EPRI ELECTRIC POWER RESEARCH INSTITUTE

# DistribuTECH 2014

**An EPRI Brief** **February 2014**

## DISTRIBUTECH 2014 HIGHLIGHTS

By Matt Wakefield

The DistribuTECH Conference and Exhibition in San Antonio, Texas did not disappoint in 2014. A 2013 MIT Sloan Management report says there is "a growing belief that we are on the cusp of an analytics revolution that may well transform how organizations are managed.[1]" I think that belief was manifest at DistribuTECH. I would categorize this year's event as **"the year of data analytics"** with data being a key element of numerous exhibitions and presentations. It seemed all the major exhibitors and sponsors were showcasing their data analytics capabilities and there is no shortage of innovation occurring in this space. The MIT report also concluded that companies are struggling to figure out how, where, and when to use data—and that was also evident at the conference. We are at an early stage of data analytics, and there are still a lot of uncertainties and also a lot of hype. We are continuing to work with over 15 utilities and many vendors on this topic on the EPRI Distribution and Transmission Modernization Demonstrations on Data Analytics, but I'll not name them here as I'm sure to miss some.

One interesting product related to data analytics and social media is Go360 Social Media for Utilities by AGSI. The company has numerous products, but its social media solution just came out in October and provides a service of searching and filtering social media content organized geographically and by key word. This can be done in real-time and also you can "play back" a history of activities. It also enables you to directly send messages to people who have posted their comments. This is all very exciting to help utilities in outage management among other things, but it is also raising privacy concerns and the amount of data that is publicly available.


[1] *MIT Sloan Management Review* and SAS Institute, From Value to Vision: Remembering the Possible with Data Analytics, Spring 2013

This was also another good year for **standards.** The vendor community has heard loud and clear that standards are a preference of electric utilities and the vendors have done a good job of promoting where they are using standards including DNP3, IEC 61850, IEC 61968/61970 (the CIM), MultiSpeak, and more. One relatively new standard that had a strong presence was OpenADR (Open Automatic Demand Response).

The **OpenADR Alliance** had a booth and more than 20 alliance members also had booths showcasing their OpenADR compliant products. This is a pretty significant growth in just the last year and is likely the most significant infrastructure development for demand response (DR) in the world regarding an international DR protocol.

One interesting twist I found while visiting several OpenADR vendors was that their demand response service was OpenADR compliant to receive standardized signals from a utility, but they then translated the DR signal into their own proprietary messages to their own end devices (i.e. thermostat). This approach defeats a primary benefit of standards when a proprietary protocol is inserted between the utility and the end device, risking stranded assets and technology obsolescence. Clearly not all vendors are doing this, but it was notable. Perhaps it is because the standard is so new, and the certified end-devices are just becoming available, but be aware (and beware) of the potential for vendor lock-in.


Overall EPRI participation at DistribuTECH was very strong with more than a dozen technical staff contributing to the Utility University sessions, numerous presentations as well as hosting guests in the EPRI booth (see below for a list of EPRI authors, presentations and panels).

I personally find this event one of the most productive conferences because so many utility, vendor and industry stakeholders are here. It is a great opportunity to make progress on our research and do networking. The following highlights and observations are from the EPRI staff who attended the conference. Enjoy!

## EPRI Contributors to DistribuTECH 2014 Program

| Presenter/Moderator | Topic |
|---|---|
| **Pat Brown** | • Field Data for Asset Management and Operations at TVA |
| **Brian Deaver** | • Leveraging New Data Sources and Analytics for Improved Distribution System Performance<br>• Outage Management and Restoration |
| **Doug Dorr** | • Leveraging New Data Sources and Analytics for Improved Distribution System Performance |
| **Roger Dugan** | • Using Hosting Capacity Methodology to Develop Simplified Screens for New Solar PV Interconnections |
| **Gerald Gray** | • Architecting the Enterprise |
| **Walt Johnson** | • Open Automated Demand Response in Practice |
| **Brian Seal** | • Demand Response Participation Made Easy |
| **John Simmins** | • Use of Social Media in Support of Outage Management<br>• Laptop, Tablet or Phone: What Makes the Most Sense for My Utility?<br>• Optimized Integration of PV With Battery Storage: A Real-world Success Story |
| **Jeff Smith** | • Using Hosting Capacity Methodology to Develop Simplified Screens for New Solar PV Interconnections<br>• Beyond PV "Percentage Penetration": Myth or Fact |
| **Scott Sternfeld** | • Advanced IED Password Management Strategies<br>• Best Practices for Serial-to-IP SCADA Migration |

