to improve data, only 54% have dedicated staff.
- 73% have automated quality assurance.
- 91% have not seen quality deterioration over time.

The second survey is currently active. This survey looks more closely at the likelihood that a utility will achieve the benefit from the cost of a data quality improvement initiative. The link to the survey can be found here:

EPRI Data Quality Detailed Survey

For more information on this project, contact John Simmins at jsimmins@epri.com or (865) 218-8110.

## End-to-End Integration Testing Lab Update

EPRI began developing the end-to-end integration lab testing capability early in 2012 to bring together many of the same types of assets that utilities have in their own back-offices. This was in response to a need to move beyond simply testing assets within their own domain such as meters or home area networking devices, and to begin to include standards-based back-office integration. As utilities have learned the cost of integration often meets or exceeds the cost of acquiring an asset in the first place. A further outcome of this lab is to take the lessons learned from the integration and give feedback to the respective standards development communities. The feedback is expected to be incorporated into standards updates, maturing the standards, incorporating best practices, which should reduce the distance to integrate and lower the maintenance costs associated with integration.

To this end EPRI has acquired a number of assets to put into the integration lab, a blade center to host servers, metering systems from both Landis+Gyr and Elster, a Meter Data Management (MDM) system from Ecologic Analytics, and an Outage Management System from MilSoft. To tie these systems together an open source enterprise service bus, OpenESB is being used with plans for other commercial ESBs to also be installed.

One of the first efforts to utilize this architecture is the CIM-MultiSpeak harmonization project. CIM and MultiSpeak standards both cover the distribution application integration domain, although in somewhat different ways due to the nature of the constituencies that they serve. The harmonization effort seeks to identify how to map from one standard to another, noting where correlations exist and feeding back information on gaps and best practices to the respective standards communities. This effort is already bearing fruit with model managers for CIM and new additions to MultiSpeak incorporating features based on this feedback. EPRI is also leading the development of the IEC Technical Specification that will guide how harmonization should be done which will give specific guidance to utilities, systems integrators, and vendors. This should reduce barriers to entry for new vendors. For example, MilSoft currently uses a MultiSpeak interface but could be CIM compliant by utilizing the transformation based on the technical specification at an enterprise service bus.

Other capabilities that will be added to the lab in the near future include updates to the EPRI Test Harness. Originally designed to do semantic validation for the CIM, the harness will be refactored to support Green Button conformance testing. In addition EPRI will soon be adding load testing and network emulation capabilities, initially to support security key management testing scenarios and outage management scenarios.

EPRI is also using the lab capabilities to do proof of concept demonstrations of NoSQL technologies as one way to address big data challenges that utilities will be facing. EPRI is using the CIM EndDeviceEvent (a common message payload that can be used for anything from a HAN device pairing with a meter to notifying the utility of a meter outage) to compare the capabilities of object-

oriented databases with traditional relational databases to help utilities discern what is real versus what is vaporware.

Standards-based integration development, testing improvements, big data technologies, security research; there are many new and exciting capabilities being added to the lab. Contact Dr. Gerald R. Gray, ggray@epri.com, 865-218-8813 to learn more about how the EPRI back-office integration lab can be used to support your utilities R&D needs.

## INFRASTRUCTURE AND TECHNOLOGY FOR CUSTOMER INTEGRATION

### IntelliGrid Project Set D: Information and Communications Technology for Customer Integration Including Metering and Demand Response

*Project Set D within the IntelliGrid program addresses the communication integration of customers with the utility, including advanced metering, load management, distributed energy resources (DERs) such as photovoltaic (PV) and battery storage, and other general information exchange. In the past, the customer interface was primarily limited to monthly metering, but advances in communication, measurement, and control technologies have transformed the landscape of customer integration, bringing many new possibilities but also many challenges. This project set addresses these challenges by evaluating technologies and architectures, identifying standards gaps and accelerating development, identifying lessons learned and best practices, and demonstrating capabilities in both laboratory and field environments.*

### Standards for Integrating Distributed Energy Resources with Distribution Management Systems

Over the last few years, the utility industry has made significant strides in defining common grid-supportive functions for distributed energy resources (DER) such as solar PV and battery storage. Progress has also been made in defining open standard communication protocols to manage these functions. Work has focused on both the behaviors of individual DER systems as well as on the communication protocols over field networks that connect to the DER devices.

Recent EPRI research is carrying DER integration to the next level by studying enterprise integration as well as the interactions between DER management systems (DERMS) and traditional Distribution Management Systems (DMS). In coordination with a DOE award related to smart inverters, and the NIST DER Domain Expert Working Group, a set of enterprise-level interactions have been identified as a starting point for developing future standards for DER integration. These interactions recognize that many different types and sizes of DER may exist on a single feeder or segment, and that the ideal services that a DERMS should present to a DMS relate to circuit- and system-level needs, such as peak power limits at select points of metering; volt-var optimization; network reconfiguration; and fault location, isolation, and service restoration (FLISR).

