

# Seamless integration into the grid

*Power & Energy* talks to a panel of experts about the future of smart grid. With AT&T's KEVIN JONES, MALCOLM UNSWORTH of Itron, JIM HANSON of Motorola Inc., ANDREW A. BOCHMAN of IBM's Ounce Labs, ALLAN BREITMAYER of Sierra Wireless and TELUS Business Solutions' ROLAND LABUHN.

## What is your definition of smart grid?

**Kevin Jones.** Smart grid is more than AMI or a self-healing electricity delivery system. It is a true transformation of how our utilities operate, support and touch their customers. The smart grid will require sophisticated enterprise-wide digital communications to enable the rapid transfer of data between smart meters, in-home gateways and utility back office systems where critical decisions will be made. Building a smarter grid could be equated to the effort required when telecommunication providers overhauled their systems to move from an analogue to a digital voice and data network. It will provide a new and better way to generate, deliver and manage our energy. It is possible that no one can truly comprehend the future benefits or capabilities of a smart grid.

**Jim Hanson.** Within a smart grid, business critical information flows seamlessly among a utility's wired and wireless networks to connect grid infrastructure, work teams, business processes and customers. The smart grid will use high speed communications to enable multiple smart grid data applications, including sophisticated energy management and control of transmission and distribution equipment, power quality, line and outage monitoring, and to support various load control and demand response programs at the customer level. This will provide real and near real-time connectivity throughout the utility enterprise to improve service delivery, overall productivity and energy conservation and will help to promote the increased use of renewable energy, resulting in a greener environment.

While smart grid is machine-to-machine data-centric, it will also enable the utility to connect information about infrastructure outage, restoration conditions and problem areas requiring maintenance to its mobile workforce and customers, and in the process increase grid efficiency and improve customer service levels, resulting in an even smarter, connected utility enterprise.

**Andrew A. Bochman.** As we say on our blog, the smart grid is a growing digital information network and modernized power generation, transmission, distribution and consumption system. Construction of the smart grid has begun, as it builds on the antiquated electric system that exists today. To this, utilities and others are adding modern computer and networking technologies that will give us a system in which power and information flows to and from all stakeholders. Essentially, the smart grid is made out of software. Functionality and applications we can't even imagine will soon spring up as the data networks are established. And all this is being done in an effort to greatly enhance its reliability, efficiency, manageability and flexibility.

**Allan Breitmayer.** Smart grids deliver electricity from suppliers to residential and commercial customers by leveraging the latest advancements in hardware, software and wireless communications. Wireless connectivity en-

ables smart metering applications to measure, collect and analyze energy usage, from advanced devices such as electricity meters, gas and water meters on request or on a pre-defined schedule. This infrastructure includes hardware, software, communications, customer associated systems and meter data management (MDM) software. Meter data management and advanced metering infrastructures (AMI) are two critical components in today's smart grid technology.

**Roland Labuhn.** A smart grid is an electrical infrastructure that is overlaid with communications technologies, applications and services, and that supports efficiency, reliability, security, conservation and sustainability of our electrical system. The smart grid is the digitization of the entire power industry, transforming an electro-mechanical infrastructure to a system with widely distributed and integrated digital solutions. There are many different applications and services that help accomplish this transformation, and all those efforts are part of the smart grid. At the front of all this change is network technology. This transformation is similar to what public carrier networks experienced during deregulation of the telecommunications industry – our carrier networks are now very much aware, they are IP-based and extend into homes.

*“The challenge in developing and rolling out a smart grid is successful consumer adoption of these applications”* **Allan Breitmayer**

**Malcolm Unsworth.** At Itron, we tend to agree with the seven characteristics of a smart grid as defined by the Department of Energy's Smart Grid Task Force. These characteristics are: enabling active participation by consumers; accommodating all generation and storage options; enabling new products, services and markets; providing power quality for the range of needs in a digital economy; optimizing asset utilization and operating efficiency; anticipating and responding to system disturbances in a self-healing manner; and operating resiliently against physical and cyber attacks and natural disasters.

