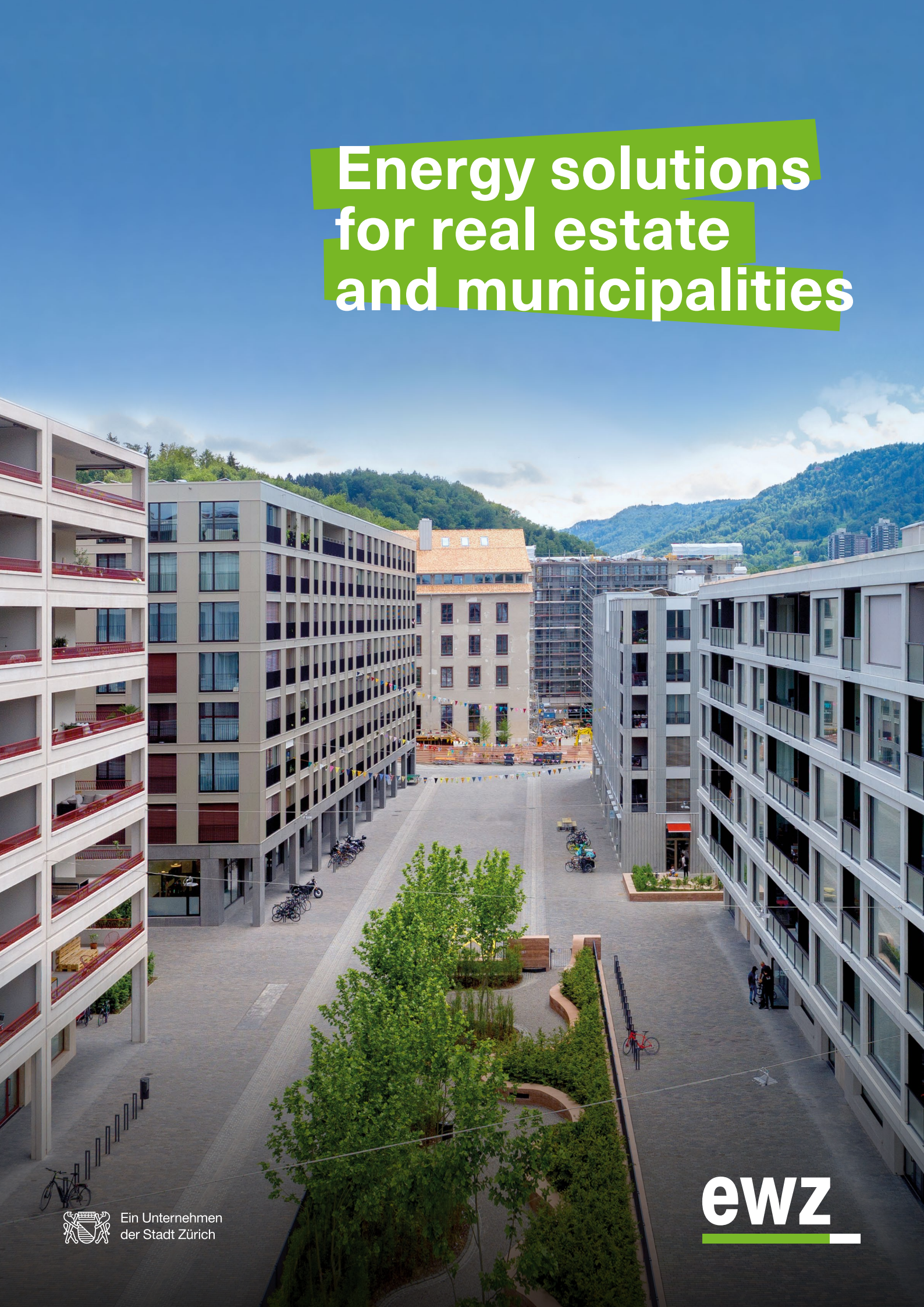
Energy solutions for real estate and municipalities



Ein Unternehmen der Stadt Zürich

ewz

Contents

Foreword

The decarbonisation of Switzerland's building stock is steadily increasing the demands placed on our residential areas and the building stock itself. New construction or renovation projects are becoming more complex, with holistic approaches and partnership models gaining in importance. They do not replace stakeholders in a project, but rather optimise their collaboration.

Integrated energy solutions that deliver heat, cooling and electricity from renewable sources through the grid are ideal if the potential for energy efficiency and a reduction in emissions is to be utilised to the full. Networking systems generates synergies that standalone solutions simply cannot achieve.

Another key to decarbonisation and the efficient supply of heating and cooling are thermal grids for entire neighbourhoods and municipalities. The use and combination of local, climate-friendly energy sources meets legal requirements, while bundling plants and infrastructures delivers economies of scale that reduce the costs of generating energy.

