



Information, Communication and Security Technology Newsletter

EPRI Update on ICT Research from the Cyber Security and IntelliGrid Programs and Related Demonstrations

January 2014

About the Newsletter

Dear Information & Communication Technology (ICT) Stakeholders,

Welcome to the first ICT newsletter of 2014. We at EPRI have been working hard to deliver all the 2013 research results as well as planning for 2014 and beyond. This newsletter offers a snapshot of recent activity and resources for more information.

In this issue:

The 2013 Annual Reviews are now complete and are featured in the first article. I strongly encourage you to review these reports as they highlight how EPRI research funding has been applied to meet the ICT needs of the electric industry.

Looking a little into the future, I was able to attend the International CES show that may provide insights on what is around the corner. I would classify this show as the "year of the connected gadget." A summary of the experience starts on page 2 – and it was an Experience!

Also of note is an update on progress related to the OpenADR Open Source Software as part of EPRI's Auto Demand Response Demonstration followed by an article on enabling ICT for the future Power System.

Lastly, if attending DistribuTECH this week, remember to visit us at booth 3947 and we also look forward to seeing many of you at the upcoming EPRI Advisory & Council meetings in Huntington Beach, CA February 10-13.

Sincerely,

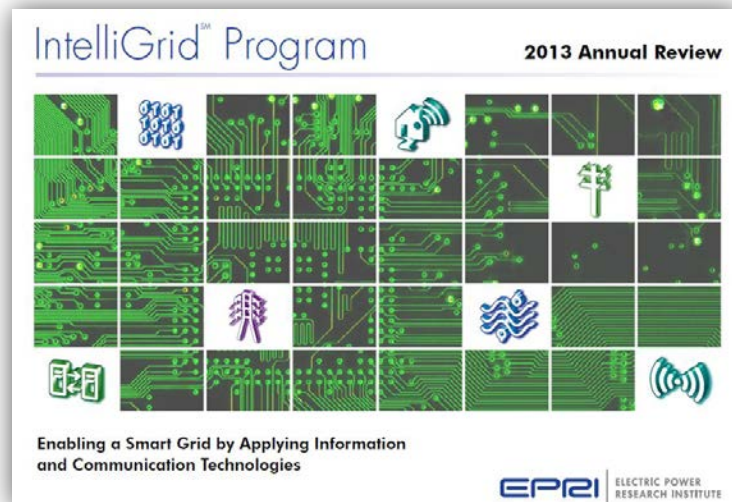
Matt Wakefield, Director, ICT
865-218-8087, mwakefield@epri.com

Contents

- ICT Research Annual Reviews.....1
- International CES2
- OpenADR Software.....5
- EET&D Article on ICT.....5
- Smart Grid Demo Update.....5
- Key Dates.....6

EPRI IntelliGrid and Cyber Security 2013 Annual Reviews Available

The 2013 IntelliGrid (P161) and Cyber Security (P183) program Annual Reviews are complete and available for download. Between the two Annual Reviews, there are over 40 Deliverables documented, each with a key take-away and seven success stories. Each Annual Review also includes an appendix of deliverables over the last several years and contact information for the entire team.



Download: <http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=00000003002002137>



Download: <http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=00000003002002138>

Hard copies are also available for ordering online and will be available at DistribuTECH in EPRI booth 3947 and at the February advisory meetings.

Highlights from the International CES Show in Las Vegas Jan 7-10.

By Matt Wakefield

I finally had an opportunity to attend the International CES show; a long-time goal of mine. My primary goal was to explore emerging innovations that may be applicable to the electric utility industry. Let me tell you, the experience was amazing and intimidating - I was like a deer in the headlights. The show had more than 150,000 attendees, 3200 exhibitors in over 2 million square feet of exhibit space. To put that into perspective, this is over 15 times larger than DistribuTECH. I thought I had a well thought out daily plan to visit specific exhibit hall areas and attend a few targeted panel sessions. That plan went out the window pretty quickly as I found the exhibit hall very enticing and engaging and much larger than I anticipated. I did sit in a couple panel sessions, but ended up spending most of my time on the exhibit floor. To be honest, there was way too much for any single person to absorb, fortunately, a few other EPRI colleagues attended and we will be compiling notes into a formal report to distribute shortly. To provide a little teaser, here are some of my observations.

