

## Power Tower in Linz.

*A high-rise office block uses the energy from heaven and earth.*



*The building was designed by the architects Weber & Hofer of Zurich.*

The new group headquarters of the Upper Austrian power utility, Energie AG Oberösterreich, is currently under construction in Linz. Known as the Power Tower, this is no ordinary office complex – even before completion, it is setting the benchmark for energy efficiency in large buildings. With its nineteen storeys, this will be the first high-rise office building in the world that uses renewable energies to meet almost its entire energy requirement for heating, cooling and fresh air.

### **Farewell to fire: energy from sun, earth and water.**

The power utility's new building has neither gas nor district-heating supplies: instead, it is connected directly to the sun and the earth. As the tower continues to rise at a busy inner-city intersection in Linz, it seems to be imitating a sunflower: the building complex rises to a height of 75 metres so that it can trap the sunlight on its facade area of 700 square metres. The solar power station on the south-western side of the Power Tower will be one of Austria's largest photovoltaic facilities when it is completed in September 2008. Below the building, 46 geothermal sensors extend 150 metres downwards like roots, to draw thermal energy from deep underground. In summer, the relatively cooler temperature below ground will ensure a pleasant climate in rooms and offices.

### **An active contribution to climate protection.**

One major factor in the overall energy concept is a combined heat pumping plant for heating, cooling and ventilation. Thanks to the novel process, the office building should use only half of the energy that conventional building technology would require for heating and cooling. The Power Tower saves about 300 tonnes of CO<sub>2</sub> per year as compared to a similar high-rise building – an active contribution to climate protection. The energy needed for lighting, heating and cooling is supplied from regenerative energy sources: the sun and the earth, and also the groundwater. The energy concept provides for cooling energy in the computer centre to be pumped from two groundwater wells. The well system will support heat gain during winter.

### **Setting an example for a sustainable approach to energy.**

The Power Tower makes no use of fossil energy sources whatsoever. With its new group headquarters, Energie AG Oberösterreich is moving towards the goal of independent energy supply. The power utility con-

siders that it has a responsibility when it comes to efficient and sustainable energy usage, so its 19-storey office tower should not merely be a new administrative building but also set new standards for the future.

### **Sun: an intelligent facade produces power and provides shade.**

This slimline building shows its sustainable energy concept to the world by using sunlight as an inexhaustible source of energy. The photovoltaic installation on the south-western side of the office tower is designed to produce 42,000 kilowatt hours of solar power per year. For Energie AG, this solar power station represents a milestone in the implementation of its philosophy of energy efficiency and sustainability. The multi-functional shell, made of glass and materials with high thermal insulation values, features many of the design characteristics of a passive building. Triple glazing and heat insulation restrict heat losses to a minimum, while ensuring that the introduction of solar heat into the building during summer is reduced by 90 per cent.



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#### Earth: heating in winter, cooling in summer.

Geothermal energy ranks as an equally inexhaustible source of energy. To obtain thermal energy for heating, the office tower taps the resources within our own planet rather than turning to solar energy. In the Power Tower's central technical units, geo-coupled heating pump systems draw geothermal heat energy from underground, raising it to a higher temperature level so that it can be used for heating purposes. At the same time, the heat pump systems are able to remove excess heat from the building. Heat pumps operate on the same principle as a refrigerator: for cooling, the unit simply operates in the opposite direction.

Energy from the depths reaches the heat pump systems in two ways. A total of 46 pipes, paired together, plunge 150 metres straight down into the earth, distributed over two geo-sensor fields. After a 180° deflection at the lower end, the thermal transfer fluid which has been heated up underground flows back into the building through the

pipes. The geothermal sensors attain a total length of 6,900 metres. Geothermal heat also circulates through a total of 90 foundation columns on which the 75-metre-high office building stands. The concrete pillars accommodate pipes which draw heat from ten metres below the surface, or carry heat away from the building into the earth, depending on the requirement for heating or cooling.

#### Water: constant water temperatures cool the computer centre.

Thermal energy is pumped from the groundwater via two wells in order to operate the heating system in winter. In summer, the well water is mainly used as cooling water for the computer centre and to cool the supply of fresh air. If heating energy is required, the system operates as a heat recovery facility: in the computer centre's cooling circuit, the water heats up so that the heat can then be reutilised via the heat pumps in order to heat the building.

#### The energy concept makes heavy demands on the building's "central nervous system" – the building automation system.

Because it has minimum energy consumption, reduces the cooling loads and uses geothermal and solar energy, the Power Tower reflects the state of the art. However, this innovative energy concept makes heavy demands on the control technology. Changing operating conditions and load situations, together with heat requirements for certain zones of the building, at the same time as a cooling requirement for the computer centre – these aspects call for intelligent load management and a correspondingly large number of control and regulation processes.

The heating, cooling and ventilation for the Power Tower are supplied and controlled via seven central technical units. Radiators, chilled beams and fan convectors are controlled by SAUTER ecos intelligent unitary controllers.

According to present plans, about 6,000 data points will be linked to the building automation system. A separate bus system is being developed to monitor about 420 fire protection dampers in the ventilation system.

Visualisation for the control centre (which also provides a graphic display of monitoring for the fire protection dampers) is implemented with SAUTER's novaPro Open building management software. This makes it possible to centralise all the user profiles and authorisation data in one main data base, so that users benefit from a reliable management system that is insensitive to errors. SAUTER's contribution to the Power Tower project also includes the development of an energy monitoring system with separate display units.

#### Summary

The building's consistent use of renewable energies, together with the photovoltaic facility integrated into the facade, offers a shining example of futuristic energy-efficient concepts for modern commercial buildings. The Energie AG Power Tower in Linz sets new global benchmarks for energy efficiency in large office buildings.

The revolutionary energy concept makes the new group headquarters of Energie AG Oberösterreich the first high-rise office block with the design characteristics of a passive building.