## OBSERVATIONS FROM EPRI STAFF

### Open Demand Response Communications

A panel describing **"Bring Your Own Thermostat" Residential DR Programs** was moderated by E Source's Tim Stout and consisted of EnergyHub's Seth Frader-Thompson, Southern California Edison's Carl Besaw, Austin Energy's Scott Jarman, and Sacramento Municipal Utility District's Lupe Jimenez. They discussed field results from "Bring Your Own Thermostat" (BYOT) programs at SCE, Austin Energy, and SMUD. BYOT programs leverage equipment already in customer's homes (such as might have been originally purchased at retail stores or through HVAC contractors or home security companies). The key to making such programs work is the use of an open protocol for communication between the utility's Demand Response Management System and the ad hoc collection of thermostats owned by the participants. All of the programs discussed used versions of OpenADR, sometimes in combination with other protocols (such as ZigBee), and all were expecting the wider availability of OpenADR V2.0b to be an important element of future programs. Utilities that wish to lower barriers to residential enrollments in their DR programs should closely follow the development of open DR communication protocols such as OpenADR.

For more information on EPRI's OpenADR activities, contact Walt Johnson at hwjohnson@epr.com.

### Demand Response Tool Demonstrated


AutoGrid provided an interactive demonstration of its DROMS product. DROMS stands for Demand Response Optimization Management System, a cloud-based system that leverages big data analytics and open standards such as OpenADR an SEP for a variety of power management programs including direct load control, peak pricing and rebates, grid balancing and more. DROMS is promoted as a scalable solution that can keep pace with participation.

AutoGrid reports that the system is completely hardware neutral and interoperable with more than one hundred hardware devices. Its demonstration simulated several end-use loads such as air-conditioning, water heaters, pool pumps, lighting, etc. Participants from the audience received a text message or automated phone message when the demand response call was initiated. Another participant "opted out" via email. The DROMS dashboard provided status of the event in real time.

### Security

G. Pino Porciello, President and CEO of Systems With Intelligence, presented on the ability of video analytics to detect physical intrusions to a secured perimeter and perform asset condition monitoring in locations where it may exceed safe human exposure limits. The system can then provide alerts, status and alarms to a SCADA system through common protocols, such as DNP3 and Modbus. Further, SCADA operator screens can be configured to incorporate substation or field video cameras to visually verify a breaker opening.

**Distributed Network Protocol (DNP3)** was a hot topic in several sessions at DistribuTECH, due to recent vulnerabilities identified in several vendors' implementation of the DNP protocol. These recent vulnerabilities were discovered by two researchers performing "fuzz testing," or the practice of sending unexpected

IEEE Advancing Technology for Humanity

dnp Distributed Network Protocol

variations on protocol messages and exchanges to master and outstation (slave) devices alike. They identified that under certain conditions, sending fuzzed commands to a master or slave device could cause a disruption to a single device, or affect the entire SCADA system. Not all of these vulnerabilities can be mitigated by the newest version of the DNP3 standard, DNP3 Secure Authentication version 5 (DNP3 SAv5). However, the value that this version does provide was discussed in several technical sessions and at the DNP3 Users Group meeting. It is important to note that the protocol was NOT found to contain deficiencies, but the DNP User Group has issued some guidance documents to vendors regarding implementation practices. See www.dnp.org for more information.

EPRI will be hosting an education session on DNP3 SAv5 and conducting a vendor interoperability demonstration in late summer 2014 as part of the Cyber Security and Privacy program. For more information and how to participate, please contact Scott Sternfeld, ssternfeld@epri.com.

**DistribuTECH 2014 exhibitors** included a large number of new vendors including some engaged with or of interest to EPRI's Cyber Security and Privacy program's "Managing Cyber Security Incidents for T&D Systems" project. The objective of the project is to help utilities understand and develop the requirements and plan for the deployment of an Integrated Security Operations Center, or ISOC. Thomason Technologies unveiled their new SourceFire based solution, running on a substation-grade platform. FireEye, a security information and event manager (SIEM) vendor also had its products on display. Radiflow's parent company, Rad Data Communications was also an exhibitor. Radiflow's gateway device has been utilized for testing within EPRI's ISOC test bed alongside other vendors. For more information on the EPRI ISOC test bed and how to participate, please contact John McGuire at jmcguire@epri.com.