Itron's smart grid technology enables several of these characteristics, and plays some role in all of them. For this reason, we're proud to say we're offering technology that is foundational to the nation's burgeoning grid.

**With major funding coming from Washington for smart grid initiatives, how do you see the grid developing in the near future?**

**RL.** We need to understand that we are in the early days of what will be a multi-decade smart grid journey. Digital solutions have existed in SCADA networks for many years, but we are now expanding the pervasiveness and depth of these services.

In the short term, funding is driving a wide range of technologies that support several project themes: automated meter installations, IT security and network planning. These are critical, however. The challenge with these initiatives is that they can be treated as isolated events within and amongst utilities.

In order to integrate this rapidly expanding universe of solutions, utilities are taking a step back and assessing how to manage them all. This includes examining the broader network, application and IT security strategies. In addition, the broader challenge of interconnecting utilities requires industry-wide IT standards. The new NIST standards are promising and ZigBee has gained a lot of traction, but we're not there yet.

Finally, the pace of change in smart grid is forcing utilities to consider new creative partnerships. This includes working together with telcos and integrating public carrier networks into the smart grid.

**MU.** The smart grid is about more than just communications, technology and energy systems allowing us to secure our future. It's about a cultural transformation for the utility industry and all consumers of energy.

Imagine the change from rotary phones to 3G cellular phones, from pensions to 401(k) plans, from three analog television stations to hundreds of digital channels, all rolled into one.

The 'how' of this transformation is overwhelming. Gathering and integrating real-time information about renewables, generation, transmission, consumer use and more goes beyond any challenge the industry has ever had to face.

Applying what Itron has learned from working on the leading edge of utility innovation for the past 30 years has never been more important. We're using our knowledge and perspective to help make utilities successful in a smart grid world.

***“Utilities should benefit from real, measurable visibility into how, where and when energy is being consumed”***

***Kevin Jones***

**AAB.** I see the grid developing sporadically. With the early closing out of the Smart Grid Investment Grant Program, the future build-out looks less smooth and certain than initially thought. What was intended to be a three-phase investment program in new approaches to energy and grid manage-



ment has become a two-phase program, and likely a single shot of stimulus funds. Billions of dollars of federal stimulus kick-started the process, but in some ways may cause trouble as systems are developed and deployed before the early smart grid standards have time to firm up. As the benefits of the early pilots begin to accrue and the value proposition comes into focus, stimulus effects will recede and good old investment will return.

**JH.** With funding from the American Recovery and Reinvestment Act, many utilities will be able to accelerate their smart grid initiatives with the deployment of smart metering infrastructure, demand response technologies and alternative energy sources. To support these applications, utilities will require a robust and flexible communications backbone. A data communications network that provides reliable and secure two-way monitoring and control of data across a diverse geographic service territory and with a range of data latency and bandwidth requirements will be important to the success of the initial phases of development but will be absolutely critical to the future success of any large scale adoption. Utilities will not be able to rely on public networks exclusively and as a result they will look to deploying private smart grid communications networks to meet their service territory coverage, and operational, reliability and ROI requirements.

With the deployment of additional monitoring and control applications, the grid will become increasingly integrated throughout the enterprise, from generation, transmission and distribution to the commercial and industrial businesses and the consumer home. As a result, the utility enterprise will need to develop an enterprise-wide smart grid communication network plan that provides the coverage, capacity, capabilities, bandwidth and security required to ensure a truly reliable smart grid.

## ***“To support these applications, utilities will require a robust and flexible communications backbone”***

**Jim Hanson**

**AB.** The grid is already seeing a strong trend appear in the development of renewable energy and energy reduction programs, being pursued through a large ecosystem of technology partners. The stimulus funding is fostering advancements in clean and efficient energy applications, and spawning the development of new partnerships between energy minded corporations.