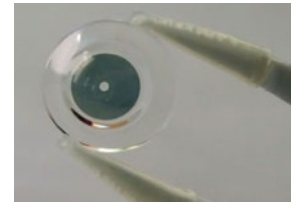
Overall Impression

To me, the show felt like the "year of the connected gadget," although not having attended in previous years, I have nothing to compare this show to. The range of gadgets was fairly broad and I focused my time on innovations that I thought have potential to apply to the electric industry. The primary opportunity I discovered was related to innovations to enhance electric utility worker performance, health and safety. The innovations are related to a combination of sensor-enabled gadgets and connectedness (i.e. the Internet of Everything).

Augmented Reality and Smart Glasses

There were a number of connected gadgets that seemed to blur functionality between various aspects of Augmented Reality and Smart Glasses. Augmented Reality (AR) is a way to view superimposed data into a live view of the physical environment (like the first-down line shown on TV during football games). There are a number of AR applications we are working on at EPRI and also variations of products that could feed into enhancing electric utility worker performance. In terms of products, Google Glass seems to be the standard most of these are being compared to although there is still not a commercially available product. Variations of Google Glass are available now or will be shortly. The elephant in the room is related to privacy. Some of these technologies are approaching a "creepiness" that needs to be discussed with the appropriate stakeholders. As this technology evolves, we need to understand the boundaries that are personally and legally acceptable to the public and our co-workers

Innovega, Inc, iOptik, www.innovega-inc.com – How about augmented reality contact lenses? Well this had some hype for it in hallway discussions, but digging in a little deeper, it's not exactly as it sounds. It is augmented reality glasses that have a special bifocal contact lens that enables the viewer to clearly see the AR Images in the glasses. The breakthrough here is the ability to focus and clearly see images on the glasses that are very close to the eye. Also, the design allows for more lightweight eyewear since the optics portion of the eyewear is incorporated into the contact lens. In talking with the inventor, they are still about two years away from production and the lenses still need to go through FDA approval. Anyway, worth keeping an eye one (pun intended...).



Vuzix, www.vuzix.com – Likely the leader Augmented Reality (AR) glasses and in this business since 1997, Vuzix is one of the few that have a commercially available product today. They have a broad suite of products from AR, Video, Virtual Reality and more.

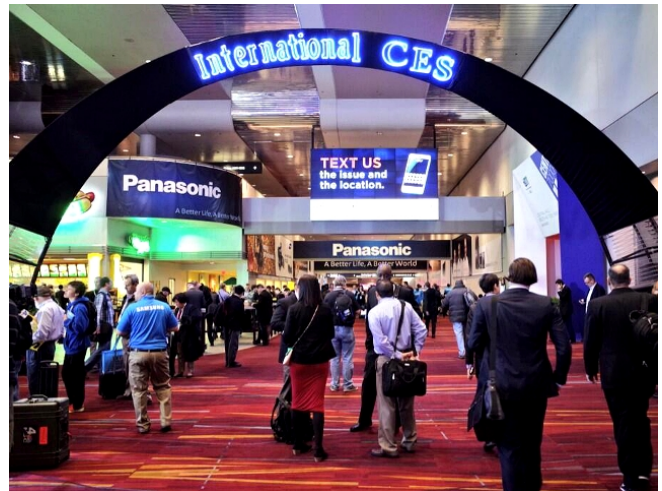
They target market for Vuzix is commercial applications more so than consumers and

EPRI has numerous models of their product that we are evaluating. The "killer app" for consumers is still yet to be found, but there are numerous applications that can enhance training, collaborative work, and documentation in the commercial market. Coming in late 2014, they will have binocular glasses that display AR in both eyes and come with prescription glasses option.



