Energy Management and Climate Protection at Freie Universität Berlin

Energy and Environment Unit
Energy Management and Climate Protection: Enhancing Sustainability

With more than 30,000 students, about 4,200 employees and 200 buildings, Freie Universität Berlin is one of the biggest universities in Germany. The university has reduced its energy consumption by nearly a quarter in the last 11 years – (approximately 42 millions kilowatt hours in 2012 compared to the baseline of usage in 2001). This corresponds to an energy cost reduction of 3.5 million euros per year, without changing the surface area of the campus. This document will outline the main activities related to energy management in the university as a cross-sectional task, which combine various technical, organisational and behaviour-based measures with a step by step approach. The most important instruments are an energy monitoring system, annual energy efficiency programmes with a focus on technological improvements and a bonus scheme, which motivates the departments to save energy.

Freie Universität Berlin has 15 departments, schools, and central institutes offering more than 160 study programs in all disciplines with the exception of engineering. There are nearly 33,000 undergraduate, graduate, and doctoral students, more than 4,100 employees, including almost 350 professors. Freie Universität has more than 200 institute and administrative buildings covering approximately 500,000 square meters in total.

Carbon Footprint: Continuous Improvement

Freie Universität has continuously reduced its energy consumption and associated CO2 emissions since the year 2000 by implementing various activities and incentives. The steps taken include the control of energy consumption, modernisation of buildings, and the establishment of a bonus system for energy conservation. The latter began in 2007 and provided the departments with a financial bonus for energy savings. The approaches have been successful: Since 2000 the university succeeded in cutting its annual consumption of power and heating by nearly a quarter, or 42 million kWh, – without reducing the surface area of the campus. The consumption of heating oil has been reduced by almost 90 %, the use of total heating by about a third and power consumption by 10 % during the same period.

Based on 2012 prices, the university has saved 3.5 million euros in energy costs annually. Thus Freie Universität also protects the climate. The energy conserved since 2000 leads to a reduction in CO2 emissions of 12,500 tons per year (as of 2012). Since 2008 Freie Universität has installed solar panels on 8 roofs. With an overall capacity of 675 kW (as of 2012) they produce about 600,000 kWh of clean energy each year.

Freie Universität was also the first higher education institution in the German capital to sign a climate protection agreement with the state of Berlin in 2011. The university thereby commits itself to reduce its energy use by an additional 10 percent between 2010 and 2015. These efforts include continuing the technical building optimisations, developing an online energy monitoring system, and implementing a green IT action program. In addition, in February 2013, Freie Universität installed two highly efficient block heat and power plants, which will make a significant contribution to reducing the university’s CO2 emissions.

Energy Management

Energy management is a cross-sectional task that includes the planning, management, organisation, and monitoring of operational energy use, with the goal of achieving continuous improvement.

The most important elements of the energy management strategy at Freie Universität include the monitoring of energy consumption (since 2003), developing and implementation of annual energy efficiency programs (since 2003), using renewable energy sources (since 2009), managing the Green IT action program (since 2010), and establishing an incentive system for energy savings (since 2007).
Thereby the university reduced its energy use by 24 %, or 42 million kilowatt-hours, between 2000 and 2012. Despite these considerable savings, Freie Universität also entered into a climate protection agreement with the state of Berlin in 2011, committing to reduce its energy use by a further 10 per cent by 2015 (compared to 2010).

Climate Protection Agreement

On May 17, 2011, Freie Universität Berlin was the first higher education institution in Berlin to sign a climate protection agreement with the state of Berlin. The agreement calls for significant energy efficiency measures between now and 2015.

The agreement includes 18 different measures in order to reduce the university’s energy consumption by an additional ten per cent by 2015 and to cut CO2 emissions by about 5,400 tons.

In the past 12 years the university has already reduced its energy use by nearly 25 %, or 42 million kilowatt-hours. Thus the university has not only made a significant contribution to achieving Berlin’s climate protection targets, but has also demonstrated clearly that public institutions have considerable room for taking action.

In addition to continuing technical modernisation activities and the university’s bonus scheme for energy savings, the climate protection agreement also focuses on the implementation of the Green IT action program, and the development of an online energy monitoring system.

Bonus System for Energy Savings

Considering the escalating cost of energy in recent years, the step-by-step modernisation of the approximately 200 institute buildings at Freie Universität Berlin is indispensable. However, technology alone is not enough. Therefore, in 2007 Freie Universität launched an incentive system to encourage local energy-saving efforts.

The bonus system gives the departments financial incentives to implement their own energy saving measures. A department receives an annual bonus from the university’s budget if the energy consumed in the department’s buildings falls below the agreed baseline. The bonus amounts to 50 % of the annual cost reductions. If the department exceeds the baseline, it has to bear 100 % of the additional costs.

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<th>Bonus System Results for Freie Universität’s Departments and Schools in 2011</th>
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Green IT Action Program

Freie Universität Berlin launched the Green IT project in 2009 aimed at identifying the university’s energy saving potential in the field of IT and defining optimisation measures.

An in-depth analysis of existing IT systems and facilities revealed that IT equipment is responsible for at least 20 per cent of the university’s overall use of power. In addition, there is a considerable amount of power used for network centres, Voice over IP (VoIP) telephony, uninterruptible power supply (UPS) and notebooks. The estimated total amount of power currently used for IT equipment is well above 10 million kilowatt-hours per year, or about 1.8 million euros in energy costs.
Based on this analysis, the university developed a Green IT action program in 2010 aimed at optimising all IT related aspects of energy consumption. The most important measures include procurement improvements, accelerated centralisation and virtualisation of servers, and an overall implementation of demand-driven computer and server operations. Moreover, special attention will not only be given to the transparency and energy-efficient control of server operations but also to the training and sensitisation of staff. The full range of measures to be implemented in the next few years is shown in the following overview.

### Solar Energy

In May 2008, the first 146 kW solar plant was installed on the roof of the physics building. At that time, it was one of the ten largest solar plants in Berlin.

Since then, eight additional photovoltaic plants have been commissioned, including one initiated and financed by the student initiative, UniSolar. The roofs are rented to external solar investors. The solar plants currently have an overall capacity of 675 kilowatts, which can generate about 600,000 kilowatt-hours (kWh) of solar energy annually. About 350 tons of CO2 are prevented from entering the atmosphere every year due to this initiative.

### Block Heat and Power Plants

In February 2013, Freie Universität installed two block heat and power plants. One plant, with two 139 kW modules, is located in Düppel, where the veterinary medicine facilities are clustered. The other one, with a net output of 237 kW, is in Lankwitz, at the earth sciences site. Each location is supplied by two local heating systems based on natural gas.

Block heat and power plants produce electricity and heat simultaneously, and are among the most efficient types of power plants. These 2 plants generate a total of 510 kilowatts net output of electricity and 804 kilowatts of heating. If operated as planned, the heat-operated cogeneration plants will produce about 3.3 million kWh of electricity in total. About 95 per cent of this is used directly at the two locations. The Engineering and Utilities Division of Freie Universität expects savings in primary energy of about 23 per cent. This should reduce the university’s carbon dioxide emissions by 1,300 tons per year. The payback period for both plants will take less than four years.

The Engineering and Utilities Division of Freie Universität is responsible for operating the cogeneration plants.

### Contact

Andreas Wanke  
Head of Energy and Environment Unit  
andreas.wanke@fu-berlin.de  
+49-(0)30-838-52254