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“Intelligent buildings in the city of the future”

Interview with: Dr. Hubert Keiber, CEO, Business Unit Building Automation, Siemens Building Technologies Division, Zug, Switzerland

Siemens has formed a new Sector: “Infrastructure & Cities.” What are the factors behind this decision?

The battle against climate change is being waged in the cities. Even today, over 50 percent of the world’s population lives in cities, and this figure will grow to more than 60 percent as early as 2030. The motivation for change is especially strong in the urban centers. Although cities occupy only 1 percent of the world’s surface, they consume 75 percent of the global energy, require 60 percent of the water and produce 80 percent of the greenhouse gas emissions. In cities, buildings are the biggest energy gluttons, accounting for 40 percent of global energy consumption while producing 21 percent of the climate-damaging emissions.

With our new Infrastructure & Cities Sector, we are concentrating our existing expertise in the areas of infrastructure and cities. This new Sector joins the three existing ones: Energy, Industry and Healthcare. As the second most important Sector after Energy, Infrastructure & Cities is a heavyweight, accounting for one third of the Siemens Group’s entire sales volume. With this move, we are even more resolutely pursuing the goal of offering our customers climate-friendly and energy-efficient solutions and services – across industries and technologies.

If the battle against climate change will be waged in the cities, what are the biggest challenges that this presents?

First of all, the challenges certainly lie in mobility and the efficient management of private and public traffic networks as well as airport logistics. Secondly, building technology must provide comfortable and yet energy-efficient buildings. A third point is energy management. Power grids on the provider side will continue to develop so that they can adapt to new situations. For example, renewable energy is not always available to the same extent as fossil energy or nuclear power. Wind turbines depend on the wind and photovoltaic plants on sunlight. Thus, feeding power into the grid can vary from one point in time to the next. Producers, consumers and the grid must be able to deal with fluctuations that occur both in production and consumption. The smart grid of the

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future can balance out these fluctuations by coordinating the entire chain of supply from generation and storage to distribution all the way to the consumer. This is where “intelligent” buildings come in because they can be used to store energy, much like water reservoirs or electric cars of the future. To summarize, cities face the challenge of providing technical solutions to achieve a reasonable and energy-efficient interplay between energy, mobility, building technology and suitable storage media.

What is an intelligent building, exactly?

A building can be a single-family home as well as a large office complex, a hospital or an airport. The savings potential in smaller units is around 15 to 20 percent, while large buildings or building clusters can save much more with the help of building technology, namely up to 35 percent. Buildings today are pure consumers on the grid. In the future, a smart building will be able to generate and store renewable energy, draw it flexibly from the grid and feed surplus energy into the grid. This makes the intelligent building a “prosumer”, that is, an energy provider and energy consumer at the same time. The dual role of buildings is the determining factor in further developing smart grids.

How soon will the intelligent building of the future become reality?

All technologies already exist today. In my opinion, it depends on the political climate and energy prices. The current talk of abandoning nuclear energy can be a further impetus. Renewable energy sources are currently very much on the rise. But renewable resources aside, the greenest energy is still the energy we save.

What measures are the most efficient for saving energy in buildings?

The key is to raise user awareness and thereby improve user behavior. For example, we can continuously monitor energy consumption and make this consumption visible. For instance, we use a Green Building Monitor in many of our Siemens locations, including our headquarters in Zug, Switzerland. This monitor is a screen that provides visual displays of consumption curves, for example, and thereby alerts building users to historical and instantaneous consumption. Making consumption behavior visible is very effective. However, it is also important to track down and eliminate energy gluttons and then to visualize the savings achieved. Renovation is another important point. If we were to subject all existing buildings in Europe to deep renovation, we could save 32 percent of the primary energy consumed in Europe. This is equal to Europe’s combined coal and nuclear energy use and would be equivalent to saving four billion barrels of crude oil. Window, façade and thermal insulation in single-family homes can save a great deal of energy. Automation – that is, automatic regulation and control of heating, ventilation and air conditioning – plays a very important role in large buildings. Cost arguments are the key drivers here because

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efficiency gains are gains that we achieve over and over. The opportunities for saving energy efficiently using technology deliver a very good return on investment. There is equally strong demand for our energy performance contracting services where we guarantee our customers a contractually specified percentage of energy savings.

How does energy performance contracting work?

With energy performance contracting, we guarantee specific energy savings over the term of the contract. The cost savings are used to refinance the investments made in energy saving measures and efficient building operations. An energy performance specialist first performs an assessment to identify the savings potential and then confirms the potential in detail following an in-depth analysis, arranges for financing, conducts the energy savings measures and checks the savings over the entire term of the contract. Siemens began to offer energy performance contracting services in 1995. To date, we have completed 1,300 projects, which have saved our customers around €900 million in Europe and the United States.

What other technologies is Siemens developing for greater energy efficiency in buildings?

The use of new building technologies such as heat pumps, thermally activated building systems (TABS), solar systems and night-time cooling through ventilation offers enormous potential for saving energy. However, these technologies result in complex total systems which depend on widely varying conditions such as weather, occupancy and dynamic electricity rates. Optimizing the operation of such systems partially requires new predictive control concepts which take weather and occupancy forecasts into account. We work together with development partners in the areas of science, industry and weather to devise predictive control strategies aimed at minimizing energy consumption in buildings while keeping investment and operating costs low. At the same time, these strategies will enhance user comfort and limit peak electricity demand. We anticipate the potential energy savings to be as much as 20 percent.

So this means that a “smart weather forecast” is built right into the building control system?

Yes, you could say that (laughs). Picture an office building where the individual zones have an automated system for controlling blinds, lights, heating, air conditioning and ventilation. By developing control software, we can incorporate weather forecasts specific to the building location right into the automated control system. Of course, reliable weather data is extremely important for intelligent systems like these. New weather models already supply local weather forecasts for individual cells, with a precision of approximately two kilometers. These numerical weather forecasts can be corrected using readings from meteorological stations as well as from local sensors connected to the building automation system. This approach makes local forecasts much

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more accurate than before. Predictive control technology is an important component in further developing energy-efficient solutions for buildings.

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 (CO₂) emissions by nearly 320 million metric tons, an amount equal to the total annual CO₂ 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 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