This stimulus is funding the co-development of smart grid applications in energy management algorithms, demand response appliances and advanced load control strategies.

The challenge in developing and rolling out a smart grid is successful consumer adoption of these applications. Utility companies and their suppliers are going to great lengths to demonstrate to the public that these applications will help utilities better manage load and forecast demand, resulting in true cost savings to consumers.

A fundamental goal within the framework of smart grid initiatives is the promotion and adoption of standards, which drive device interoperability. Those failing to recognize or adopt the evolving standards are going to be left behind with yesterday's technology.

**KJ.** One of the primary initiatives is the increased interest in smart metering and some of that is taking place without federal funding; however, federal funds are likely to accelerate smart meter deployments. Since smart meters alone are probably not going to provide the consumer with actionable information or capabilities, the federal funds may enable demonstration projects that will help the industry to formulate, test and validate new theories and ideas, which will lead to breakthroughs in the generation, storage, delivery and especially the consumer management of energy.

### **What benefits will a smart grid provide for utilities and for consumers?**

**AB.** Smart grid and smart metering solutions enable utility companies to collect data on energy consumption and allow consumers to make smart choices about their energy use.

Sierra Wireless works with companies to offer high-speed wireless technology that can enable applications, including power infrastructure manage-



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**Allan Breitmayer** is Senior Manager, Marketing Americas at Sierra Wireless. An established veteran in the wireless industry, he has over 25 years of experience, commencing with Motorola's Land Mobile Radio division serving the public safety and utility mobile data markets. Prior to joining Sierra Wireless, Breitmayer directed the distribution channels for Airbiquity, AT&T and @Road in the LBS/transportation verticals.

ment, meter data management, back-haul transmission, and distribution measurement and control.

Other benefits include decreased costs to transfer and collect data, fast and secure information transfer, and improved distribution system planning by utilizing real usage data.

**JH.** Smart grids will enable utilities to better manage their transmission and distribution infrastructure to more efficiently deliver energy and minimize outages, while providing the tools to consumers to monitor and understand their energy consumption patterns so that they can better manage their own personal energy footprint. The smart grid will create a much closer energy partnership between utilities and their consumers that will enable them to jointly manage both energy delivery and consumption, resulting in more efficient use of our valuable energy resources leading to increased energy independence and to a greener society.



*“Utilities cannot offer the same solution to everyone and expect the same customer satisfaction”*  
**Roland Labuhn**

**RL.** At a macro level, the benefits to utilities from smart grid are widely known and discussed. Utilities achieve cost savings from flattening peak loads and demand response, supply-side benefits from conservation and energy efficiency, and renewable supply with distributed generation of green power.

Consumer benefits are much more difficult to assess and depend upon the pricing, technologies, billing and marketing programs that consumers experience. Utilities need more data on customer segments and what solutions consumers desire. In the telecommunications business, deregulation forced us to

deeply understand customer segments and the value/benefit consumers derive from various offerings. For example, the new millennials will likely want energy solutions that align with their current preferences, such as an iPhone, and older customers may not tolerate complex technology solutions. Utilities cannot offer the same solution to everyone and expect the same customer satisfaction. Maximizing consumer benefits requires creative discussions and partnerships between service providers, including telecommunications and power companies.

**MU.** Too many discussions about the smart grid are being framed with only the world’s largest utilities in mind. The key players, of course, have a big stake in the grid’s future, but all utilities need to be able to access the grid and use it in ways that meet their unique objectives.

We understand that there are common challenges all utilities face. We also understand that smaller utilities – like those owned by municipalities or co-ops – need smart grid benefits for themselves and their customers. This point hasn’t been discussed enough, but if we don’t meet all utilities’ needs, the smart grid won’t succeed. For consumers, the smart grid is creating new ways to understand energy use and behaviors. With this comes the development of new roles.