Metaio, www.metaio.com – Metaio is an Augmented Reality Software and Development company. They didn't have a booth at CES, but I did sit in a panel session where the CEO, Thomas Alt, presented. The interesting thing about this company is that they have over 65,000 developers using their Software Development Kit (SDK) for AR applications and I heard unsolicited positive comments about them from Intel and Vuzix. At EPRI, we've used this software to some degree, but will be looking at it more extensively since there is a broad range of developers already using it.

NTT DoCoMo – www.nttdocomo.co.jp/english/ - In the Vuzix booth, NTT DoCoMo, the predominant mobile phone operator in Japan, demonstrated a potential "killer app" in the security space. With the combination of the Vuzix M100 glasses, the Metaio software development tools, NTT DoCoMo developed a facial recognition application that could be used to aid security personnel to determine if the person identified by the facial recognition app is authorized to be in the location. This application has some development to be done to be speed data processing. Right now it requires the person to be stationary and some user input, but this begins to show an example of potential applications. Heck, I would like something like this at the next EPRI conferences to help me remember everyone's names. Interestingly, we are already using this technology in some cases and may not be aware of it. When you tag someone in a Facebook photo, Facebook uses some intelligence to attempt to match the face with one of your friends with its "Tag Suggest" feature. Of course, the privacy issues associated with this type of technology still needs to be addressed.



Eye Tracking

There were a number of eye-tracking and motion sensing devices. I found this a potentially useful input device if it could be perfected. I didn't get a chance to demo it myself, but I did have the opportunity to watch a few people. It didn't seem to be at a maturity where it is intuitive yet and trouble free, but some interesting applications are being developed and with some at \$99, that is bringing it close to reality.

THEEYETRIBE, www.theeyetribe.com – THEEYETRIBE has an eye tracking bar to connect via USB. At \$99 with a full Software Development Kit (SDK), this is definitely interesting. Their eye tracking algorithms use a high resolution sensor tracking tiny movements of the pupils. The demos were focused for gaming applications, but there could be some possibilities for hands-free tablet control or data input for field workers.



EyeTech Digital Systems, www.eyetechds.com – EyeTech Digital Systems offers tracking systems and solutions such as an eye mouse or eye control displays. Some of the use cases they have identified include call centers, programmers, and interactive kiosks.



Motion Sensing

YEI Technology, <http://www.yeitechnology.com/> - YEI 3-Space Sensor product line has a full range of products to determine attitude, heading and inertial measurements. They showed a gaming demonstration, but there could also be applications for workers with repetitive motions or other activities that could benefit from feedback (work with me, I'm trying to find some uses for this in the electric industry...). The equipment worn seemed complex and bulky and included head gear, body gear, as well as an extension to your arms and legs. The good news is that it seemed to work fairly well in their demonstration of an interactive video game.



Another similar product was by Xsense, www.xsense.com. Xsense is using inertial sensors for wireless motion tracking in a combination of applications. They highlighted both animation and medical applications.

Macron, <http://www.macronsystem.co.kr/> - As an example gesture recognition, Macron demonstrated their technology with a demonstration of a virtual mouse. I think this is a good example of potential technology applications, but a bit awkward in its current form. The required hand gestures and user visuals is almost looks like what was in the movie "The Minority Report," but I think for this technology to be successful, it will need to work with relatively small gestures and movements otherwise you may raise some eyebrows if your hands arms are flailing around for no known reason (I'm exaggerating a bit).



Mobile Input Devices

I came across a number of mobile input devices and technologies that seemed interesting to me. The primary goal of these types of devices is to enhance data input for mobile devices and there may be some applications for these as we see field crew workers transition to the use of tablets and other handheld devices.