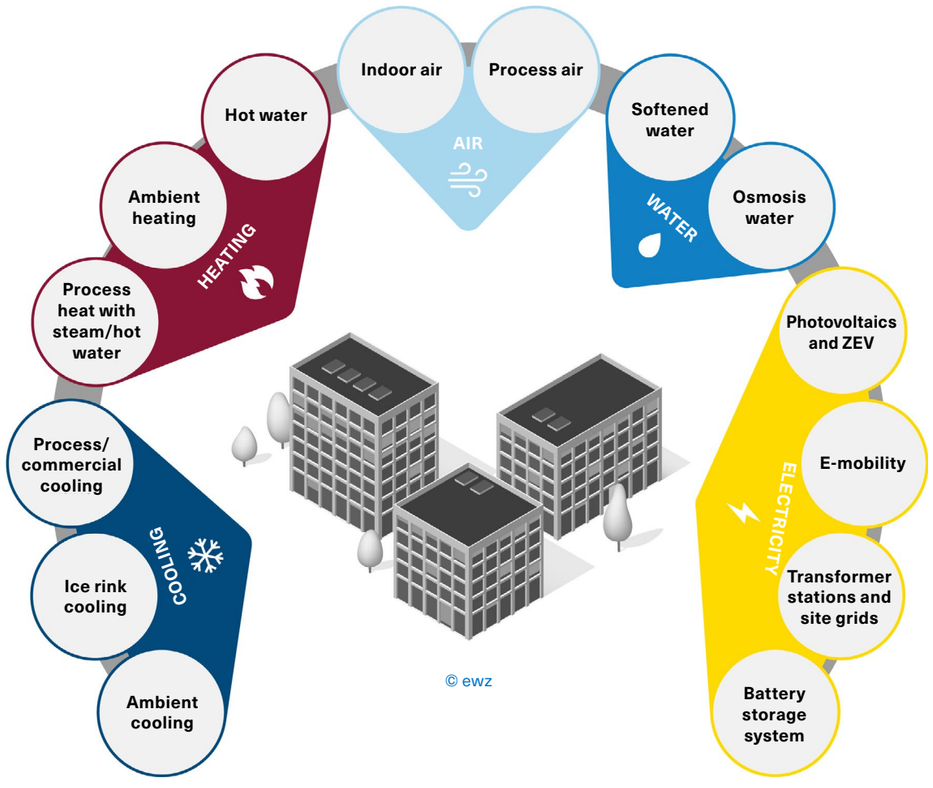
As Switzerland's leading energy service provider, we will support you in the development and implementation of innovative energy infrastructure projects. We would be happy to come to you and present energy solutions that have already been implemented and explain the different concepts.

Christoph Deiss,
Head of Energy Solutions, ewz,
Member of the Management Board

Integrated energy solutions – synergies from holistic supply concepts

Integrated energy solutions are the key to sustainable sites and complexes. In addition to supplying heating, cooling and power, they also incorporate electromobility. Networking the components allows the best possible coordination of power generation, storage and consumption. This results in an overall system that creates added value for the owners, the users – and the environment.

To make the best possible use of synergies, our experts start planning at an early stage and tailor their plans to local conditions. The development and combination of local renewable energy sources and the decentralised generation of electricity play a key role. With the aid of data-based analyses, we identify usable energy sources such as ambient heat or waste heat – even across different properties. We guarantee high security of supply with low energy costs over the long term – both in new buildings and in renovated existing properties.



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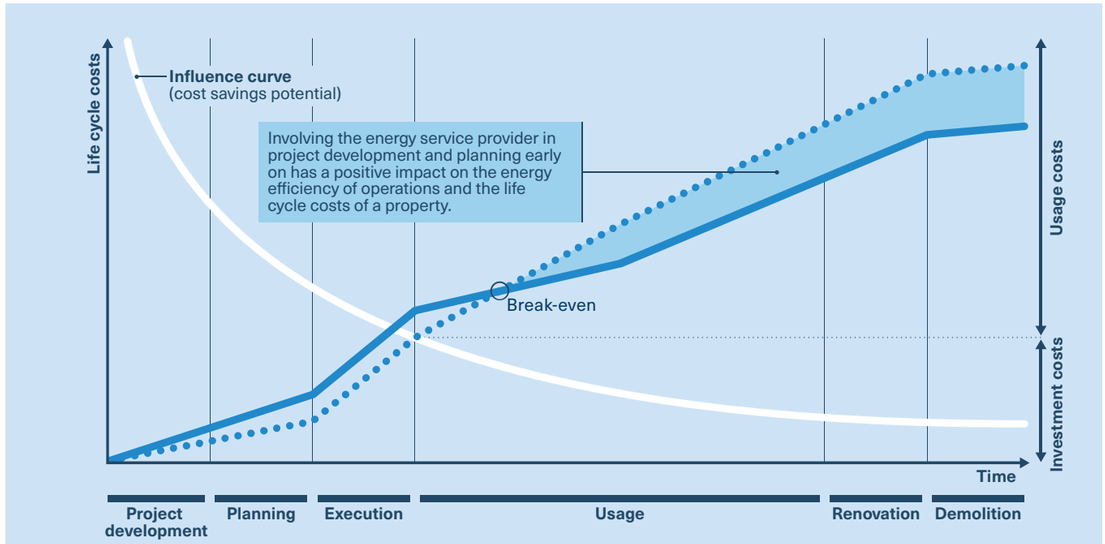
Energy as a Service – using instead of owning

