

The energy marketplace – Innovative energy concept for Berlin TXL

At an exchange point for heating and cooling Berlin TXL' users will be able to trade energy. The low temperatures of the LowEx Network mean the greatest possible efficiency and make it possible to use renewable heat sources at the same time.

Berlin wants to be climate-neutral by 2050. With an innovative combination of different technologies Berlin TXL will be an urban laboratory for a carbon-neutral city district. One of the biggest city development projects in Europe will be completed on the site of the present airport after its closure. The Berlin TXL research and industrial park – the Urban Tech Republic – provides space for up to 1,000 businesses and 20,000 employees. In the immediate vicinity of the Urban Tech Republic, a smart residential district – Schumacher Quartier – will be developed, with more than 5,000 homes for more than 10,000 people. The sustainable energy concept for the site is unique for its size in the world.

The future-oriented concept for the Urban Tech Republic and Schumacher Quartier goes far beyond just decarbonizing the energy supply. In particular it makes a future without fossil fuels possible for the heating and transportation sectors. The energy concept's guiding principle is a marketplace for heating and cooling.

This LowEx (Low Exergy) Network, as it is called, is operated at temperatures of up to 40 degrees Celsius. Compared with standard district heating with temperatures of more than 100 degrees, the losses in the LowEx Network are smaller. Moreover, the low operating temperature now makes it possible to use environmentally-friendly heat sources.

In the decentralized energy marketplace consumers can in addition feed surplus waste heat from buildings, waste water, server rooms, and industrial facilities into the Network's ducting system. The concept envisages for instance close-to-surface geothermal energy and solar energy systems as sources of renewable energy.

An entirely newly-developed urban district offers ideal conditions for this innovative energy concept, as the concept can be incorporated at all planning stages. New and existing constructions are equipped with panel heaters for this purpose. Existing buildings such as the hexagonal former airport terminal from the 70s will be equipped with modern thermal insulation. The LowEx Network's low flow temperature of 40 degrees Celsius during the heating season is made possible only by a combination of low energy demand and panel heaters.

In summer on the other hand the buildings can be cooled via the same heating surfaces in the walls or floors. This works because in the warm season the LowEx Network runs at a mere 20 degrees Celsius. During this time the ground serves as a natural cooling source.

Furthermore, heat pumps can regulate the Network's temperature level rapidly and flexibly. For this purpose, pumps known as reversible high-capacity pumps are installed in the energy center located in the south of the site that can switch from heating to cooling. Heat pumps installed at the users' premises provide additional heating or cooling energy upon demand.

The passive cooling works via the components of the buildings. The LowEx Network's liquid heating medium circulates in the heating panels where it absorbs heat in the summer. The Network conducts the heat via the geothermal probes into the ground. In effect the subsoil functions as seasonal storage. Surplus heat from summer can be used for heating in winter.

Cooling energy accrues in winter as a waste product from the heat pumps and is conducted into the ground to cool the building during the hot season. There will be short-term storage for heat and cold in the form of subterranean tanks located in the vicinity of the energy center. This optimizes the operation of the high-capacity heat pumps and increases the energy efficiency of the system still further.

In the future energy center at Berlin TXL all the data from the energy marketplace flow at the same time. A comprehensive control and information technology system regulates the complex interaction between many input sources and the consumption billing via smart meters. The Berlin LowEx Network thus becomes an exemplary model for digitalization of the heating sector. In the energy center's showroom interested parties can learn about the energy concept for Berlin TXL and find details regarding the LowEx Network.

Energy supply is also controlled by a digital smart grid. As a result electricity from the photovoltaic systems on renters' roofs, for example, can be intelligently applied. Depending on the situation, solar power charges electric vehicles or stationary accumulators, covers peak loads from businesses, or provides control energy for the European power grid. At the same time data from weather forecasts and from energy exchanges can be taken into account, as are forecasts of user demand.

The entire energy concept for Berlin TXL is structured in modules. In a first step high-efficiency co-generation units will save a considerable portion of the fossil energy. They will supersede older, gas-fired heating stations on the former airport grounds that will only cover the peak load in future on particularly cold winter's days. Thanks to the modular structure the energy supply can be extended step by step.

The co-generation units can be operated carbon-neutrally for example if they use biogas or what are called synthetic gases, such as methane or hydrogen, which are obtained through conversion from green electricity. Besides power-to-heat solutions such as heat pumps, this power-to-gas technology is an approach that is important for sector coupling and thus for the comprehensive decarbonization of the entire energy supply as well. By 2050 Berlin TXL's carbon emissions will be reduced to a minimum.



The operation of the LowEx Network will be taken over by Berliner Stadtwerke and E.ON. In November 2018 this bidding consortium had prevailed in a Europe-wide invitation to tender for the concession for supplying heating and cooling to Berlin TXL.

The heating costs for renters at the site are expected to be lower than for district heating and with very good sustainability values. Developers can also implement their own plans for energy supply to their building if they can show that they are more sustainable than those of the operator.