Communication standards in the enterprise integration environment include the IEC 61968/61970 CIM and MultiSpeak and are different from field network protocols in terms of both design and purpose. EPRI aims to contribute and coordinate this new DER work with the CIM and MultiSpeak standards development groups, with the vision of making standards-based end-to-end DER integration possible.

IntelliGrid members are invited to attend a workshop on this topic that is being held in the Washington, DC area on Wednesday September 26th, 2012, from 12:00 to 6 PM.

For more information, please contact Brian Seal at 865-218-8181 or bseal@epri.com.

## Sub-Metering Scoping Study and Recent NIST Initiative

Emerging technologies such as solar photovoltaics and electric vehicles are adding to utility need for a secure and cost-effective approach to sub-metering. The ability to separately capture the consumption and/or generation of sub-loads is driven by a variety of renewable portfolio standards, customer credits, taxes, and incentives.

In 2012 the EPRI IntelliGrid program is working jointly with the Renewables Integration and Electric Transportation programs on a scoping study for sub-metering. The project goal is to engage broadly with stakeholders from both the utility and vendor communities to understand the range of options that exist (i.e. physical and logical ways to do sub-metering) and the pros/cons of each. This is being carried out through a series of face-to-face workshops engaging metering/AMI providers, solar inverter providers, and the electric vehicle industry. Program members are welcome and encouraged to attend these meetings and may do so by responding directly to invitations on this topic or contacting EPRI. The project results will be contributed to standards organizations as appropriate to address gaps that may exist in association with the most preferred approaches. It will also serve to direct and prioritize future EPRI research on this topic.

Recently, NIST announced a project related specifically to electric vehicle sub-metering. The project is being managed out of the traditional weights and measures part of NIST rather than the utility-focused NIST SGIP.

A kickoff webcast was held for this project on Wednesday, September 29th. It was described as a relatively far-reaching initiative, considering various approaches to how consumers might be billed for EV "fuel" in an understandable way, and drilling down to the enabling technologies needed to support EV sub-metering. Only two of the forty attendees represented utilities, and more representation is needed. The project is now asking for volunteers to be either Participating members ("P Members") or Observing members ("O Members"). If you or others in your organization are interested in participating in this NIST project, please contact Brian Seal, bseal@epri.com.

# INTELLIGRID INTEREST GROUPS

The IntelliGrid program has launched several Interest Groups in 2012. These Interest Groups are open to people from any utility – both members and non-members of the IntelliGrid program. One of the key objectives of the groups is to engage key subject matter experts to help IntelliGrid staff develop R&D programs that effectively meet the industry's needs. The following describes the current activities within each Interest Group and provides information on how to get involved.

## Enterprise Architecture Interest Group

The Enterprise Architecture Interest Group was created to foster the development of enterprise architecture that meets the unique needs of the utility industry. The group is open to people at utilities with an architecture interest – both EPRI members and non-members alike.

The activity of the group focuses on the unique enterprise architecture needs of utilities and aggregates available artifacts from across the industry into a single repository. The repository uses standard UML so that information in the repository can be exported to the respective utility architect's tool of choice. This is useful for architects that may want to re-use an artifact that is in the repository.

Some of the reusable artifacts that are in the repository are:

- Guiding principles examples from The Open Group Architecture Framework (TOGAF), and industry efforts such as SG-Enterprise, and OpenHAN
- Data reference models from the IEC Common Information Model and MultiSpeak
- Example AS-IS and TO-BE application architecture diagrams
- Actor lists from the IEC, OpenSG, NIST, and MultiSpeak
- Use case related diagrams (use case, business process, and sequence)

An example of one of the application architecture activities has been the development of what a Distributed Energy Resource Management System (DERMS) might look like, functions it would perform, and interfaces it would support to other back-office systems.

As important as it is to have a library of reusable artifacts, hearing from your peers about their successes, struggles, tools, and best practices can be just as valuable. In the kickoff meeting we had a presentation from Detroit Edison on their architecture journey and in our upcoming meeting we will hear from Snohomish PUD on theirs.

Information on the group is available at http://smartgrid.epri.com under the Resources tab. The page provides links to download the repository and webcasts of previous meetings and notices of upcoming meetings. For more information on the Enterprise Architecture Interest Group, please contact Dr. Gerald Gay at ggray@epri.com or (865) 218-8113.