Using instead of owning is a principle that is ideally suited to integrated energy solutions. If you opt for an energy-as-a-service model, you are outsourcing the planning, construction and operation of your entire energy infrastructure to us. Once the energy infrastructure has been built, we will operate and optimise the energy systems on an ongoing basis with our operational specialists and professional energy management. Our full-service package also includes maintenance and renewal of the systems, a 24/7 on-call service for troubleshooting and the supply of customised energy data for reporting and billing.

You decide whether you bear the costs of the energy infrastructure yourself or share them with us, or whether we should assume the financial and technical risks in full, without you having to incur any capital expenditure (CAPEX). Either way, you benefit from an efficient solution and long-term predictability of energy costs. You can rest assured that your properties will always be efficiently supplied with energy and enjoy low operating costs in the long term.



Optimisation of life cycle costs for properties. © ewz
Based on: Preuss N., Schöne L. B., 'Real Estate und Facility Management – Aus Sicht der Consultingpraxis' (Real Estate und Facility Management – From the Perspective of Consulting Practice), Springer Verlag, 2010

Examples of best practice
Integrated energy solutions

Swiss Life Arena, Zurich

The Swiss Life Arena is a showpiece for energy efficiency and can accommodate up to 12,000 hockey fans or event visitors. The integrated energy solution from ewz combines ecology, energy efficiency and cost-effectiveness by exploiting synergies between heating/cooling and power generation.

A core of cooling machines

The cooling machines produce cold air for the ice of the two rinks and for the demand-based dehumidification of the ambient air in the stadium. Where cold air is generated, so too is waste heat. We use this for heating the arena and for producing hot water. Since the stadium was opened, we have been able to cover almost 100 per cent of the heating requirements with the waste heat.

Optimal energy management

By connecting the Swiss Life Arena to the Altstetten energy network, we ensure loss-free energy management. If cooling in the arena creates excess heat, we feed this into the grid's anergy network. We also use the cooling machines to cool the surrounding office buildings. A photovoltaic system on the roof of the Minergie-certified stadium delivers around 400 MWh of electricity a year This is used for the power generation plants and for the operation of the Swiss Life Arena.

Energy solution from a single source

ewz planned, implemented and financed the energy solution for the home stadium of the ZSC Lions. Since it opened, we have also been responsible for the energy-efficient operation of the systems. A remote monitoring system enables us to intervene quickly and resolve faults if and when required.

You can find further information at:
ewz.ch/en/swisslifearena

© ewz

Côté Parc, Geneva

'Côté Parc' is a modern site that includes a retirement and nursing home, a hotel, a restaurant, a grocery store, apartments and a nursery. ewz was involved in the project at an early stage and was able to provide a sophisticated building services system that optimally coordinates energy production with energy consumption, increasing efficiency and reducing costs.

Geothermal probes and photovoltaics

The energy for the heating and cooling supply comes from 41 geothermal probes in an internal and an external field. The internal field is cooler than the external one and is used for cooling in summer. The external field is operated at a higher temperature, as it is actively regenerated in summer using the waste heat from free cooling. In winter, both fields provide the thermal energy for heating the four buildings. A photovoltaic system covers around a quarter of the site's electricity requirements. A 'self-consumption association' (ZEV) allows the systems to be operated economically, giving users the benefit of affordable solar power.