TREWGrip, www.trewgrip.com – The TREWGrip mobile QWERTY product was one I liked the best of the ones mentioned here (that will be available soon). It does require you to be a proficient qwerty typist and it does take a little getting used to. One use I instantly thought of was using it to take notes during meetings or conferences, but I sense there may be other uses for field workers. The person I talked with said the average user can become proficient within 8-10 hours of practice. They said they expect the product to be available in the 2nd quarter of this year with a price of about \$250.



Grippity. The Grippity has a catchy name and is a more forward looking version of the keyboard attachment solution because it is a fully integrated solution with a built in Android tablet. The innovation is the ability to see your fingers from behind through the transparent screen. The current design is intended to also be used for gaming with additional inputs at the top. I didn't get a chance to test this personally and they only demonstrated a prototype. I'm not sure how close something like this is to production since they are still raising money on their kickstarter campaign.



Communications Technology

On the communications front, one area that stood out to me was Li-Fi (Light-Fidelity) or other variations of visible light communications (VLC). Other Communication technologies prominent included Powerline Carrier (HomePlug and Home Grid or G.hn). Yet another communication media that was apparent was Near Field Communications (NFC). NFC was noticeable the moment I received my CES badge that had an NFC tag in it.

On the Li-Fi front, I came across several demonstrations that showed the possibility of simple one-way communications using LED's. It has extremely high transfer speeds of 150MBPS. The most prominent demonstration was having a smart phone that used its camera to receive a URL to automatically go to a specific web page – clearly not taking advantage of the full two-way capabilities, but a simple enough demonstration. Since most phones don't have the light sensing functionality built into camera yet, there was a dongle provided that connected to the phone's audio port. More advanced demonstrations showed the capability of high-speed two-way communications between devices by PSKEYSystems. Of course, the major obstacle here is the requirement of line-of-sight communications, but it will be interesting to see where this takes us. For the consumer market, broadcasting HD video becomes a potential solution. Besides the simple marketing examples for shoppers and location based advertising, there could also be outdoor applications in situations where you have line-of-sight communications. Vendors I visited with this technology included [PSKEYSystems](#), [OLEDCOMM](#), and [Luciom](#) (in French).



Home Automation and Energy Management

I found much more about Home Automation than Energy Management. Related to this technology, there was an entire portion of the exhibit floor dedicated to the Connected Home, the theme seemed to be about connecting disparate devices in the home. The success of that theme is dependent on interoperable devices and although there are still a lot of proprietary devices and systems in a number of booths, there seemed to be a growing prominence of showroom floor space that recognize the benefits of interoperability. Both the ZigBee and Z-Wave Alliances had dedicated floor space showcasing products using those standards. Most products were focused on traditional Home Automation devices (security, etc.) and not a strong emphasis on energy management, but I did see a growing variety of controllable plugs. The good news is that there seems to be growing momentum for standards-based approaches which will avoid vendor lock-in and increase innovation.



One example of taking this to the next level was Dish Networks Hopper demonstration that had a multi-protocol interface to both ZigBee and Z-Wave products doing HA controlling lights, thermostats and cameras being managed through a ZigBee/Z-Wave USB dongle on the Dish Hopper DVR. I wasn't able to verify both can reside simultaneously on the dongle, but they said they could. Some features they demonstrated were having the lights dim when playing a movie and brighten when the movie is paused. It also automatically pauses the movie if the doorbell rings. The key here is that utilizing standards enables these innovations where as proprietary solutions require one-off customizations that have a higher risk of long term success and proliferation.

For those of you developing products in this area, here are a couple that may be of interest. First, TÜV Rheinland demonstrated their new [ZigBee test Harness Tool](#). Secondly, I came across the new [RaZberry](#) – a Z-Wave toolkit and daughter board to add Z-Wave functionality to the Raspberry Pi at a cost of 49 Euros. I assume also available in the US.



A complete summary of highlights from the International CES show will be produced shortly.

