



## Exemplary in energy

### Setting a good example

Technical implementation of measure no. 31:  
Highly energy-efficient data centers

# Free cooling for premises with electronic equipment



Outside view of the Wankdorf DC

**In terms of energy efficiency, Swisscom's new data center is way above average, having a PUE (Power Usage Effectiveness) value of 1.2. Its high efficiency is attained primarily by means of the new free cooling process. In Switzerland, the process can be utilized all year round for all information and communication technology equipment.**

Free cooling means free-of-charge cooling. Although cooling is not completely free of charge, use is made of freely available cold from the environment – for example, outside air in the Wankdorf data center (DC) in Bern. This means that power consumption and power costs are massively reduced compared to cooling with refrigeration machines.

#### **System temperature is decisive**

A high system temperature is a decisive factor for the successful use of free cooling: the free cooling share increases by about 300 hours per year for every degree celsius. Accordingly, the IT infrastructure in the Wankdorf DC is allowed to operate for a few hours at temperatures of over 28° C, which is guaranteed by the IT suppliers. A maximum temperature of 28° C is maintained in the premises the rest of the time. With these temperatures, Swisscom can guarantee that the data center is cooled all year round by free cooling, and no emergency cooling systems are needed whatsoever.

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## Strict separation of air flows

Figure 1 shows the free cooling system in the Wankdorf DC. The server rooms are cooled only by means of circulating air. This means no outside air is fed in directly. Hot and cold air flows are strictly separated by encasing the hot air generated by the IT equipment (figure 2). The hot air heated in the casing can reach up to 42° C. This air is cooled down to 26° to 32° C via heat exchangers connected to a water circuit and is then blown back into the rooms contain-

ing the servers. The water circuit in turn is connected via heat exchangers to the City of Bern's district heating system. In this way, apartments and offices in the neighbourhood are heated with the waste heat from the data center. The water circuit in the data center is cooled down at the same time. Excess heat is subsequently cooled by means of hybrid recooling units. "Hybrid" means that the recooling units can operate in both dry and humid modes.

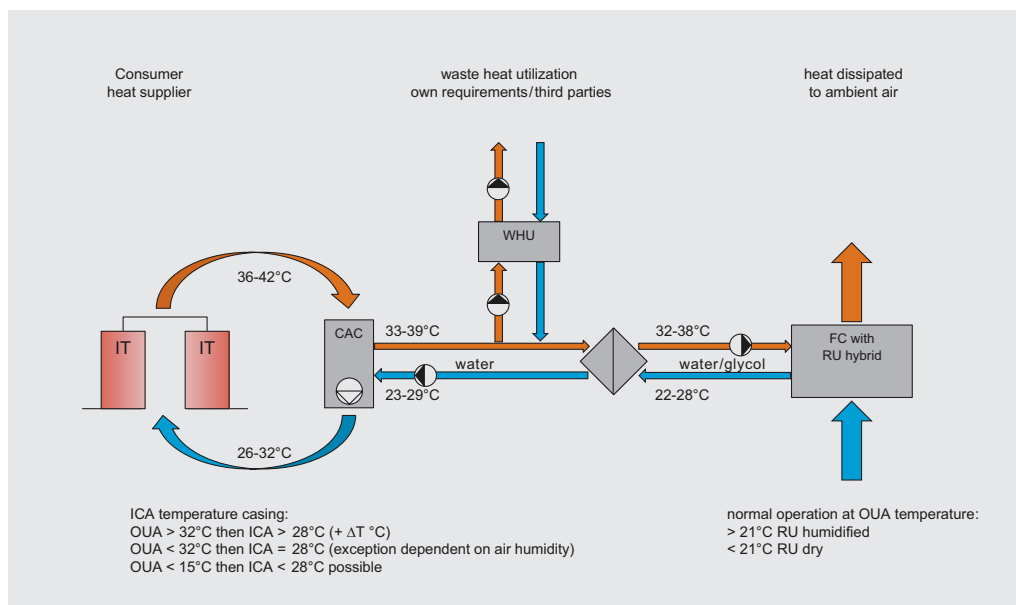


Figure 1: Diagram of free cooling in the Wankdorf DC

(OUA: outside air, ICA: incoming air, CAC: circulating air cooler, WHU: waste heat utilization, FC: free cooling, RU: recooling units)



