Highlights

The Plus-Energy Office High-Rise Building is the first office tower block in the world able to claim to say that it can feed more energy into the power grid than is required to operate and use the building

- Austria's largest plus-energy office building, with the largest photovoltaic system ever integrated into any facade in the country
- A unique example of interdisciplinary networking and simultaneous, integral planning with a custom-designed usage concept
- Cutting-edge construction which provides valuable insight into actual energy consumption in office buildings
- The building shows not only what is technically possible, but also how feasible plus-energy office buildings are from a commercial perspective.
- The new findings from the research project have set the standard for upcoming projects and construction activities for TU Wien and are already being applied for all 4,500 employees.
- Awards and achievements include the 'klimaaktiv GOLD-Plakette' from the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management, achieving 1,000/10,00 points, first place in the Austrian Sustainable Building Council's TQB rankings (with 986/1,000 points), 2015's most innovative building' – 'innovative gebäude (building)' platform.

'With this 'plus' innovation, we are really making technology tangible for people here'

Sabine Seidler, Rector + project team

Facts

Renovation of an office tower block to plus-energy standard as part of a research project within the Research Focal Area Energy and Environment

Part of the 'TU Univercity 2015' project: Modification and refurbishment of the infrastructure of TU Wien

- Location: 1060 Vienna, Getreidemarkt 9, unit 'BA'
- Use: Approx. 800 workstations for TU employees and students, capacity for up to 1,800 people, incl. seminar rooms and lecture halls
- Net floor space: 13,500 m² over 11 floors (the equivalent of the floor space of 135 homes)
- Type of construction: Development of a passive construction for office buildings
- Energy production: Austria's largest photovoltaics system integrated into a facade (would be enough to supply power to 128 households), server waste heat utilisation to heat the building, and energy recovery from the lift system
- Energy consumption: Extreme reduction in energy consumption following the evaluation of over 9,300 individual components by a team of scientists - from the LED lamps and office equipment through the lift, ventilation and servers

Project partners:

Building owner:
Federal Real Estate Company (BIG)

Tenant:
TU Wien

User:
Faculty of Mechanical and Industrial Engineering

General contractor:
Work group of architects Hiesmayr - Gallister - Kratochwil

Scientific lead:
Univ. Prof. DI Dr. Thomas Bednar, TU Wien
DI Helmut Schöberl, Schöberl & Pöll GmbH

Picture credits:
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Chronology of the Plus-Energy-Office High-Rise

1969-1971	Construction of the high-rise building
2006-2007	Security refurbishment (during operation)
2011-2012	Planning of the plus-energy-refurbishment, the beginning of the research project
Spring 2012	Start of the plus-energy-refurbishment
6th Nov. 2014	Opening
2015	Start of the monitoring and optimisation phase

More info about the Plus-Energy Office High-Rise:
www.univercity.at/plusenergyhighrise

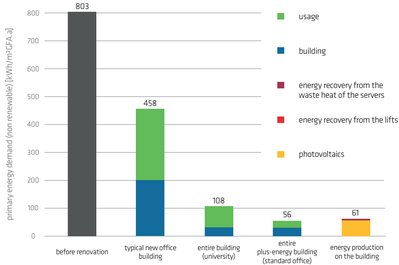
More info about the Research Focal Area Energy and Environment:
energiewelten.tuwien.ac.at/home/EN

financed by:

funded by:

TU WIEN
UNIVERCITY 2015
Wir gestalten die Zukunft der Technik
www.univercity.at/plusenergyhighrise