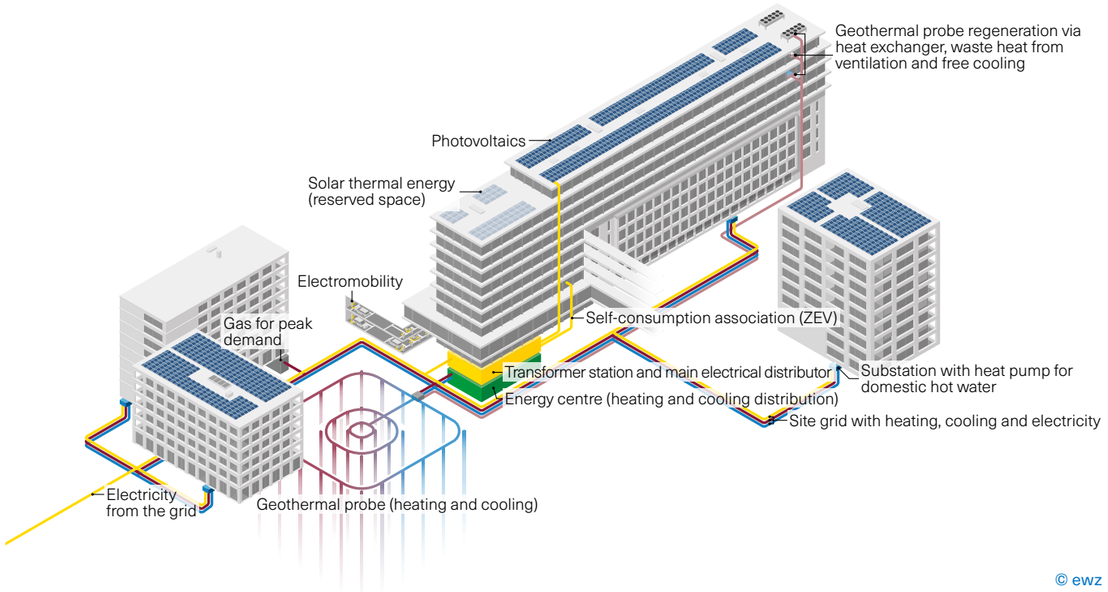
Future-proof charging infrastructure

Electromobility is also part of the energy solution. Twenty parking spaces have been equipped with a charging station, while others can be retrofitted with little effort if required. A load management system coordinates the consumption of the charging stations with that of the buildings.

Sustainable and practical

Our comprehensive energy-as-a-service model offers owners a range of benefits. Planning, financing, implementation and operation of the energy infrastructure from a single source ensure the long-term efficiency and reliability of the energy solution.

You can find further information at:
ewz.ch/en/cote-parc



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SBB Werkstadt, Zurich

SBB wants to transform the 42.000 m² Werkstadt site into a vibrant urban space by 2035. Working in coordination with the monument preservation authorities, it is converting the existing buildings and adding new structures and more storeys.

Environmentally friendly construction

Various climate-adapted building measures have been incorporated into the planning. Sealed surfaces will be largely unsealed and the arrangement of the new buildings will allow the easy circulation of cool air currents in the future as well. SBB is is particularly keen to ensure that building components are reused and the CO_2 emissions of buildings are minimised over their life cycle.

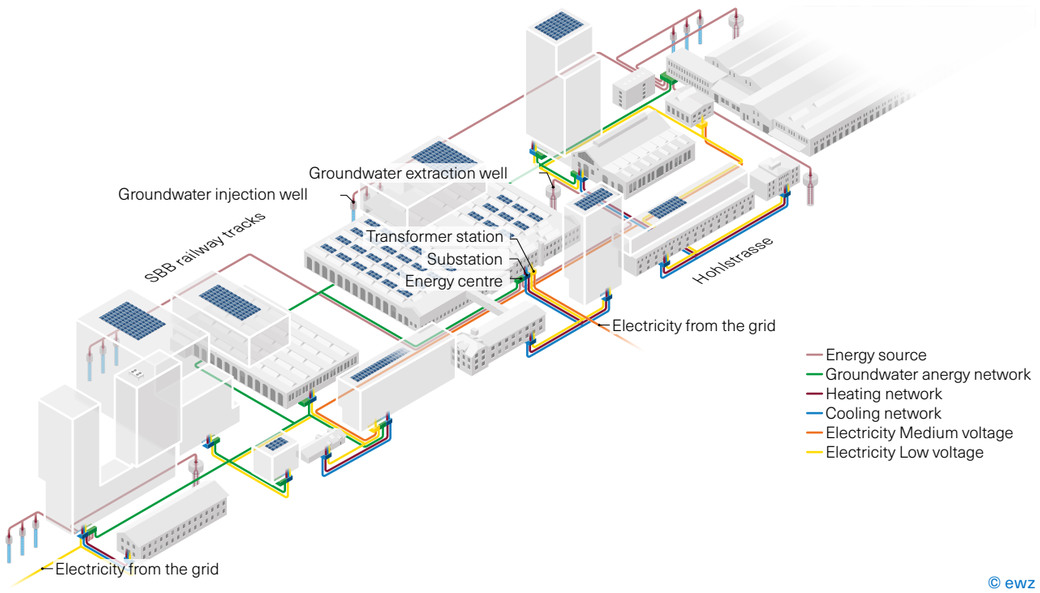
Energy concept: 100 per cent carbon-free

The energy solution developed by ewz utilises groundwater as a heating and cooling source. An anergy network connects the buildings so that excess energy can be exchanged between the building groups. Solar power will be generated on the site and utilised locally through a 'self-consumption association' (ZEV). The high self-consumption rate boosts the cost-efficiency of the photovoltaic systems.

