Smart-Energy Consumption via an Open Ecosystem

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From America’s viewpoint, there is a dire need to transform the way we manage energy consumption and smart grid initiatives are leading the way. Our nation is saying goodbye to inefficient utility control systems plagued by slow reaction speeds, incompatibility, and isolation, which is due in part to the establishment of the ARRA (American Recovery and Reinvestment Act). Instead, we're working to develop the proper communications and connectivity needed to implement smart grid and automated meter applications for electric, water, and natural gas utilities.

Expect in 2011 to see smart grid solutions and smart meters — a real-time, automated, metering infrastructure (AMI) — to be rolled out across the country. This will deliver to consumers and utilities the ability to have unparalleled visibility into their power consumption. Utilities will be able to better predict and meet demand using the most cost-efficient power, and there will be greater flexibility in deploying renewable power into the grid.

Utilities and technology developers are working together to achieve an open ecosystem in the effort to connect and revolutionize our nation's energy management. Supervisory control and data acquisition (SCADA), distribution automation (DA), combined sewer overflows (CSO)/sanitary sewer overflow (SSO) water collection system flow measurement and alarming, emerging solutions for global positioning systems (GPS) tracking, location based services (LBS), and geographic information systems (GIS) are playing a major role in enabling smart-energy infrastructures and helping to drive a paradigm shift in new sectors. Driven by ecological and political concerns, and fueled by stimulus dollars, smart-energy

infrastructures — the smart electricity grid and the related electric-transportation ecosystem — are becoming realities.

Smart infrastructures are characterized by technologies that enable two-way monitoring between producers and end-users, such as those seen with OPC and communication protocols. The smart grid infrastructure involves the integration of two-way communications between utilities and consumers through automated metering infrastructure — or smart meters and sensors — to determine where and to what extent electricity is being consumed. AMI provides customers and utilities with real-time or near real-time energy information, such as pricing, power, demand, quality, and so forth.

In the automation world, OPC's latest standard, known as OPC-UA (Unified Architecture), can address the features and benefits required in smart grid applications. Operating tomorrow's distribution network will require interoperable, efficient, and secure communications to help tightly integrate systems for a fast, coordinated response to potential issues.

NIST (The National Institute of Standards and Technology) issueda report titled *The NIST Framework and Roadmap for Smart Grid Interoperability Standards, Release 1.0*, which provides a list of standards and other assets needed to support an interoperable smart grid. OPC-UA is one of the standards to make that list and demonstrates the importance of achieving interoperability among devices and systems, as well as security.

Naturally, privacy issues have emerged, which take into account the serious challenges involved in building out not only a smart — but also secure — infrastructure. Smart meters lead to critical levels of data sharing and interoperability of systems within electricity grids. As increased two-way connectivity between energy producers and end-users emerges, so will concerns for cyber-attacks in regard to this potential exposure of smart grids. For instance, an individual home's smart meter could be targeted and hacked. Intrusions could be more serious, with a cyber-terrorist potentially being able to black out an entire city. As smart infrastructures proliferate, there are steps being taken to safeguard systems by adding layers of security. Protecting smart infrastructures against criminal or malicious attacks are not only a major concern for utility companies, but also have emerged as a national priority.

The best technologies to support smart grid-related projects will be those that are scalable and easily adaptable to next-generation technologies. As in any fast growing industry, expect a clutter of technologies to emerge as more and more players enter the smart-infrastructure space.

Within the next five years, anticipate a converging of the industrial, commercial, and consumer adoption of smart-infrastructure technologies as they become more pervasive and ingrained. As this happens, the hope is that standards for smart-infrastructure technologies will emerge as there will also be sufficient vendor support to encourage a smart grid market of compatible products and secure applications.

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