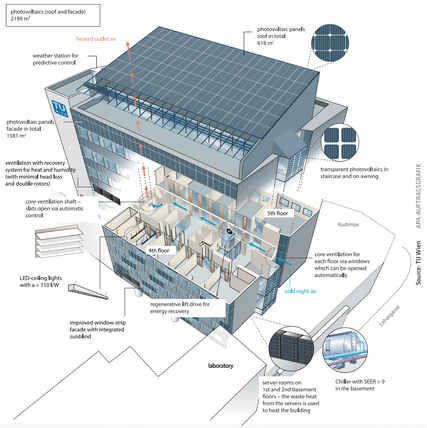
Energy balance



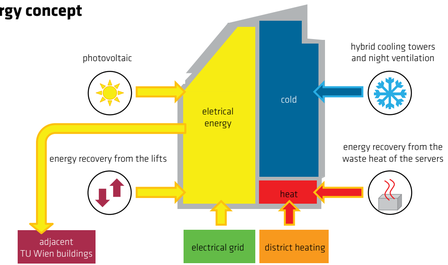
Explanation of the chart:

This energy balance contrasts energy consumption in the building in different cases (before refurbishment, with a conventional refurbishment and after the refurbishment) with potential energy production on the building.
The energy consumption is subdivided into two categories: 'Building' covers all quantities of energy required to make the building usable in general (heating, cooling, lighting etc.). 'Usage' covers the actual energy consumption that results from usage (computers, telephones, equipment in communal areas etc.)

The typical definition of an plus-energy building states that the building's own energy production must cover the 'building' part of the energy consumption. However, as the 'usage' part of the energy consumption is also covered in the office area, the building could actually be described as 'plus-plus-energy'.
If you take into consideration the fact that TU Wien also needs a number of high-performance computers for their research activities which are not found in regular office buildings, this energy consumption would increase from 56 kWh/(m²GFA.a) to 108 kWh/(m²GFA.a).



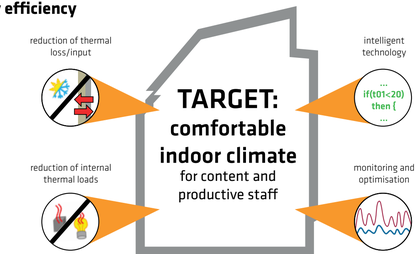
Energy concept



Electrical energy is produced on as well as in the building directly via the photovoltaic system mounted on the roof, integrated into the facade and via energy recovery from the lift. If the energy produced is greater than the building's current energy consumption, this surplus is used by neighbouring buildings at TU Wien. If too little electrical energy is produced, the current that is still needed is obtained from the power grid.

The energy recovered from the servers' waste heat is the main source of heating for the building. If this is not enough to cover heat consumption needs at any one time, extra heating is obtained from Vienna's district heating network.
The cooling required in the server room and in the building in the warmer months is obtained via hybrid cooling towers (which use free cooling and/or an ultra-efficient chiller) and an automatic night ventilation system using the ambient air.

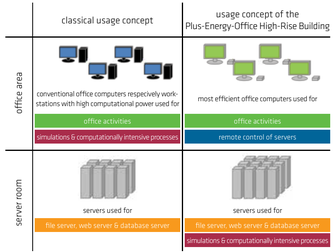
Energy efficiency



To guarantee a pleasant indoor temperature as well as energy efficiency, reducing heat loss and heat input is essential. This is achieved by developing the passive construction, i.e. thermal bridge-free insulation, an extremely air-tight building shell, a ventilation system that has heat and moisture recovery and external blinds that provide shade.

Furthermore, optimising all energy consumers will ensure that internal loads are reduced to a minimum, as only energy-efficient equipment will be used, and only when it is really needed.
The building is fitted with intelligent technology which ensures each room is in a position to consume the lowest amount of energy possible. The integrated monitoring system makes it possible to study and optimise the building.

Usage concept



TU Wien's research activities require standard office computers, and also workstations on which simulations and complex calculations can be carried out. This equipment is usually kept in the office space itself and adds unwanted heat to rooms.

The usage concept of the Plus-Energy-Office High-Rise Building specifies among other things that computationally intensive processes and the respective applications be moved from the workstations to the servers in the server room, where the heat generated can be dissipated efficiently or be used to provide heating in the colder months. Suitable IT solutions are required to move these computationally intensive processes to the server room and users must be involved in the related planning.