**Secure Remote Substation Access**: Several vendors involved in EPRI's Secure Remote Substation Access project also had updates to their products. These vendors include Siemens' Ruggedcom division (Crossbow), Subnet Solutions (PowerSystem Center), Eaton's Cooper Power Systems division (Yukon IED Manager Suite), TDi Technologies (ConsoleWorks), and Schweitzer Engineering Laboratory's (SEL-3620). DistribuTECH 2014 was also used to announce a partnership between Novatech and PAS to provide a Remote Substation Access solution. EPRI hopes to include this solution in the 2014 supplemental project, Secure Remote Substation Access Solutions. For more information, please contact Scott Sternfeld, ssternfeld@epri.com or visit the Secure Remote Substation Access Interest Group page at http://smartgrid.epri.com/SRSA.aspx.

**Network Security:** A kickoff meeting was held on the floor of DistribuTECH for a group of vendors currently interested in participating in the "Protective Measures for Securing T&D Systems" project, which involves validating the mapping of IEC 62351-7 network security events. Vendors currently engaged in the project include SISCO, Ruggedcom, OSIsoft, Doubletree Systems, and Radiflow. Other vendors expressing interest include Cisco, Schneider Electric, and SEL. The project will be driven by use cases developed in early 2014 with proof-of-concept implementations to be developed and demonstrated in the EPRI Cyber Security Research Lab throughout 2014. For more information please contact Glen Chason, gchason@epri.com.

## Wireless Systems for Field Area Networks

In addition to the vendors that have presented at the EPRI Field Area Network (FAN) Demonstration Vendor Forums, the following companies offer products that may be of interest for applications as part of FANs. These products are generally based on proprietary protocols.

1) Tait Communications offers a long-range but low rate radio systems based on Digital Mobile Radio. They operate in VHF and UHF licensed bands in 12.5 KHz wide (voice) channels. This type of product may be of interest as an adjunct or range-extension technology for a FAN.
2) John Vislosky of Access Spectrum, a source of spectrum for private FANs, announced an agreement with the FCC to approve operation of TDD systems in the 700 MHz A Block (757-758 and 787-788 MHz), which opens up new options for FANs in those bands.
3) Tantalus Systems is another supplier of narrowband licensed communications systems supporting both 220 Mhz and 900 MHz.

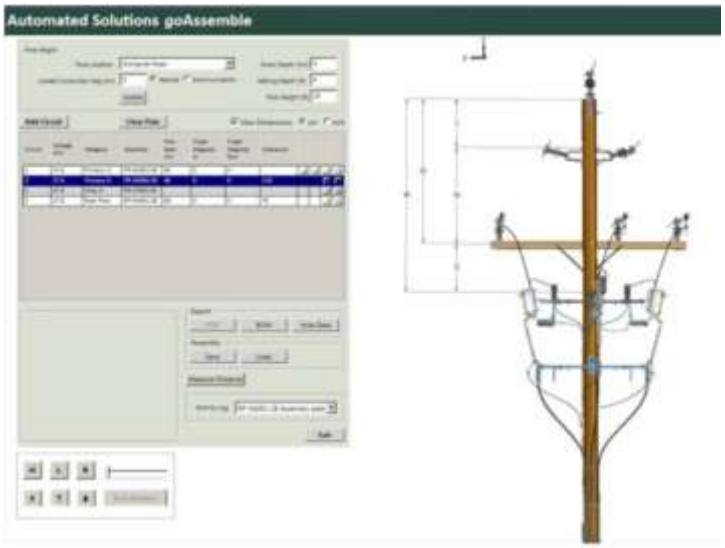
4) CalAmp showed its IP modems for licensed spectrum. The Viper SC+ operates in VHF and UHF bands and can support 4 to 256 Kbps data rates in channels of 6.25 to 100 Khz.
5) 4rf demonstrated Aprisa radios for utility applications. The radios operate in the 400 – 470 MHz band, in 12.5 or 25 Khz channels. Using QAM modulation in 25 Khz channels, they can provide a 120 Kbps data rate.
6) Solectek demonstrated point-to-point and point-to-multipoint broadband wireless systems. Point-to -point microwave systems operate in licensed 6 – 42 GHz bands. Unlicensed systems operate in 4.9 / 5.8 GHz bands, and licensed multipoint systems based on 802.16d are available for the 3.5 and 3.65 GHz bands.

