

# Berlin, Germany: Sustained energy efficiency efforts pay major dividends for Freie University

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### **Sustained energy efficiency efforts pay major dividends for Freie University**

**By: Charles Waltner**

Freie University of Berlin is one of the leading research universities in Germany and one of the top humanities institutions in all of Europe. Now it is also home to some of Berlin's most energy efficient buildings.

Founded in West Berlin after World War II, the institution manages a broad mix of more than 200 buildings in the Dahlem district of southwest Berlin. For the past decade, Andreas Wanke, head of the university's energy and environment unit, has been working to improve the energy efficiency of the university's buildings. Now the institution is one of the leading practitioners of building energy management in all of Europe. The Smart+Connected Communities Institute spoke with Wanke about Freie University's pioneering efforts.

### **When did the Freie University of Berlin start its building energy management program?**

**Andreas Wanke:** We began our efforts in 2001. I was commissioned by the university's administration to conduct a small feasibility study. Up to that time I was working as a political scientist at the research unit for Environmental Policy (Forschungsstelle für Umweltpolitik). We had been trying to convince the university's administration to do more concerning building energy management. The university's new administration was much more open to our ideas.

In April 2001 we began our work by establishing an energy databank, which tracked energy consumption in the university's buildings. We also brought in a consultant engineer to do an energy analysis on some of our buildings. An evaluation of this data showed very clearly that there was a lot of energy savings potential in many buildings.

This information convinced the university's top administration to staff a one-person unit for energy management in our Technical department. I took on this role. Establishing this unit was - and still is - extraordinary. But our initial study showed that there was tremendous potential for energy and cost savings.

In 2003 we developed our first energy efficiency program, which included 21 big buildings with a usable surface of more than 120,000 square meters. That was more than a quarter of the entire university. Our chancellor and the former head of my department supported our efforts in a very strong way and that helped us secure about 2 million euros for financing our work. We also succeeded in acquiring financial support based on an environmental protection funding program that is financed by the European Union and the State of Berlin.

One year later we could testify to the broad success of the program. The heating savings were about 33 percent, and the cost reduction was more than 400,000 euros a year. We had a return of investment (ROI) within 4.8 years. That initial success paved the way for our ongoing efforts until now.

### **How have you developed and expanded your building energy management program during the past decade?**

**Andreas Wanke:** In the first four years the Technical department focused our efforts on improving building heating systems. In this phase we worked closely with consultant engineers, who were specialized in energy efficiency. After that we optimized the regulation of ventilation and cooling systems. And since 2009 we have been looking to implement energy savings for our information technology (modernization of the cooling system of the data center, installation of cold-aisle containment at the racks, data management, power management, etc.). Today, 90 percent of the university's buildings area is heated

by modernized energy efficient heating systems. We spent 1.2 million to 2 million euros annually to steadily carry out these upgrades.

In the first three years the program had a return of investment of about 5 years, but you have to keep in mind that energy prices have increased quite a lot during the past decade. We have saved more than 41.4 million kWh (25.3 %) of electricity and heating energy since the baseline 2000/01 year. Without these measures the university's energy expenses would have been 3.3 million Euros higher in 2010. The CO<sub>2</sub> emissions were reduced by 12,500 tons that year.

But our success wasn't just from the equipment modernization. Crucial to the program was a set of non-technical efforts. In 2004 we started a certification process of our environmental management system, according to the international standard of ISO 14001. We started this process in selected departments. The complete university has been certified since 2007.

The key was that the certification process created an opportunity to involve and motivate a lot of people in all departments and all levels of management. Through the certification process, we are building environmental teams throughout the university. Currently we have more than 120 members in these teams.

In 2007 we also established a bonus scheme, which is an internal incentive system for energy savings to motivate the people in our 15 academic departments and central institutes to change their energy behaviors. The principles of our bonus scheme are very simple. We have defined a baseline that normally is the average of the years 2004 and 2005. Energy savings or consumption increases are the difference between the consumption in the accounting year and the baseline. The savings or increased consumption is multiplied by current energy costs and the bonus rate (extra payment rate), which determines the bonus payment the departments can earn and apply to their budgets. The bonus scheme program is educational for everyone involved, since it clearly tracks energy savings efforts compared to actual results. In the last year all departments got a bonus from reducing their energy consumption. The largest academic department got more than 220,000 euros in 2010.

