

More and more consumers are aware of the environmental impacts of power generation and use, while at the same time the liberalization of energy markets is advancing throughout Europe. As a result, consumers can now for the first time use their purchasing power as a political tool by opting for 'green electricity', meaning electricity produced from renewable sources. In May 2000, the city of Darmstadt made itself a pioneer in Germany by signing a power purchase contract stipulating that one third of the electricity requirement of city properties is to be met by green electricity.

THE CITY

Darmstadt has 136,000 inhabitants and is located on the edge of the Odenwald uplands. The city is known above all for its commitment to the arts, with numerous museums and the Georg-Büchner award of the German Academy for Language and Literature, and higher education, with 25,000 students at the Technical University and two technical colleges. However, it is also home to industrial companies of international repute such as Merck and Wella.

Climatic data:

Degree days (base 18 °C): 3250

Annual mean temperature: 10.1°C



CONTEXT

The Darmstadt Local Agenda 21 is viewed as a tool for developing projects and activities. The Agenda Document of Science City Darmstadt contains a broad array of action goals and sustainability projects supported by committed citizens.

The city of Darmstadt has adopted a climate protection action plan. The municipal corporation (Magistrat) took a decision in 1994 committing the city "to reduce CO₂ emissions in city properties by 35% by the year 2005". Activities implemented include:

- > Stipulation of an energy performance index for city properties and for buildings on city-owned land (low-energy or passive house standard),
- > District heat connection for the Albert-Schweitzer-Haus building (heat from wood-chip fired facility operated by the town of Lindenfels),
- > Installation, by means of contracting arrangements, of 20 on-site combined heat and power (CHP) units in city properties,
- > Intensified use of solar energy (solar thermal and photovoltaic),
- > Procurement of green electricity.

EXPERIENCE OF DARMSTADT

The framework contract

On 27 May 2000 the city of Darmstadt signed a contract with the HEAG NaturPur AG supplier concerning the procurement of green electricity. The NaturPur electricity generated from environmentally sound sources is used to supply 33 schools, 23 kindergartens and the city administration. These facilities consume some 3.9 million kWh electricity annually, corresponding to a proportion of about 29% of the total consumption of city properties.

Despite procuring green electricity, the city saved almost EUR 145,000 in electricity costs in the year 2000 compared to 1999. This is attributable to the liberalization of the electricity market in Germany, which has depressed electricity prices substantially – as a result, green electricity cost less in 2001 than conventional electricity in 1999. The new supply contract also yields environmental benefits, reducing CO₂ emissions by 2,570 tonnes annually.

By procuring green electricity, the city aims not only to meet its energy requirement in an environmentally sound manner, but also to promote on-site power generation. Consequently, in a step-wise process in the next years, photovoltaic systems with a total capacity of 61 kWp are to be installed on urban properties. These include twelve kindergartens or schools with a 1 kW demonstration installation each, as well as a large photovoltaic system on the future Park&Ride building at Darmstadt's main railway station in the Weststadt district (see below).

The contract was signed by Darmstadt's mayor and the executive director of the electricity supplier at a ceremony which attracted great public interest. For Darmstadt's schoolchildren and kindergarten children, a balloon competition and an energy quiz were organized. The schools whose pupils sent the most balloons on their way were to be among the first at which an image-boosting photovoltaic system was installed.

The term of the framework contract commenced in April 2000 and was limited to 2 years. It is extended automatically by 1 year if no party terminates it by 1 month before the end of the year. Rates are adjusted continuously.

The green electricity supplier

HEAG NaturPur AG was established on 29 April 1999 as an autonomous subsidiary of Hessische Elektrizitäts-AG – HEAG – (51%) and HEAG Versorgungs-AG (49%). The new stock corporation concentrates the strong activities of the HEAG group in the field of renewable energy production.

The city of Darmstadt has an indirect holding of 79% in HEAG Versorgungs-AG via Hessische Elektrizitäts-AG. Since summer 2000 Ruhrgas Energie Beteiligungs-AG holds 12.5% and is entitled to increase its holding in the year 2002 to 25% plus one share. The other stockholders are mainly cities and municipalities.

Green electricity mark-up and use of revenues



The 'mark-up' depends upon the consumption situation of the building/site concerned. Depending upon the supply tariff – i.e. standard tariff or special contract tariff – the rate differential between conventional and green electricity purchase varies from site to site. Under standard tariffs (i.e. involving a switch from the 'Egalstrom' conventional supply to 'Ökostrom' green supply) the mark-up is just under 3 Ct/kWh. For special contract tariffs it is approx. 5.7 Ct/kWh. These values are subject to rate changes and to changes resulting from altered site consumption. Consumers have no

influence upon the investment activities of the green electricity supplier (i.e. HEAG NaturPur AG). In mutual agreement, involving contracts permitting the use of roof areas, a total of 62 KW_p will be installed on buildings owned by the city (schools, kindergartens, public buildings). However, the 'mark-up' does

not place any obligation upon HEAG NaturPur AG to install renewable electricity production facilities in the city.

First pilot installations in Darmstadt

By the end of 2001, 1 kW_p system had been installed on each of the three schools and on the kindergarten which had won the balloon competition and the energy quiz. With an area of about ten square metres, each photovoltaic module generates some 800 kWh solar electricity annually. A display fitted in the entrance area of each building provides continuous information on energy yields: This shows instantaneous output, daily electricity yield and total yield since the system started operation. Through their modular structure, the installations can be expanded freely.

All schools supplied with green electricity were able to take part in the competition. The goal of the competition was to raise awareness among teachers and pupils that their school generates power in an environmentally sound manner. At the same time, they were to be stimulated to address the issues surrounding sustainable power supply. Almost 3,000 pupils at seven schools took part in the competition.



In addition, a large-scale 24 kW_p facility has been installed on the new building of the autonomous waste management undertaking of the city (Eigenbetrieb Abfall wirtschaft und Stadtreinigung Darmstadt). A further 50 kW_p facility is planned on the new Park&Ride multi-storey car park at Darmstadt's main railway station – 25.6 kW_p have already been installed. This facility, visible from afar at the 'gates' of Darmstadt, will supply about 44,000 kWh green electricity. In the basement of the car park there are four green electricity recharging points for electric vehicles. Within the context of this pilot project, HEAG NaturPur AG

will provide green electricity free of charge for one year to its customers and electric vehicle owners. In order to showcase the performance of the green electricity and of the NaturPur vehicle recharging points, the German solar vehicle championship race will be held in Darmstadt.

EVALUATION AND OUTLOOK

No increase in the quantity of green electricity procured is presently planned. Assuming that 1 kW_p requires an investment of approx. EUR 7160, the total capacity of 61 kW_p generates an investment of about EUR 444,000.

At the same time, the procurement of the green electricity generates positive side-effects: For instance, in suitable properties of the city it has permitted the use of efficient combined heat and power production (CHP) technology. The heat and power generated are used in the building. The CHP power thus buffers bought-in green electricity, and is consequently highly economical. The amount of bought-in green electricity thus buffered is replaced by extra procurement of green electricity elsewhere, so that in sum the agreed amount of green electricity supply of approx. 3.9 million kWh annually is retained. Since 2001, 11 small-scale CHP units have been installed in city properties procuring green electricity. In 2002, a total of 20 small-scale CHP units will be in operation. These are implemented through contracting arrangements. The contractor finances, installs and operates the CHP unit. The fuel (gas) is supplied by the city. Following installation, the city becomes the owner of the CHP unit. The contractor is paid by a contracting rate which can be drawn from the administrative budget. No additional borrowing is required.

FURTHER INFORMATION

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