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Buildings, Industry, Automation, and Smart Grids

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As wholesale energy markets have developed, and mandates for re-purchase by utilities and power grids of alternate energy such as wind and solar, your building may be a net consumer at one time and a net provider at another.

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Many of us are working to foster collaboration between smart buildings and smart grids. The National Institute of Standards and Technology Industry-to-Grid [I2G] and Building-to-Grid [B2G] Domain Expert Working Groups are working on issues and requirements for future standardization along these lines. The NIST effort started as a result of the Energy Independence and Security Act of 2007 [EISA]; more information is on the NIST Smart Grid web site (http://www.nist.gov/smartgrid/).

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Building and Industrial Concerns

Industrial and building concerns overlap—there are similarities between industrial facilities, large campuses, microgrids, office developments—and differences. The energy consumption and co-generation capabilities of industrial facilities set them apart, but as solar and wind power are integrated in larger buildings and campuses these are mostly differences of scale.

In many ways the level of collaboration between the power grids and buildings is where the growth of the Internet and electronic commerce was years ago. There are few consistent standards for interaction, and the many sets of rules make interoperation difficult.

The Internet started out with a notion of a host and an Internet terminal. Computing has evolved, first to client-server and later to peer-to-peer interactions. Symmetry in processing is becoming more obvious, but the model used by regulators

and utilities is not very symmetric. You buy power from a utility. The utility controls the price, the delivery, and the characteristics. If you generate power, you may be very restricted in what you can do with your surplus (often, nothing at all!).

Energy Markets and Building Management

As wholesale energy markets have developed, and mandates for re-purchase by utilities and power grids of alternate energy such as wind and solar, your building may be a net consumer at one time and a net provider at another. But the rules and interactions need to be more symmetric for buildings and the grid to collaborate to reduce our collective energy use and costs. And there are few if any standards to enable that collaboration.

As wholesale markets have developed for buying and selling of power, so-called *curtailment* (or *demand-response*) markets are being created—treating reduction of use as the mathematical and nearly practical equivalent of additional generation. This opens up opportunities for building managers and building automation system providers. A building or campus or industrial site may be able to save money buying energy in the marketplace, and directly earn money by selling reduction in use through efficiencies, changing set points, or on-site generation, all of which needs to be managed and communicated.

Real Time Pricing is coming. There are differences from market to market, but the key is that prices vary over time—not just a few times of year, or on critical peak days, but every five to fifteen minutes. Many areas will develop futures markets, so a facility can compare the price of energy today with the price tomorrow and choose which to buy by shifting cooling and other loads.

The building needs to manage itself. Some intrusive techniques, typically called something like *direct demand reduction*, may allow a utility (note again the asymmetry) to turn off specific loads, and automated meter infrastructure allows a utility to turn off an entire facility. But there are liability and scale and complexity issues that make automated buildings better partners—turn off, or reset, what you need to limit use, but in a way that's responsive to business needs, not just grid needs to reduce peak energy use.

Energy and Interoperation Standards

OASIS, the Organization for the Advancement of Structured Information Systems (http://www.oasis-open.org/) is the leading Web services and electronic commerce standards group. OASIS has defined OASIS BLUE, an open standards initiative for applying the lessons of eCommerce to this new world of distributed, interactive, and transactive energy. The November issue of AutomatedBuildings described OASIS BLUE (http://www.automatedbuildings.com/news/nov08/articles/oasisblue/081029024312oasisblue.htm). The OASIS BLUE white paper (http://www.oasis-open.org/resources/white-papers/blue/) explains in more depth, and a forum (http://www.xml.org/oasis-blue/) is starting in February to discuss this entire range of issues.

OASIS expects that an OASIS BLUE Member Section will be created in the near future to shepherd interoperation standards in this important area.

Opportunities for Building Automation

So what's in this for building automation? The value is in several broad areas.

First, there is value to your customers in defining and implementing higher level building interactions, both with the power grid and with the business operating in the facility. This is the first step to be able to take advantage of the new energy markets.

Second, you can enable energy buying (and selling, if you have generation) through the portal. The cost to a customer to implement and maintain these capabilities should be significantly less than the savings, making a sale easier.

Third, by enabling selling of co-generation, solar, or wind power, you can bring money directly to the facilities manager who pays your bills. The revenue opportunity further enhances the customer value of building automation.

Finally, by saving energy and money for your facilities, you're helping to reduce and delay the need for expensive upgrades in the electrical delivery infrastructure, helping make energy more cost-effective for all of us.

About the Author

William Cox, Ph.D., (wtcox@CoxSoftwareArchitects.com). William Cox has developed enterprise product architectures for Bell Labs, Unix System Labs, Novell, and BEA, and has done related work in OASIS, ebXML, the Java Community Process, OMG, and the IEEE, often working at the boundaries between technology and business requirements. He was lead architect for Unix System V Release 4 and of follow-on highly scalable and secure Unix systems, service-oriented architectures and directory APIs for Novell, distributed object technologies, Web services and XML messaging and transaction systems, and other enterprise software. **He is co-chair of the OASIS Technical Advisory Board.** He consults on software architecture and the application of eCommerce and security technologies to buildings and energy management. See http://www.CoxSoftwareArchitects.com/energy/.