The **WiMAX Forum Smart Energy Working Group** also met at DistribuTECH. Case studies of WiMAX being used in field area networks were presented by BC Hydro (Powertech Labs), Hydro One, CenterPoint Energy, and EDP Brazil. The presentations are available here:
http://www.wimaxforum.org/files/WiMAX_Forum_Events_2014/WiGRID_2014_Presentations.pdf

For more information on the EPRI FAN Demonstration, contact Tim Godfrey at tgodfrey@epri.com./

## Distribution System Design Software

Midland Power Utility Corp and Automated Solutions International (ASI) presented on what ASI calls its "go" software suite. These applications are geared toward improving efficiencies and safety for distribution system design. One of the software applications is goAssemble, a 3-D web-based service that can be used to create complete distribution pole assembly designs much quicker than traditional methods. ASI designed this product to appeal to the "gamer" set: responding to what it considers an opportunity afforded by the combination of an aging workforce and an aging electricity infrastructure. Standards are incorporated in the interactive, browser-enabled software, including minimum clearances that ensure that the resulting designs will comply with IEEE and CSA.




Midland Power demonstrated the speed of the tool by designing and then redesigning a pole configuration in less than three minutes. Once the design is complete, a bill of materials can be printed to aid in the procurement process. While software such as this will not replace the need for having design engineers on staff, ASI expects that goAssemble can cover 80% of the design needs and will simplify checking as-built assemblies through instantaneous 3-D drawings (see right). Planned enhancements to the software will include structural analysis.

## Utility Data for Better, Smarter Cities?

One the Utility University courses, "Leveraging New Data Sources and Analytics for Improved Distribution System Performance" taught by EPRI's DMD Program Manager Doug Dorr, and Technical Executive Brian Deaver, uncovered an opportunity for EPRI coordination with a new cross-cutting industry initiative called "Using IT for Smarter Cities."

The course focused on how utility sensor and external data resources can positively impact grid operations, planning, asset management and customer engagement, Specific applications covered included outage management data, storm predictive data sets, and numerous AMI applications using data analytics. One notable area of opportunity for coordination between such distribution modernization research and **"Using IT for Smarter Cities"** was identified as a potential area of need for follow-on coordination. The basic premise is that along with transportation, water, and gas, electric service providers and corresponding data on energy usage and infrastructure are an important piece of the data analytics puzzle for better managed and informed cities. A useful white paper on the subject is available at http://www.microsoft.com/global/sv-se/offentlig-sektor/PublishingImages/The%20Smart%20City_Using%20IT%20to%20Make%20Cities%20More%20Livable.pdf

## Standards

The **NIST SGIP** (Smart Grid Interoperability Panel) Architecture Working Group conducted an all-day meeting at DistribuTECH to continue refinement of the meta-model, definitions, and reference model for the description of and use of standard utility actors and roles, This work will create a standard set of actors/roles, describe their use, how they are applied in architecture, and will complement both use-case development and give more detailed guidance for practitioners who use either Zachman or Open Group's architecture frameworks.

Attendees in photo, left-to-right:
Steve Ray, PhD, Carnegie Mellon University; Ron Cunningham, American Electric Power; Elizabeth Sisley, PhD, Calm Sunrise Consulting; Gerald R. Gray, PhD, EPRI; John Ruiz, Johnson Controls; Stepham Amsbary, Enernex Consulting.

## Network Management

Smarter Grid Solutions promoted its Active Network Management (ANM) solution at the meeting. The approach involves a range of data management, software, automation and controls. They monitor the grid in real time and focus on a layer of analysis and autonomous grid management of controllable end-use devices as a layer between SCADA and protection and control. The company seems to offer many of the same functions as the EMS/DMS (e.g., power flow, voltage stability, state estimation, error estimation, dynamic ratings). What appears new in the ANM solution is the focus on increasing existing capacity in order to integrate, in real-time, more controllable smart-grid resources such as energy storage, distributed renewable generation, demand-side resources, and so on.