Figure 2: Diagram of casing to channel hot air flow



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At outside air temperatures of below 21° C (the normal situation), the recooling units operate only in dry mode, that is, the heat can be dissipated by convection to the ambient air. In the case of higher outside air temperatures, the system switches over to humidified recooling. In this case, rainwater collected in a tank with a capacity of approx. 2,000 cubic meters is injected into the hot air stream, and heat is extracted from it through evaporation. The rainwater is cleaned by means of an osmosis process so that it does not soil the recooling units. With this system, the power consumption for cooling and air conveyance amounts to 8% of the data center's total consumption (4% each for cooling and air conveyance). That is less than one quarter of the European average of 37%. The power consumption of each component of the cooling is continuously monitored via the MSR system.

### Planning and implementation

To cool its data centers, Swisscom follows the guidelines of the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).

In addition, Swisscom's internal standards for energy-efficient DCs were factored into the planning from the outset. Moreover, a member of Swisscom's sustainability team was represented on the project team for the new DC. Swisscom collaborated with the company RZintegral AG for the innovative cooling process. The persons in charge of the project at Swisscom are very satisfied with the way the planning and implementation went and would proceed in the same way if they had a similar project again. The system has also proved itself in operation. Even during the heatwave in summer 2015, cooling could be guaranteed with any problems.

### Free cooling also cuts costs

Swisscom inaugurated its new data center in Bern-Wankdorf in September 2014. The initial version comprises four modules, each with an effective IT output of 600 kW and has space for over 5,000 servers. If necessary, Swisscom can extend the building to a maximum of seven modules with a total of 4,000 sq. m. of space usable for ICT. Swisscom has invested about CHF 60 million in the new data center. The investment costs for the cooling system were less than CHF 10 million. This cooling system is more cost-effective than conventional cooling systems. Savings are made not only on investments but also on operating costs, as only about 50% of the energy utilized in conventional data centers can be used by IT. The rest is expended on cooling, ventilation and other electricity-consuming functions.

In the Wankdorf DC, 82% of the energy can now be expended on the IT infrastructure. The inverted value – known as PUE (Power Usage Effectiveness) – is thus 1.2.



Hybrid recooling units on the roof of the Wankdorf RC

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## Awards

In January 2015 Swisscom received the “Golden Watt” award from the Federal Office of Energy for this new data center. Swisscom sources 100% of the power for the data center from renewable, domestic energy. The new Wankdorf data center is the first one in Switzerland to gain the Tier IV certification from the Uptime Institute. It thus meets the highest requirements in terms of availability, safety and efficiency.

## Implement the measures yourself.

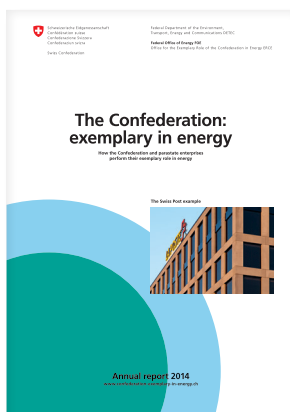
- The standard that applies to the environmental conditions of information and communication technology equipment in telecom buildings and data centers is ETSI standard 300 019-1-3, class 3.1. By incorporating these specifications, it is possible to have full free cooling all year round in Switzerland without refrigeration machines (hybrid with circulating air or directly and only with outside air).
- Since the standard is, in principle, also applicable to other electronic appliances, premises with electronic equipment can be cooled 100% by free cooling in Switzerland.

## Further information

- Swisscom [website](#) about the Wankdorf DC
- [Media release](#) on the inauguration of the Wankdorf DC in September 2014.

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## Exemplary in energy

The annual reports form the core of the reporting by the Exemplary in energy initiative. They present the 39 joint measures and summarize the actors' actions plans, which also contain their specific measures. Furthermore they enable all the measures to be monitored. You will find the reports on [www.exemplary-in-energy.ch](http://www.exemplary-in-energy.ch).

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