

ETH Domain

Since 2006 the ETH Domain has been characterised a very rapid expansion in teaching and research, fast-growing student and teacher numbers, and novel large-scale research facilities. The extent to which technology is used in the buildings is constantly increasing as a result of the latest laboratory technology and other innovations. Thanks the modernisation of building technology, increased recovery of waste heat and great endeavours to ensure that large-scale research facilities are as energy-efficient as possible, energy efficiency has been improved by 19.7% since 2006, although total energy consumption has risen by 5.7%.



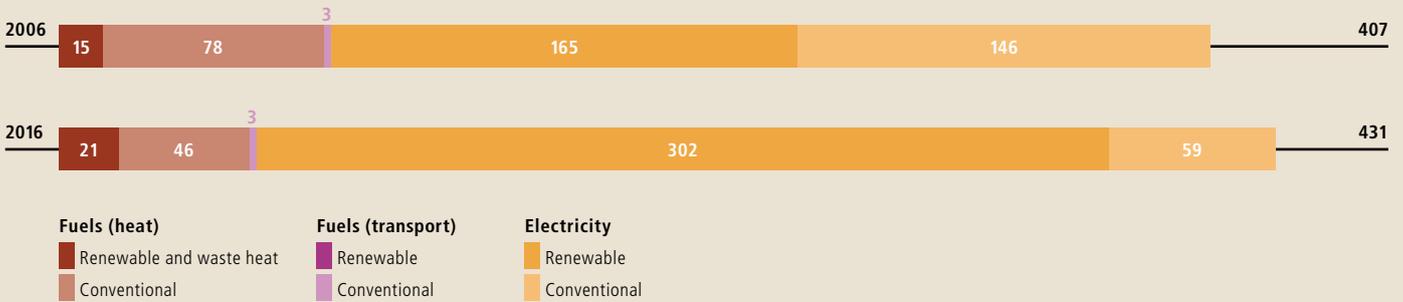
Success story

Reducing the energy requirement and producing power

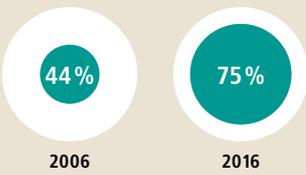
The Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) consistently pursues a CO₂-neutral strategy for its building stock. It has renovated two buildings dating from the 1950s to ultra-modern energy standards. Thanks to better thermal insulation of the buildings, for example with an additional facade layer made of 24 cm of glass wool, a weather layer made of sustainably-produced wood and high-insulation windows, the existing woodchip heating system is now sufficient, together with heat recovery, to heat all of WSL's buildings in Birmensdorf CO₂-neutrally. The existing oil heating is used only as a back-up for emergencies. Since January 2017 the new solar panel roofs have been producing about 110 MWh of renewable electricity per year, which WSL consumes itself. Moreover, thanks to sensor-controlled LED lighting, the buildings also require significantly less power. The two renovated buildings are the first in the canton of Zurich to fulfil the requirements for both the Minergie-P-ECO and the Minergie-A-ECO standards. As plus energy houses, they produce more energy than they themselves consume.