EPRI Automated Demand Response and Ancillary Services Demonstration Completes Major Milestone – Completion of the Open Source OpenADR 2.0b Virtual Top Node and Virtual End Node Software

With the support of electric utilities from the U.S., Japan, France and Ireland that are participating in EPRI's Automatic Demand Response and Ancillary Services Demonstration (AutoDR Demo), we have completed the Open Source version of the OpenADR 2.0b compatible Virtual Top Node (Server) and Virtual End Node (Client) software. The software is immediately available to the member utilities and will be downloadable via Sourceforge.net in the coming weeks.

This is a significant milestone for demand response which has lacked a industry standard messages for demand response and ancillary services events, pricing and transactions. We are using the software to evaluate the standard against utility requirements to identify opportunities and uncover potential gaps in the standard from quality of service, reliability, security, and scalability characteristics. As part of the development process, we took this opportunity to test the accuracy and completeness of the specification and we have contributed the results of our findings to the [OpenADR Alliance](#) to improve ongoing and future versions of the standard.

	Application 1	Application 2	Application 3
Role (per OpenADR 2.0)	Virtual Top Node	Virtual End Node (VEN.1)	Virtual End Node (VEN.2) (library)
Use	DRMS	Desktop Client	Embedded Client
License	BSD 3-Clause	BSD 3-Clause	BSD 3-Clause
Supported Profiles	2.0a and 2.0b	2.0b	2.0b
Data Models	Push / Pull / Poll	Pull / Poll	Pull / Poll
Transports	HTTP, XMPP	HTTP	HTTP
Tested Operating Systems	Linux, Mac	Windows 7, 8	Linux, Mac
Programming Languages	JRuby, Java	C#, .NET	C++
Development Environments	JetBrains IntelliJ IDEA (or text editor)	Visual Studio 2012	Eclipse
Estimated Release Date (Uncertified Version)	Jan 31, 2014	Jan 31, 2014	February 7, 2014

EPRI will be using the software for our own research as well as working with the members of the AutoDR Demo for their own use as well as interested stakeholders. The download will include the source code, compiled applications user/installation manuals, and license (BSD 3 clause).The intent of this software is for research purposes, not commercialization. However, did make it open source to accelerate evaluation and adoption of the standard by interested stakeholders that may be applied to commercial product development.

We anticipate holding technical training of the software in Knoxville in March and in Dublin, Ireland in April. Specific dates are yet to be announced and you do not have to be an EPRI member to attend, but space will be limited. For More information, contact [Walt Johnson](#) or [Chuck Thomas](#).

Electric Energy T&D Magazine features article on Information and Communication Technology (ICT) – a Key Enabler for the Future Power System

In the "From Research to Action" section of the January/February edition Electric Energy T&D Magazine, Matt Wakefield; Director at EPRI authored an article on "[Information and Communication Technology \(ICT\) – a Key Enabler for the Future Power System](#)." The article includes a quote from Bennett Gaines, Senior VP and CIO at FirstEnergy and also the Chairman of EPRI's ICT Executive Council. This is the first in a series of articles that EPRI will author throughout the year that will include input from utility CIO's on EPRI's ICT Executive Council.



SMART GRID DEMONSTRATIONS

The EPRI Smart Grid Demonstration Initiative is a seven-year collaborative research effort focused on design, implementation and assessment of prevalent challenges with integrating all types of Distributed Energy Resources (DER). Additional information is available in www.smartgrid.epri.com or contact Gale Horst at ghorst@epri.com.

Highlights from the Most Recent Smart Grid Demonstration Newsletter

[Smart Grid Demonstration Newsletter](#)

The November / December newsletter had several key updates including:

- SCE Workforce of the Future
- SMUD Situational Awareness and Visual Intelligence
- Hydro-Quebec use of AMI for Phase Identification
- Poll Results: 2014 Top Research Topics
- March 18-20 Smart Grid Advisory Meeting Preview

**January 28-30, 2014, DistribuTECH Exhibition and Conference, San Antonio, TX**

EPRI will again have a booth and a number of presentations at DistribuTECH. We have a strong presence from the ICT team as we continue to find this a good opportunity to present our results and interact with the many EPRI members that also attend this conference. Please be sure to visit us in booth 3947. <http://www.distributech.com/index.html>

February 10-12, 2014, EPRI Power Delivery & Utilization (PDU) Advisors Meeting, Huntington Beach CA

The EPRI Power Delivery and Utilization Advisory Councils review the progress of ongoing research within their respective collaborative R&D programs. For ICT Stakeholders, the two key programs of interest are the Cyber Security and Privacy Program (P183) and the IntelliGrid Program (P161). Utility advisors are encouraged to participate in these twice-a-year meetings as a benefit of your EPRI membership. [Click here](#) to register.

