

Smart buildings in the smart grid

“Buildings offer enormous energy saving potential”

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Mr. Spengler, we are facing far-reaching changes on the energy market. How do you view this development?

The reshaping of energy supply systems towards greater sustainability, especially in the United States and Germany, is well underway. We have largely completed the technical and legal separation between energy generation, transportation and distribution. The greatest challenge facing energy providers today is to prepare the grids for decentralized feeding of renewable energy. In Switzerland, the politicians will soon begin work on concrete measures to implement the 2050 energy strategy.

What is causing these fundamental changes?

There are a number of fundamental drivers. Demand for energy from fossil fuels such as coal, natural gas and oil is rising, resulting in price increases. At the same time, we need to limit climate change by reducing CO₂ emissions. Calls for significantly greater energy efficiency are getting louder. In addition, renewable energy from the wind and sun are fluctuating energy sources that must be fed into the electricity supply. It is these new energy sources that are pushing present power supply structures to the limits of their capacity. After all, creating a balance between generation, grid capacity and consumption will require much greater agreement and coordination as well as short-term and long-term energy storage in the power grid than is currently available.

Is the price of energy the key driver of these changes?

It is estimated that global energy consumption will increase by around 60 percent over the next 20 years. Price alone is not causing these enormous market changes. Instead they are due to increasing demand, particularly in large metropolitan areas. In addition to electricity rates, however, other financial incentives are producing movement on the market. For example, if I build an energy-efficient building for commercial use or renovate an existing one so that it can be operated energy-efficiently, I can usually command higher rents and higher resale prices. Studies conducted at the University of Maastricht and at UC Berkeley have documented this. Environmental protection and resource conservation also pay off when it comes to a company's image.

How would you describe energy efficiency and sustainability from a business and financial point of view?

As a business manager, I naturally look at the financial and management aspects that influence the energy market on the supplier and consumer sides. In 2009, Siemens and McGraw-Hill Construction collaborated on a study of managers and chief financial officers in the United States. They discovered that the share of companies committed to sustainability is nearly 40 percent. The study also demonstrates that more and more weight is given to the financial aspect of sustainable operations as far as the savings potential is concerned. Over half the companies surveyed also indicated that they offered sustainable products or services and regularly asked their suppliers or service partners for information about their sustainable management practices. Clearly, sustainability is now considered an important competitive factor on the executive level.

You work in the field of building technology. Exactly how do you define a “smart building?”

A smart building is essentially able to do three things that are impossible for a conventional building. First of all, it is able to respond to price signals from the grid and to take action on this basis, for example by reducing power consumption when rates are high or automatically shifting consumption to times when rates are lower. Secondly, a smart building can produce electricity for its own consumption, for example via photovoltaics. Any excess can be fed into the grid, which makes the building a “prosumer,” i.e. both a “provider” and “consumer.” Thirdly, intelligent storage can be used to balance out the smart grid. We even go so far as to say that a smart grid cannot exist without smart buildings.

What are some of the new approaches to power storage?

We have been trying to store energy ever since electricity was first discovered. And to this day, we have had little success in storing electricity as such. Therefore, the best thing to do is to balance supply and demand as closely as possible at any given time. Today, we use pumped storage power plants to meet this challenge. However, these plants are not always effective at times when energy production fluctuates. Increasingly, therefore, we use the storage capabilities of smart buildings, for example cooling or heating systems. Thermoactive construction materials such as concrete or heat exchangers in building foundations can be used to store energy temporarily. To use the building for storage, however, it must be able to communicate with the energy systems in its surroundings. This is done through intelligent data exchange. This intelligent communication between the building and the grid is an important prerequisite for taking full advantage of the energy savings potential that exists and also for using fluctuating wind and solar energy efficiently. In addition to this energy saving potential, future energy consumption in buildings and devices will also be controlled and adapted relatively quickly by the availability of renewable energy.

What is furthering the development of smart buildings in the smart grid?

We have already discussed some of the promotional aspects. Electricity rates that become flexible and thus create incentives. Or the positive image aspects of a sustainably designed building. However, awareness of the enormous savings potential that the building sector has to offer is an important factor. Yet we can achieve these savings only if existing buildings are optimized for energy efficiency and new buildings are built with sustainability in mind. This costs money. That is why political incentives are provided, for example in the form of government subsidies or tax breaks. However, low or reduced interest rates and tax cuts alone do not stimulate additional investments in energy efficiency. Only the coordinated combination of legislature, rate flexibility, improved transparency and capital availability can take advantage of the potential for sustainability measures.

How is Switzerland positioned in relation to the smart grid?

Switzerland has long been a power hub in Europe, earning a great deal of money in this capacity. As a country with few natural resources, Switzerland has always been open to innovation. I don't think this will be any different when it comes to the smart grid. The high share of renewables in Switzerland's energy mix, especially hydroelectric power, further encourage this development. The

country has the opportunity to take the lead in Europe where smart grids are concerned. On the infrastructure side, the high voltage grid is being expanded, and the opportunities offered by smart metering have also grown enormously. Power consumption is becoming more transparent to consumers, who can already take active measures such as using a smartphone app to control energy demand in their own home.

How is Swiss industry positioned in this changing environment?

Switzerland has many innovative companies that offer industry-specific solutions for supporting and assisting energy providers in meeting their future challenges. On June 1, 2012, six Swiss suppliers of technology solutions for smart metering and the smart grid formed swissmig, the Swiss Association of the Smart Grid Industry, in Olten. The association aims to combine the interests of Swiss suppliers and represent them jointly along the entire energy value chain. At present, 16 Swiss companies, including Siemens, are organized under this umbrella, and several requests to join have been received in the months since the association was formed. Both the press and politicians as well as the electricity industry have responded positively and seek a dialog with us. Common sense and business prudence notwithstanding, we could all use a bit more determination and strength of purpose to cope with the paradigm shift in the energy debate.

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