### Geospatial Information Systems (GIS) Interest Group

GIS is emerging as one of the key systems for distribution modernization programs at utilities. Once only a source for two dimensional, paper maps, GIS is finding its place as the source for the distribution connectivity model. Applications from planning to distribution management systems (DMS) are using the data from GIS as the source data for their analytics. The GIS itself is becoming the basis for real-time visualization and analytics.

The activities of this Interest Group focus on utility examples of GIS data improvement tricks, tools and techniques as well as showcasing utilities that have gone “outside the box” in their use of GIS. The free exchange of issues and ideas is a key input into the direction of research for project set 161C and also acts as a technology transfer opportunity. As utilities expand their reliance on GIS, the EPRI GIS Interest Group will be a valuable tool for lessons-learned from other companies. In addition, by participation in the webcasts and workshops utilities can use the Interest Group to seek lessons learned from others when faced with a new issue or other challenge in developing or implementing their program.

The first two webcasts started to address some common data issues with GIS. Some of the data issues that were discussed include:

- Lack of knowledge of available data.
- Gaps – Data not available.
- Corrupted (time sensitive, inaccurate).
- Redundant data (unplanned).
- Inaccuracies with the field.
- Inaccurate or unavailable land-base.
- Customer connectivity (by phase) is in doubt.

In future webcasts, we will begin to address these issues with the lessons learned from utilities that have successfully addressed one or more of these issues.

Information on the group is available at http://smartgrid.epri.com under the Resources tab. The page provides links to download the repository and webcasts of previous meetings and notices of upcoming meetings. For more information on the GIS Interest Group, please contact John Simmins at jsimmins@epri.com or (865) 218-8181.

### Smart Grid Roadmap Interest Group

The purpose of the Smart Grid Roadmap Interest Group is to bring together the people who have the responsibility for developing, maintaining or implementing their company's smart grid roadmap to share lessons learned and discuss topics of mutual interest.

The interest group will meet primarily by webcasts. So far this year, we have heard presentations from San Diego Gas and Electric and the Tennessee Valley Authority on their Smart Grid Roadmaps. We have also had a presentation on EPRI's work on Smart Grid Cost Benefit Analysis.

Topics for future webcasts include:

- methodology for roadmap development
- deployment experiences
- maintaining a roadmap
- architecture development
- standards adoption
- cost benefit analysis

To join the Smart Grid Roadmap Interest Group, contact Don Von Dollen at dvondoll@epri.com or (650) 855-2210.

### AMI Interest Group

The Metering and AMI Interest Group is a forum for utilities to share concerns, experiences, and best practices regarding smart meters and AMI systems. Over the last decade, the utility industry has witnessed the transformation of metering from electromechanical designs that had been stable for a hundred years to new solid state electronic designs. Many concerns and questions regarding the reliability and use of these new meters exist. In addition, communication systems (AMI) are being deployed, adding new aspects to the process of reliably and accurately collecting meter data. These networks are also new and evolving, and merit discussion.

Recent areas of discussion have included solid-state meter voltage surge tolerance, sensitivity to DC currents and magnetic fields, and impacts from low-frequency conducted emissions on metrological accuracy.

The Metering and AMI Interest Group meets by teleconference and/or webcast quarterly, and in additional meetings on the basis of member interest and need.

To join the Metering and AMI Interest Group, contact Ashley Eldredge at aeldredge@epri.com (650) 855-2063. The next meeting is by webcast, October 2nd, 2012 – 11AM Eastern.

### Communications Interest Group

The Communications Interest Group (CIG) serves utility communications directors and IT executives. The objective of the CIG is to provide a forum where new ideas and emerging technologies relevant

to utility communications can be presented and discussed. The CIG also provides opportunities for members, whether or not they are IntelliGrid members, to provide feedback, direction, and prioritization for the IntelliGrid communications roadmap. Input from CIG members aids EPRIs mid-term and long-term strategic planning, and identifies gaps and opportunities for new collaborative research in communications.

The Communications Interest Group is holding a series of webcasts on emerging communications standards and technologies. The topics are selected by polling the members of the group. One webcast has been held on the IEEE 802.22 TV White Space Standard, and the next one has been selected to cover the 802.11af TV White Space standard.

Membership in is open and on request. For more information on the Communications Interest Group, please contact Tim Godfrey at tgodfrey@epri.com or (650) 855-8584.