We have moved from a one-way process to a two-way conversation. No longer will utilities send out energy and then collect data back to be used solely for issuing a bill. The smart grid allows us to deliver not just energy, but also pricing information, load data and knowledge to help consumers make smart, informed decisions. Utilities will gather not only billing information but also data about patterns of use, consumer preferences and much more. The information and data being delivered today are moving the needle towards changing behavior and ultimately shifting the way we think about and use energy.



A highly respected executive both domestically and internationally, with broad experience throughout the utility industry, **Malcolm Unsworth** was named Chief Executive Officer of Itron in March 2009. Prior to taking up his post as CEO, he was Itron’s President and Chief Operating Officer.



**Jim Hanson** is Energy and Utility Industry Director for Motorola’s Enterprise Mobility Solutions business. He has been in the energy and utility smart grid/AMI and mobility systems and solutions field for over 20 years, having held senior management positions in operations, sales and business development.

**KJ.** Utilities should benefit from real, measurable visibility into how, where and when energy is being consumed. Improved monitoring and communication with the various aspects of the transmission and distribution grid will likely assist in ensuring that vital energy services are available to consumers in a reliable manner. The conservation and demand-based pricing benefits have been well covered in a variety of publications, but utilities could also leverage insight from analytics and emerging forms of real-time customer interaction to build closer relationships with their customers.

Consumers will likely benefit from the natural ecosystem of information services that will spawn from the availability of energy information. We'll probably see rolling phases of technology introduction followed by cultural adoption. For example, previously expensive home automation platforms are likely to reach new price points that trigger mass adoption. This may transpire because the smart grid roadmap is likely to promote, through lower entry barriers, motivated individuals and groups to participate. The rate of innovation can be directly influenced by the cost to innovate.

## ***“The smart grid is about a cultural transformation for the utility industry and all consumers of energy”*** **Malcolm Unsworth**

**AAB.** For the utilities, smart grid is all about business optimization via the infusion of new types of previously unavailable knowledge on their customers' usage patterns, on the parts of the transmission and distribution system that affect them and on their own systems. Where once utilities viewed their roles as relatively static, they will now achieve performance and business improvements by being proactive – an entirely different mindset. For customers of all sizes, from small households to international enterprises, the benefits are several, but mainly revolve around the fact that they no longer have to be completely passive. Most household customers don't even know their electrical utility provider's name. This will change when some of them begin generating their own electricity and via net metering, start selling it back to the utility.

**What types of technologies and solutions can utility companies use to ensure the seamless integration of smart grid into their operations?**

**AAB.** There is no way to ensure integration with a system that's still in its infancy, whose business models are still forming and for which most of the standards have yet to be formulated. What a utility can do at this point is watch, listen and learn. Watch the pilots and the standards committees' drafts and early standards, listen to what their customers are saying, learn from everyone, and possibly build on existing systems and keep their options open.

The smart grid won't work if organizations view it as something completely new, a project that they can adopt wholesale, which will somehow not be intimately connected to their existing infrastructure. Evaluate any new smart grid project or investment with a sensitivity to the way in which they operate now, so that new projects will enhance, not endanger, the core businesses of managing or delivering power.

In a market where development is in its infancy, it's impossible to project the detailed direction of new technologies. It is the nature of something

so new to be extremely dynamic and volatile. As such, the best plan is one that starts with what is stable and known. Then evaluate and adopt new components in ways that can be understood and partitioned, until they themselves become more mature and mainstream.

**JH.** Increased use of standards-based smart meters and intelligent electronic devices (IED) in the transmission and distribution system coupled with standards-based wireless wideband and broadband communications technologies will foster the migration to new smart grid solutions that will still need to be interoperable and compatible with legacy grid equipment and back office management systems. At the same time, these technologies will help to provide a stable platform to support the growth of future smart grid devices like smart thermostats, distributed generation, PHEVs and alternative energy sources like solar and wind power.