### **What role did technology play in your efforts?**

**Andreas Wanke:** Energy management is a cross-sectional task. Although it cannot be performed without technical knowledge, it really requires multiple management processes. The day-to-day management of heating systems or other environmental systems is crucial, as well as building design, construction, and procurement.

But the most important precondition for successful energy management is the quality of energy controls and energy data. You need at least monthly information about heating and electrical consumption for a building. To improve our ability to do this, we started in 2001 by installing smart meters in all buildings that did not have heating or electricity meters.

You cannot ask for behavioral changes if the technical base is not up to date. So it is absolutely necessary to have environmental controls that are user-friendly. With this in mind we started our program with a focus on technological improvements. Another aspect of this is that technological improvements are usually more sustainable than behavioral improvements.

### **What were some of the key digital technologies that you used?**

**Andreas Wanke:** Our most important work was with the hydraulic calibration of heating plants combined with the installation of precisely adjustable thermostat valves and line valves. But we also modernized regulating technologies and demand-based guidance of heating and ventilation facilities in many buildings – based on modern monitoring and control technologies. We also converted many oil heating systems to highly efficient natural gas condensing boiler units. And we replaced hundreds of older heating pumps with electronically regulated heating pumps. Critically, however, these efforts were combined with the elimination of weak points in our building envelopes: insulation of flat roofs and upper story ceilings, higher efficiency windows, and an increased use of daylight.

Our approach to all our efforts was very pragmatic and step-by-step. We began with the most profitable measures centered on reengineering the environmental systems of the buildings, which normally have a return of investment less than four years. It was very

important in this phase that we cooperated with consultants who were specialized in energy efficiency measures.

We also built a photovoltaic plant two years ago, which was initiated and partially financed by a student initiative.

### **What have been some of the biggest challenges in carry out your building energy reduction program?**

**Andreas Wanke:** The biggest challenge was designing and managing the starting phase. In the beginning you have only analyses, studies, discussions and good arguments. Here we needed the support of the university's top management (and some people with courage). After having the first success it was much easier to take the next steps.

The otherbig challenge wasto establish continuity. You have to find new aims, new operating fields and new alliances. The development of our bonus scheme in 2007 and the certification process in 2005 were two very important steps. The next big step will be the implementation of our planned measuresfor energy savings with information technology equipment. The communities of IT and facility management are very different.

### **What have been some of the biggest surprises?**

**Andreas Wanke:** The question is not easy to answer. On the one hand every modernization process in existing buildings brings a lot of surprises - normally rather unpleasant factors like increasing costs or other implementation problems. On the other hand, in a more positive view, the great acceptance of our bonus scheme was a bit surprising. I had expected more skepticism and opposition in our departments.

## **What future projects are you planning to further improve the energy management of the university's buildings?**

**Andreas Wanke:** In May 2011 we concluded a negotiated climate protection agreement with the government of the Berlin region. This agreement contains new aims and programs for the next four years. We are the first university in Berlin to sign the agreement. In the agreement we committed to reduce our energy consumption by more than 10 percent from 2010 to 2015.

Our efforts will be focused on three areas. The first area is the establishment of an online energy monitoring system combined with more communication to all members of the university. The second part will focus on further modernizing the university's buildings. We have reduced the energy consumption in one of our big buildings by more than 70 percent. This will be the key objective for other buildings during the next several years.

The third part of our effort will focus on energy savings in the IT-Sector. We implemented a stock-check of all IT equipment and IT structures at the university in 2009. So we know that at least 25 percent of our electricity consumption is caused by IT. Furthermore, we know that we have a lot of energy savings potential in this sector.

## **Are you looking at new technologies to help with your future efforts?**

**Andreas Wanke:** We have high expectations for online monitoring systems, which will allow finer-grained energy control and much better information energy usage in our buildings. Especially for IT operations, we want to introduce new controlling systems that will make it easier to turn off equipment when it is not in use.

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