SIEMENS

Interview

Industry Sector
Building Technologies Division

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"No smart grid without smart buildings"

Interview with Wolfgang Hass, Chief Technology Officer and Head of Innovation Building Automation at Siemens Building Technologies, Zug, Switzerland

Mr. Hass, what exactly is a "smart grid?"
There are many definitions of smart grids, and they can vary a great deal. The way I see it, a smart grid is a power grid where for the first time producers and consumers are able to communicate with each other.

Until now, power grids have worked without communication in both directions. What is changing now?
Renewable energy sources such as wind and solar power are causing power grids to become unbalanced; there is a lack of coordination between consumption and production. Look at it this way: Each watt of power that is consumed in one place has to be fed into the grid somewhere else in real time because the grid does not store energy. What makes renewable energies tricky is that, just like consumption, they are difficult to forecast. To ensure seamless supply, we need energy storage systems. Switzerland has many pumped-storage hydroelectric plants. During off-peak hours, they use low-cost power to pump water from a lower-elevation reservoir to one located at a higher elevation. When power is needed, water is released from the higher-elevation reservoir to generate the energy required to cover the shortage. This method is a type of energy management. Today, with an ever increasing number of renewable energy sources and consumers, energy management and storage capacities are becoming more and more important.

How can we balance the power grid?
There are two methods, both of which are currently the topic of intense discussions. The first is centralized control through power producers who cycle consumers on and off as needed. The second is an incentive system for consumers: Bonuses are used to motivate them to turn loads on or off, shift work or use storage systems to contribute their share to a balanced power grid.

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Isn't central control by power producers already in place now?

Correct. In some regions, power producers are already using telecontrol technology to cycle certain consumers on and off at certain times. Just think of washing machines, clothes driers and heat pumps in households where power is automatically turned off at noon to prevent supply bottlenecks. Smart grids require a different solution. Because the amount of power fed into the grid by renewable energies can fluctuate, it must be possible to cycle consumers off and on dynamically—i.e. whenever needed.

While in today's power grid everybody knows that washing machines and dryers cannot be used in the middle of the day, it's conceivable that in the smart grid, washing machines and driers are cycled off by a central office—and that wouldn't be good for clothes or chore planning. Or imagine a fisherman out on Lake Zurich early in the morning for his daily catch. He must be able to count on his icemaker having electricity starting at 11 a.m. so there is enough ice to refrigerate his catch when he returns at noon. If the power producer were to dynamically cycle electricity or on off without taking into account the fisherman's requirements, his entire catch could spoil.

What are the alternatives?

It is impossible for the power producer to know all the processes that are mission-critical for a company or a building operator. This is where the second method comes into play, the incentive system. As soon as imbalances in the power grid arise, the power producer creates incentives for the consumers so they reduce or increase consumption on their own, shift work or charge or discharge energy stores. One of those incentives could be electricity rates that vary during the course of the day. Since it is up to power consumers whether to make use of the incentive or not, they retain full control of their business processes.

What specifically does this mean for buildings?

At Siemens Building Technologies, we have observed that building operators have made great strides as far as optimizing energy consumption is concerned. Through construction measures—but to a large extent also through optimized automation of HVAC systems—it is possible to operate a building much more energy-efficiently today than ten years ago. This allows building operators to save 30 percent or more. However, optimizing energy consumption is only the first step. The second step is to buy the required energy as cheaply as possible. Customers whose consumption is flexible can benefit from the lowest prices.

Can you give us a concrete example of flexible consumption in a building?

A good example is Taipei 101, Taiwan's tallest building located in the capital of Taipei. Siemens helped its operator achieve LEED Platinum certification for sustainability and energy efficiency. The 101-story high-rise uses cheaper electricity at night to produce ice which is then used during

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the day to cool the building in tropical Taipei. This is called load shifting: The load for cooling is shifted in such a way that it uses lower-cost off-peak electricity instead of expensive peak power. Because of renewable energies feeding into the grid, a smart grid requires dynamic energy rates. This means that rates won't be tied to a specific time of day any longer. Instead, they are determined by the current capacity surpluses and shortages.

What can building operators do to lower their future electricity bills?
They need to become independent of capacity surpluses and shortages in the grid. Energy optimization always pays off because it lowers consumption. Even more important is co-generation. This means that the building itself generates energy and feeds capacity surpluses into the grid. Consumers also become producers. Wind and solar power are good choices here. Another possibility is local energy storage right in the building, for example through ice or batteries. This allows operators of smart buildings to become very flexible and save money. It is smart buildings that make the smart grid possible.

How far along is the development of smart grids in conjunction with smart buildings?
The interplay between power producers and consumers is being tested as we speak. A number of different projects are being implemented worldwide, including the master-planned city of Masdar in Abu Dhabi or the EU's grid project on the Danish island of Bornholm. The goal is to develop holistic solutions that allow power producers, distributors and consumers to cooperate. Initial pilot facilities are being installed right now in order to gain practical experience.

Building Technologies' portfolio for building automation is part of Siemens' environmental portfolio which earned the company approximately €30 billion in sales in the 2011 fiscal year, making Siemens one of the world's largest suppliers of eco-friendly technologies. In the same period, Siemens products and solutions enabled customers to reduce their carbon dioxide (CO_2) emissions by nearly 320 million metric tons, an amount equal to the total annual CO_2 emissions of Berlin, Delhi, Hong Kong, Istanbul, London, New York, Singapore and Tokyo combined.

The **Siemens Industry Sector** (Erlangen, Germany) is the worldwide leading supplier of environmentally friendly production, transportation and building technologies. With integrated automation technologies and comprehensive industry-specific solutions, Siemens increases the productivity, efficiency and flexibility of its customers in the fields of industry and infrastructure. In fiscal 2010, which ended on September 30, 2010, revenue from continuing operations of the Industry Sector (excluding Osram) totaled around €30.2 billion. At the end of September 2010, Siemens Industry Sector had around 164,000 employees worldwide without consideration of Osram. Further information is available on the Internet at: www.siemens.com/industry.

The **Siemens Building Technologies Division** (Zug, Switzerland) is the world's leading provider of safe, secure and energy efficient solutions for buildings („Green Buildings") and building infrastructure. As a service provider, system

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integrator and product supplier Building Technologies offers building automation, HVAC, fire safety, security, low voltage power distribution and electrical installation technology. With around 42,000 employees worldwide (September 30), Building Technologies achieved a turnover of €6.9 billion in fiscal year 2010. www.siemens.com/buildingtechnologies

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