**MU.** Hardware, software and standards must work together. Clunky, 'patch-work quilt' solutions will fail. Sometimes patches can be a good thing: a mended hole in a garment; a band-aid that helps a wound heal. By definition, a patch is a temporary fix, a short-term solution. But imagine an energy grid where functions along the network were patched together and incompatible. Itron has seen firsthand what happens when incompatible hardware, software and communications are shoved together. It doesn't work, and we can't afford to make that mistake: the stakes for the smart grid are too high. We need solutions – hardware, software and communications – that work in concert to deliver reliable energy at the lowest possible cost.

**KJ.** In the past, utilities often owned most of their communications systems. Field service was handled through proprietary wireless systems. Often these systems in their current form are obsolete and upgrading them is difficult, expensive or not an option. Furthermore, due to their proprietary nature, interoperability is at risk.



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**Roland Labuhn** is the Vice President of TELUS Business Solutions' energy sector, serving the oil and gas, and utilities markets. He joined TELUS from Quorum Business Solutions where he was President of Quorum's Canadian operations and has 10 years of experience in the energy practice at Deloitte, delivering strategy and operations leadership.



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As the deployment of smart meters and other monitoring devices on the smart grid becomes more widespread, they will have to be controlled and managed. Bandwidth and latency factors will also have to be carefully considered, especially if a utility intends to use private networks with a limited amount of frequency spectrum. A paradigm shift toward national and international communications interoperability already has occurred – one example is with the GSM standard on which the AT&T network is based. GSM is a global communications technology that is deployed in over 200 countries and has over three billion users worldwide. The good news is that this enabling technology already exists to help utilities communicate throughout their enterprise and service area. With the availability and scale of public networks like AT&T’s, it is no longer practical for utilities to cobble together proprietary communications systems with varying standards or different functional purposes.

**AB.** Wireless technology for smart grid deployments should include ruggedized devices compliant with industrial environment specifications, cellular IP connectivity, RF integration expertise, open platforms and remote device management capabilities.

Sierra Wireless offers a diverse product portfolio of high speed embedded modules and wireless gateways enabling the collection and distribution of information to customers, suppliers and utility companies, allowing businesses to either participate in, or provide, demand response solutions, products and services. Providing information to customers, the system advocates a change in energy usage from their normal consumption patterns, either in response to changes in price or as incentives designed to encourage lower energy usage at times of peak-demand periods or higher wholesale prices or during periods of low operational systems reliability.

Examples of Sierra Wireless’ integrated smart grid technology include smart metering or advanced metering infrastructure (AMI) applications where partners use embedded products to provide two-way communication at either the meter head itself (under glass) or in a private RF mesh network using wireless concentrators backhauling data over the public network. Demand response is another example: embedded modules and M2M solutions are used in large retail and wholesale customers to monitor and control their system loads within the smart grid network. In times of peak demand, air conditioners and other high energy consuming equipment controlled under the DRM host would receive a wireless message requesting them to curtail or reduce their consumption.

These solutions provide valuable options for utilities with diverse metering data collection requirements that can vary by cost, coverage, urban density or other unique deployment challenges.

**RL.** Effective integration requires defining long-term IT strategies that consider all solutions as part of that plan: network standards, applications impacts, gap assessments and IT security strategies. There is much debate today in the power industry regarding network standards. Is the future IP/MPLS based? What role will legacy networks, such as Sonet, play? Our experience over the last decade is that IP/MPLS is where we have brought our networks and it is where utility networks must go to enable a truly smart and aware grid. However, migrating towards this future vision requires a pragmatic approach, and accepting a realistic time frame to transition to this future state.

Achieving seamless integration of the smart grid is a journey that requires the setting of ‘big bet’ IT strategies now. Our belief is that widely accepted standards, such as IP, will be a critical element of any long-term plan to achieve seamless integration. ■