Low financial risks

We are responsible for the planning, implementation, operation and maintenance of the systems for 45 years. We also handle the consumption-based billing for solar power. SBB and ewz are financing the energy solution jointly, minimising the financial risk for SBB. Since it was commissioned, we have constantly optimised operation of the system with the aim of keeping energy consumption and costs as low as possible.

You can find further information at:
ewz.ch/en/werkstadt



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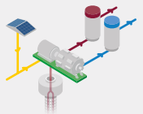
Planning, implementation and financing of technical systems	Heating and cooling	Photovoltaic solution and self-consumption association	Electricity and site grid	Advice, operation, site monitoring and optimisation
				

BELLIS, Effretikon

The BELLIS complex is the first component of the Bahnhof West Urban Development masterplan in Effretikon. The complex meets the requirements of the SIA Energy Efficiency Path: a maximum of 2,000 watts of primary energy per person, a 100% renewable energy supply and net zero greenhouse gas emissions by 2050.

Eco-friendly heating and solar power

Since it was not possible to install geothermal probes, the thermal energy required for heating is generated by an air-to-water heat pump. To minimise heat losses, the hot water is produced by fresh water stations as and when required. A photovoltaic system supplies the buildings with carbon-free solar power, which is billed through ewz. Operation of the heat pumps and charging stations is coordinated with solar power production, giving a self-consumption rate of over 60 per cent.

Parking spaces prepared for electromobility

Currently 13 parking spaces are equipped with wall boxes. All the others have the necessary installations to allow quick retrofitting. If residents notify us of any further requirements, we can install a wall box at low cost in a matter of weeks.

Comprehensive service package

ewz planned, implemented and financed the integrated energy solution. With the energy-as-a-service package, we are responsible for ensuring smooth operation for the contract term of 30 years. Since the technical building systems were put into operation, we have been monitoring the settings and adapting them to the needs of users on an ongoing basis.

You can find further information at:
ewz.ch/en/bellis

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Thermal grids – climate-friendly energy from the region

In Switzerland, an increasing number of thermal grids are supplying entire sites, neighbourhoods and municipalities with local, environmentally friendly energy for heating and cooling. They help regions create added value and are indispensable for decarbonising the building stock.

Network solutions for district heating and cooling – known as thermal grids – are important components of a fossil-free energy supply. Connection to a thermal grid allows properties to be efficiently supplied with renewable energies. Whether a high-temperature or low-temperature grid, they are suitable for entire neighbourhoods and municipalities.

Environmental and economic benefits

Thermal grids offer numerous advantages: little technology is required in the buildings themselves, for instance, leaving more room for other uses. As an owner, you are on the safe side with our environmentally friendly heating and cooling supply and are already making an important contribution to Switzerland's climate goals. Costs can be planned over the long term and the supply of heating and cooling is extremely reliable. Thermal grids make economic sense, in densely populated urban areas especially, but also in rural municipalities. Suitable energy sources include waste heat, ambient heat or biomass such as wood fuel. The potential of renewable sources and waste heat remains high – according to the federal government's Energy Perspectives 2050+, annual heat generation could more than double.

ewz – a pioneer with many years of experience

ewz is a pioneer in the implementation of climate-friendly network solutions. We have been successfully planning, financing, building and operating thermal grids for district heating and cooling throughout Switzerland for more than 25 years. Based on the site-specific conditions and the energy sources available locally, we provide you with expert support on your path to a sustainable energy supply.

Individual cooperation models for cities and municipalities

In our cooperation models, we work closely with municipalities throughout Switzerland to develop solutions tailored to your needs. The type of model depends on your environmental and economic objectives, your skills and your resources. Whether you want a comprehensive service package or call in our experts for individual services as and when required, it's up to you.

- If you choose ewz as a full-service provider, you get everything from a single source – from planning through financing and implementation to the operation of a thermal grid. You do not incur any risks at all – we take on the investments and bear the financial and technical responsibility.
- If you would prefer to use ewz for individual services, you can choose those that suit you best from a wide range. The clear division of tasks based on the respective skills and the financial and personnel resources allows projects to be implemented efficiently.