## KEY DATES & CURRENT DELIVERABLES

### Key Dates

| | |
|---|---|
| ***NISTAC Webcast*** | ***Sept. 13, 2012 (1 pm eastern)*** |
| ***IntelliGrid Advisory Meeting (Atlanta)*** | ***Sept.17-19, 2012*** |
| ***Enterprise Architecture Interest Group Webcast*** | ***Sept. 20th, 2012 (3:30 pm eastern)*** |
| ***DER Workshop (Washington DC)*** | ***Sept. 26th, 2012*** |
| ***Sub-Metering Workshop (Orlando)*** | ***Sept. 29th, 2012*** |
| ***Metering & AMI Interest Group Webcast*** | ***Oct. 2nd, 2012*** |
| ***NISTAC Webcast*** | ***Oct.11, 2012 (1 pm eastern)*** |
| ***Public Advisory Meeting (Raleigh)*** | ***Oct. 24-25, 2012*** |
| ***NISTAC Webcast*** | ***Nov. 8, 2012 (1 pm eastern)*** |
| ***Project Set B Webcast (161B)*** | ***Dec. 4, 2012 (11 am eastern)*** |
| ***NISTAC Webcast*** | ***Dec. 5, 2012 (1 pm eastern)*** |
| ***Project Set A (161A)*** | ***Dec. 6, 2012 (11 am eastern)*** |
| ***Project Set D Webcast (161D)*** | ***Dec. 19, 2012 (11 am eastern)*** |
| ***Project Set C (161C)*** | ***Dec. 21, 2012 (11 am eastern)*** |

Please contact Ashley Eldredge for details regarding the key dates, aeldredge@epri.com.

## Recently Released Deliverables

***Grid Transformation Workshop Results***

**1025087**

In an earlier white paper entitled Needed: A Grid Operating System to Facilitate Grid Transformation; EPRI; Palo Alto, CA: 2011; 1023223, we set the stage for a new grid operating system called Grid 3.0. Since that time we have identified four core research areas that are required to achieve the expected outcome. These research areas are called: seamless geospatial power system model, seamless power system analytics, integrated energy management system and setting-less protection method. While each area has significant work independently, they are also interdependent on each other in many ways and therefore all need to be considered to fully achieve Grid 3.0.

***Smart Grid Communications Intelligencer: Spring 2012***

**1025756**

This is the third issue of Smart Grid Communications Intelligencer, a quarterly newsletter published by EPRI's IntelliGrid Program. The mission is to highlight issues of relevance and interest to utility communications engineers and directors. The focus will be on developments in communications technologies and standards.

***AEP Interoperability Test Plan Update***

**1024498**
American Electric Power (AEP) has partnered with the U.S. Department of Energy (DOE) in the AEP Ohio gridSMART Demonstration Project. The project will integrate commercially available products, new technologies, and new consumer products and services using two secure two-way communication networks (advanced metering infrastructure [AMI] and the Internet) between the utility and its consumers.

***Smart Grid Roadmap Guidebook***

**1025470**

This technical report summarizes the results of the Smart Grid roadmaps developed by the Electric Power Research Institute (EPRI) from 2007 to 2011. The report's major themes are the lessons learned and the methodologies used to develop the roadmaps. Also included are a summary of the roadmaps, key points from follow-up interviews, distilled technology recommendations from the roadmaps, the purpose and benefit of developing a roadmap, the role of standards, and an updated version of the Communications Technology Assessment.

***Standards and Technology Adoption Case Study: Inter-Control Center Protocol (ICCP/TASE.2)***

**1024294**

This is the story of the development and deployment of the Inter- Control Center Protocol (ICCP), later to be known as IEC 60870- 6, the Telecontrol Application Service Element 2 (TASE.2). The enthusiastic acceptance of this communications suite by the power industry is one of the most successful stories of standards and technology adoption in a business area that is notorious for its resistance to change. Nearly every Energy Management System (EMS) in use today provides an ICCP connection for exchanging data either between utilities, or among entities within a utility.

This paper examines the factors that made ICCP successful when many of its contemporary technologies were not. As the industry wrestles with the concept of the “smart grid”, the story of ICCP provides many lessons on what it takes to achieve interoperability.

This white paper is the second in a series examining the factors that a utility takes into consideration when selecting which standards to implement.

***Evaluation of Secure Authentication Supplement to the Distributed Network Protocol, Version 3 Specifications***

**1025671**

This is a report for the Evaluation of Distributed Network Protocol, Version 3 (DNP3) Secure Authentication Specification Project, which was undertaken at the Information Trust Institute, University of Illinois. The objective of this project was to conduct a security evaluation of the Secure Authentication Supplement to the DNP3 Specification (Version 2; July 31, 2008) and an accompanying white paper titled "Methods for Remotely Changing DNP3 Authentication Update Keys" (Grant Gilchrist, September 15, 2008). This report describes the findings and results. Along with other such studies, these results should contribute toward the realization of a secure and usable DNP3 Secure Authentication standard.

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