February 12-13, 2014, EPRI Power Delivery & Utilization (PDU) Sector Council Meeting, Huntington Beach CA

The PDU Sector Council advises EPRI management and staff on the technical content, strategic planning and future direction of the PDU research portfolio. Sector Councils are comprised of executives from member companies by invitation of the Sector Vice President. This will be the second meeting of the ICT Sector Council currently made up of 23 CIO's and Security/IT leaders. [Click here](#) to register.

March 11-13, 2014, North American Synchrophasor Initiative (NASPI), 2014, Knoxville, TN

The North American Synchrophasor Initiative (NASPI) brings together electric utilities, vendors, consultants, federal and private researchers and academia to advance the deployment and use of networked phasor measurement devices, phasor data-sharing, applications development and use, and research and analysis. Important applications today include wide-area monitoring, real-time operations, power system planning, and forensic analysis of grid disturbances. In 2014 we begin a new phase for the NASPI community and EPRI is pleased to play a new role in supporting the Department of Energy (DOE) and NASPI community.

The next NASPI Work Group meeting will be held on March 11-12, 2014 in Knoxville, Tennessee at the Holiday Inn Knoxville Downtown Worlds Fair Park, 525 Henley Street, Knoxville, TN 37902. This meeting will feature "User Success Stories" from companies and individuals, who are using synchrophasor technology for specific purposes that increase grid reliability and efficiency, enhance staff and asset effectiveness, availability and productivity. The event will also feature a reception at the University of Tennessee Knoxville, highlighting the Center for Ultra-Wide-Area Resilient Electric Energy Transmission Networks (CURENT), and optional tours on Thursday March 13, 2014 including EPRI's Knoxville Laboratory and Oak Ridge National Labs. [Click here](#) to register.

March 18-20, 2014, Smart Grid Demonstration Advisory Meeting, Maui, HI

This meeting is hosted by Hawaiian Electric Company (HECO) on Maui. The general sessions will include utility smart grid project updates, discussions, and presentations on focus areas including integration of renewables and other distributed energy resources, which has been a major area of research on Hawaii. Attendees will have the opportunity to tour several of the Maui smart grid project sites. Attendance by members of the Smart Grid Demonstration Initiative is encouraged. [Click here](#) to register.

Also watch for the announcement of the EPRI Smart Grid Demonstration Final Conference, which will be a content-packed wrap-up of the Smart Grid Demonstration Initiative. The conference is tentatively slated for Charlotte, North Carolina in late October or early November.

July 14-17 EPRI Smart Distribution and Power Quality Conference and Exhibition, Charlotte, NC

EPRI and Duke Energy (Duke) invite you to the 2014 EPRI Smart Distribution and Power Quality Conference and Exhibition at the EPRI Charlotte facilities. This conference is supported by EPRI Programs: Power Quality, Distribution, IntelliGrid and Cyber Security and open to the public. The conference will focus on how utilities are defining the future of the grid by addressing the challenges of today providing a forum for electric power end users, distribution engineers and project managers, reliability and power quality (PQ) professionals, and related technology manufacturers to gather, share experiences, and learn from one another in a collaborative environment. [Click here](#) to register.

Together...Shaping the Future of Electricity®

EPRI | 3420 HILLVIEW AVENUE | PALO ALTO, CA 94304 | WWW.EPRI.COM

© Electric Power Research Institute, Inc. 2001-2014 All rights reserved