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From a cooperation model with distribution of tasks to a holistic service package
You decide which tasks you take on in which phases and when ewz should take the lead.

Phase	Project development and financing	Planning and acquisition	Execution	Operation
Responsibilities	• Development of project idea • Modelling of heating demand • Development of technical concept • Development of business plan • Selection of cooperation model • Development of milestone plan	• Detailed planning and building permits • Coordination of all parties involved in construction • Development of offer and tariff model • Preparation of sales documents • Customer advice and acquisition	• Construction of energy centre(s) • Construction of transmission lines and transfer stations • Commissioning • Documentation	• Operation of energy centre(s) • Operation of transmission lines and transfer stations • 24/7 troubleshooting service • Optimisation of operation

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Examples of best practice
Thermal grids

Ilanz heating network

As an Energy City, Ilanz is committed to a sustainable energy policy. It supplies the population with heat and electricity from locally available biomass, relying on ewz as a strong partner with many years of experience.

Local heat and power generation

A wood-fired combined heat and power plant generates heat using wood chips from the surrounding area. The heat is supplied to around 80 local institutions and businesses as well as private households via a district heating network. The use of wood means that at least 80 per cent of the heat is produced carbon-neutrally, saving 620,000 litres of heating oil. The peak load in winter is covered with heating oil. In addition to heating, the plant also generates electricity. Around 1,800 MWh of green power a year, equivalent to the electricity requirement of some 360 households, is generated by means of a steam power plant process.

The heating network as the key to success

The solution implemented by ewz is a successful example of the combination of sustainable energy generation and local added value. It makes a significant contribution to the decarbonisation of the heat supply in the municipality of Ilanz. For property owners, connection to the heating network is an efficient and cost-effective way to heat their building, because they no longer need a boiler room and do not have to organise maintenance. We supply them with heat and electricity safely and cost-effectively.

You can find further information at:
ewz.ch/en/ilanz

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Herrliberg heating network

The municipality of Herrliberg is committed to local value creation and climate-friendly energy sources when it comes to its heat supply. A heating network using two energy sources supplies public and private properties with energy from the ground and local wood while conserving resources.

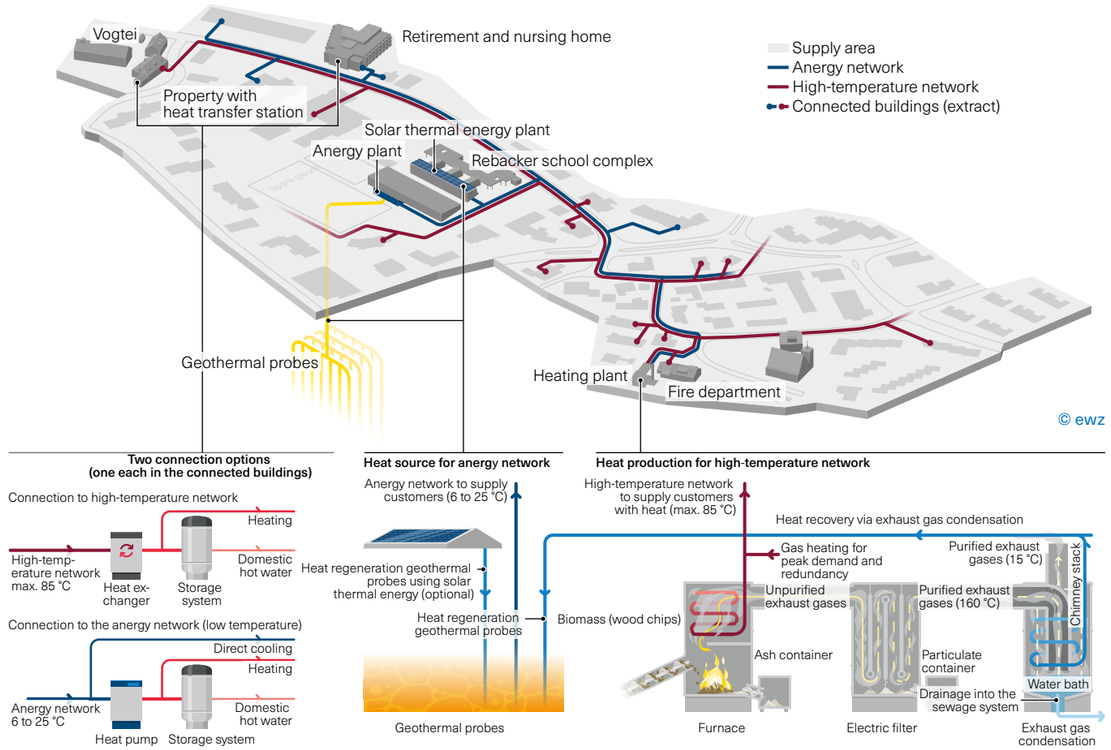
Efficiency thanks to waste heat utilisation