Final energy consumption by energy source

in GWh/y

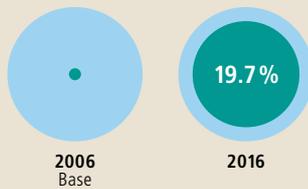


Renewable energy as a proportion of total consumption

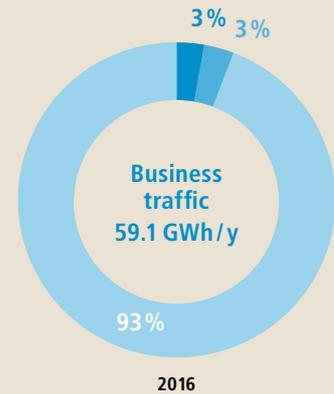


Increase in energy efficiency

Target 2020: 25%



Energy consumption for mobility

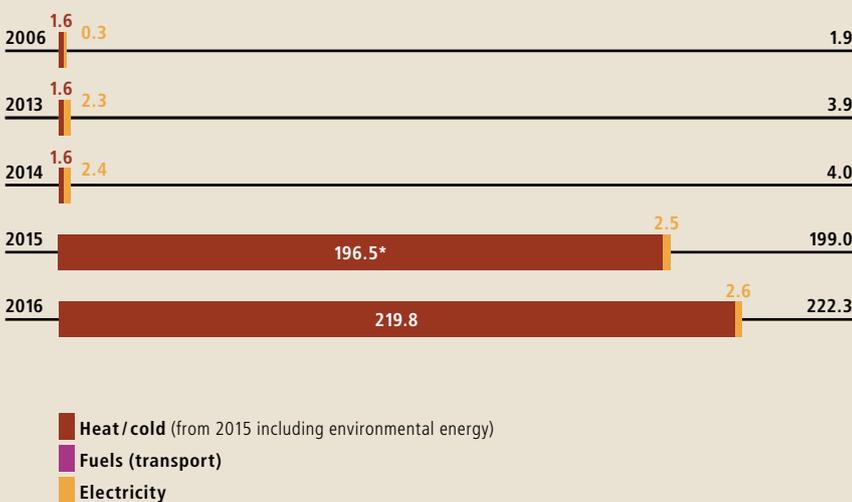


Car Train / bus Air

Note: Percentage shares based on energy consumption. Commuter traffic has not yet been measured.

Production of renewable energy

in GWh/y



*The figure for the production of renewable heating and cooling energy had to be corrected retrospectively.

Joint measures



No. Measure

Buildings and renewable energy

- 01 ● Energy-efficient new and converted buildings
- 02 ● Analyses of potential of waste heat and renewable energy
- 03 ● No new fossil-fuel powered heating systems
- 04 ● Full cost accounting of energy efficiency
- 05 ● Energy-efficient lighting
- 06 ● Energy-efficient cooling machines
- 07 ● Energy-efficient sanitation facilities
- 08 ● Energy-efficient electromotors
- 09 ● Building technology with operating optimisation regime
- 10 ● Procurement of green power and hydroelectricity
- 11 ● Mobility concepts for buildings
- 12 ● Creation of ecofunds

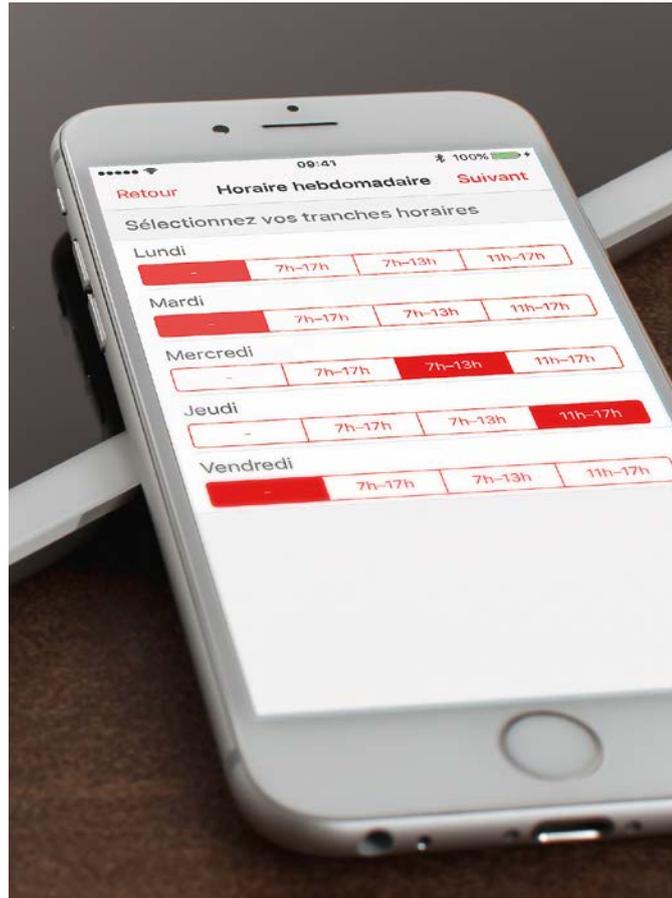
Mobility

- 13 ● Integration of mobility management
- 14 ● Central information and booking platform
- 15 ● Encouragement of mobile-flexible forms of work
- 16 ● Promoting work hubs
- 17 ● Promotion of video and web conferencing
- 18 ● Incentives for using public transport
- 19 ● Providing or co-financing PT season tickets
- 20 ● Criteria for choosing mode of transport
- 21 ● Active parking space management
- 22 ● Provision of bicycle parking spaces
- 23 ● Provision of bicycles and e-bikes
- 24 ● Criteria for procuring energy-efficient vehicles
- 25 ● Eco-driving training courses for frequent car users
- 26 ● Promoting the use of car sharing agencies
- 27 ● Joint use of a company carpool
- 28 ● Provision of charging stations for electric vehicles