Both the combination of a low-temperature and a high-temperature network and the utilisation of waste heat are unique. The high-temperature network supplies the connected properties with environmentally friendly heating energy and hot water. We extract heat from the exhaust gases of the wood-fired system, which increases the heat yield of the wood-chip heating system by 25 per cent. A condensation plant reduces the exhaust gas temperature from 160 to around 15 degrees Celsius, which has a positive impact on the sustainability of the heating network: The municipality recovers in the region of 800 MWh of heat in this way.

Unique energy solutions that set an example

The anergy network is supplied with heat from a field of geothermal probes. It primarily supplies new buildings and properties of more modern design with district heating. In the connected buildings, heat pumps are used to raise the temperature for space heating and hot water production. They can also be used for cooling. Our energy solutions encompass the planning, implementation, uninterrupted operation and professional maintenance of the systems. The municipality and the local population thus benefit from a reliable supply of heat and cooling that is both efficient and sustainable.

You can find further information at:
ewz.ch/en/herrliberg



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City of Zurich district heating networks

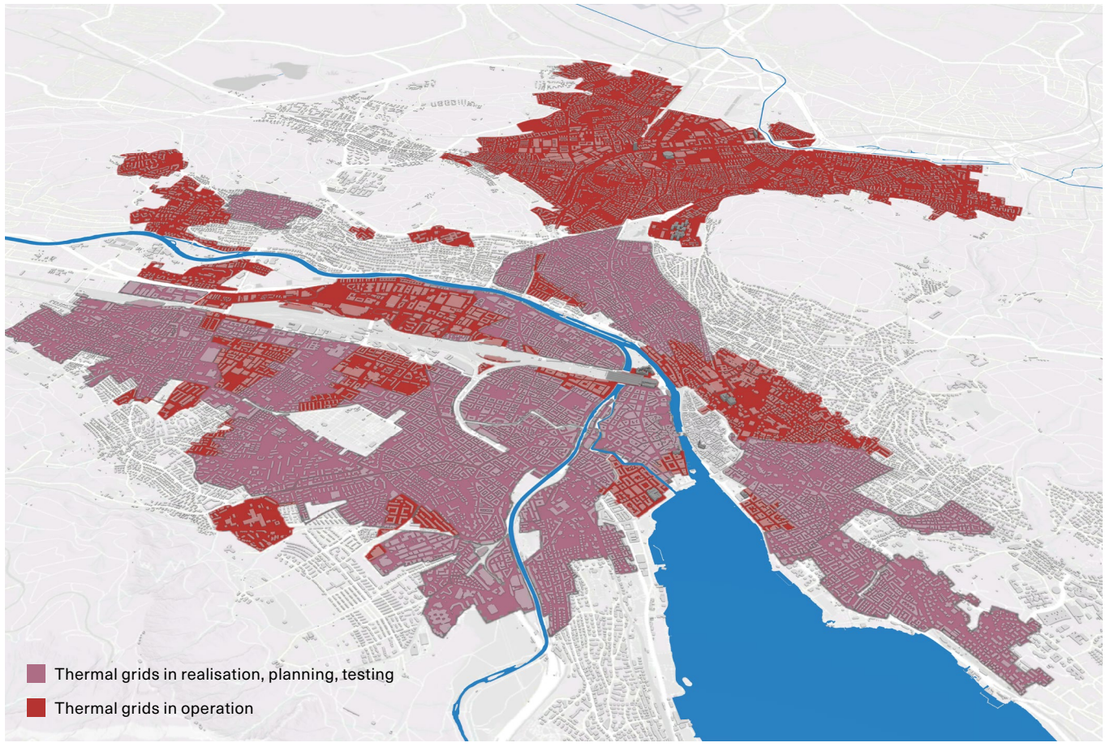
Today, district heating networks cover a good third of the city of Zurich – with that figure expected to rise to around 60 per cent by 2040. ewz's district heating network is the largest in Switzerland and currently covers around 250 kilometres with over 7,500 connected properties. When completed by 2040, it will extend to 400 kilometres.

The city of Zurich primarily uses lake water, waste heat from sewage treatment and waste incineration plants and wood from the local area as renewable energy sources for the environmentally friendly heating and cooling of buildings. Where other local renewable energy sources (e.g. groundwater or waste heat from data centres) are available, these are integrated into the thermal grids.