Data centres and green IT

- 29 ● Full cost accounting of energy efficiency
- 30 ● Specifications for new servers and new data centre hardware
- 31 ● Highly energy-efficient data centres
- 32 ● Pushing passive cooling solutions in data centres
- 33 ● Encouraging server virtualisation in data centres
- 34 ● Bundling of data centres / outsourcing of IT services
- 35 ● Monitoring and evaluation of new technologies
- 36 ● Promotion of waste heat recovery
- 37 ● Promotion of economy mode at computer workstations
- 38 ● Promotion of energy-efficient printing solutions
- 39 ● Promoting re-use of appliances

- Adopted and at least 80% achieved
- Adopted and in implementation phase
- Adopted, no data yet
- No leeway for action



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Active parking space management

EPFL's mobility plan took effect in 2016 with a 260% increase in the price of the car parks. The proceeds from these increases are paid into a mobility fund which finances accompanying measures promoting sustainable forms of transport. For example, EPFL offers a 15% discount to holders of public transport season tickets in addition to a zero charge for the SBB half-fare travelcard. Management of the car parks has been digitised and so it is now possible to charge for use by the half day/full day/month, with invoicing to the internal electronic wallet (CAMIPRO). It is one way of encouraging multimodality of journeys, according to the seasons or personal and work schedules, and of reducing the modal share of private vehicles on the campus.

Specific measures



No. Measure
Target (target year)

01 ● Research in the field of exemplary energy measures

- Implementation of the Swiss Competence Centers for Energy Research (SCCER): research on energy topics such as “Power supply”, “Storage”, “Grids and their components, energy systems”, “Efficient concepts, processes and components in mobility” and “Biomass”.
- NEST, a practical laboratory for intelligence in the building
- Smart Living Lab, a research and practical laboratory for integrating systems to generate energy from renewable energy in buildings.

New research projects (2020)

02 ● Teaching in the field of energy
Exemplary offerings from the new study and continuing education programmes

- Introduction of a master’s course in Energy Science and Technology at ETH Zurich.
- Master’s course in energy management and sustainability at EPFL

New study courses (2020)

03 ● ETH Zurich: Construction of the Energy Grid on the Hönggerberg campus
14.0 GWh/y of heat (2020)

04 ● PSI: Improved waste heat recovery on the research site
75% waste heat (2018)

05 ● EPFL: EPFL’s autonomous heat supply. Target: heating without fossil fuels by 2019, maximisation of the use of renewable energy for heating and cooling (100% heat pump with lake water) by 2019; minimisation of CO₂ emissions, use of potential synergies with other projects on the campus.
100% renewables (2019)

06 ● WSL: Conversion of all WSL’s own sites to CO₂-neutral heating. Target: reduction of CO₂ emissions by 97% from 2006 to 2020, reduction of the heat requirement by 25% by 2018.
CO₂ reduction (2020)



02

Teaching in the field of energy

Mobility is key to achieving the climate objectives and implementing the Energy Strategy 2050. This is the field of research of the Swiss Competence Center for Energy Research – Efficient Technologies and Systems for Mobility (SCCER Mobility), one of eight research competence centres under the Coordinated Energy Research Switzerland action plan. ETH Zurich is offering for the first time the MAS/CAS Mobility of the Future continuing education programme. The programme is part of the strategy of linking SCCER Mobility’s research with practice and of promoting a continuous exchange. The participants – specialist executives and managers of national and regional transport providers as well as people from industry and administration – develop knowledge and technologies that enable a switch to a sustainable transport system.



01

Ganymeth methanisation plant

In 2016 a further important component of the Energy System Integration platform at the Paul Scherrer Institute was established with the Ganymeth test installation. In this installation, different variants of the power-to-gas process can be tested on a fluidised bed reactor: mixtures of hydrogen, carbon monoxide, carbon dioxide and hydrocarbons can be converted into pure methane, which is suitable for being fed into the gas grid.



01

Energy-efficient sweeping vehicle: hy.muve II

At the end of August 2016, a two-year field test was launched in Dübendorf to refine the technology of the hydrogen-powered sweeping vehicle. The vehicle is refuelled at Empa’s hydrogen filling station and consumes 60% to 70% less energy than a conventional diesel vehicle.

- Reduction target attained
- Target