Water from Lake Zurich as an energy source

Lake Zurich is a huge natural source of energy. The lake water is collected by means of a strainer and pumped to the central lake-water system along pipelines. In winter, we extract heat from the lake water via a heat exchanger and use it as an energy source for the heat pump. This raises the carrier medium to the required temperature level (approximately 40 to 65 degrees Celsius). Distribution in the buildings takes place via a secondary circuit. In summer, the system works in reverse: with free cooling, the lake water can be used directly for room cooling instead of electricity-powered air conditioning. At the end, the lake water removed is returned to the lake without any chemical changes around 150 metres from the shore and the cycle begins again.

Using lake water is ecologically sound. No water is taken from the body of water; only heat of up to about 3 kelvin is extracted or added. Relative to the volume of the lake as a whole, the heat extraction is so minimal that it has hardly any effect.



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Waste heat and local wood as an energy source

Hagenholz, in the north of Zurich, is one of the largest waste incineration plants in Switzerland. At the Hagenholz waste incineration plant, waste that is no longer usable is incinerated in an environmentally friendly manner and the energy present in the waste is released through thermal waste recycling. The combustion process drives a steam-water cycle that generates ecologically valuable electricity and heat via a steam turbine in accordance with the principle of cogeneration. At the same time, electricity and usable heat can be produced highly efficiently for heating purposes or production processes. Waste-to-energy is a local, climate-friendly energy source. Each Züri sack has a calorific value equivalent to 1.7 litres of heating oil on average. One tonne of rubbish contains the energy of 300 litres of heating oil.

While the Hagenholz waste incineration plant ensures the base load for the heat supply, the Aubrugg wood-fired combined heat and power plant provides the mid-load in the heating season from September to May. The Aubrugg wood-fired combined heat and power plant generates heat and electricity from untreated wood fuel from the local area.

Transforming the supply of heat:

We are transforming how the city of Zurich supplies heat. Learn more about important milestones.

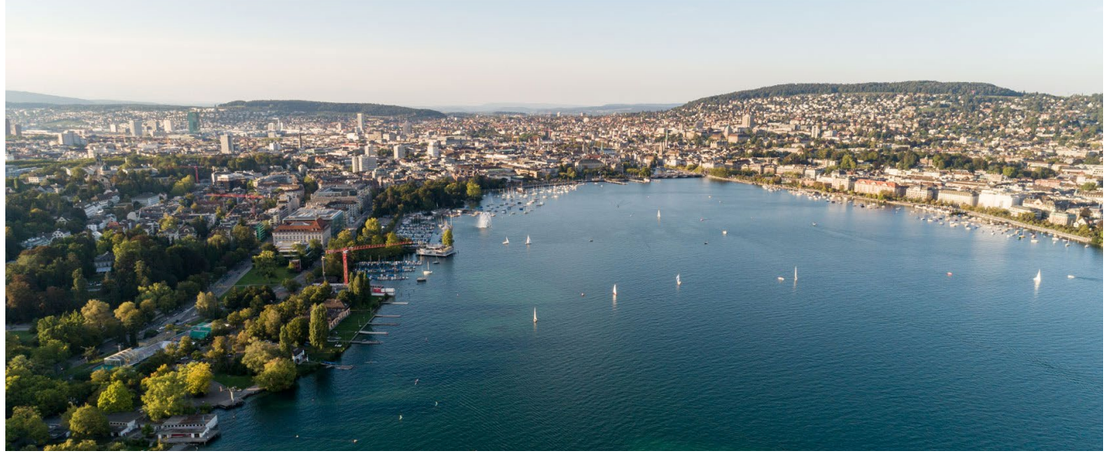
Learn more about important milestones
ewz.ch/district-heat-expansion

Waste heat from treated waste water and from the sewage sludge incineration plant as an energy source

Another important energy source for district heating is waste heat from the treated waste water of the Werdhölzli sewage treatment plant. The temperature of the treated waste water ranges from around 11 degrees Celsius in winter to around 25 in summer. Zurich's disposal and recycling service treats up to 80 million cubic metres of waste water each year – around half the volume of Lake Greifensee. Before the treated water flows into the Limmat river, it passes through a waste heat recovery facility, where heat is taken from it. In the energy centre, heat pumps bring the temperature up to the level for useful heat. The second energy source is waste heat from the sewage sludge incineration plant, which is also located on the site. We use both the direct surplus heat from this plant (around 2 MW) and the condensation heat from the exhaust gases (2.5 MW of power). Because the sewage sludge incineration plant operates at temperatures of 70 to 80 degrees Celsius, the heat can be fed directly into the system without needing to be produced using a heat pump.

District cooling in the city of Zurich

In the city of Zurich, more and more buildings are also being connected to the district cooling network. This is a climate-friendly and cost-effective alternative to conventional air conditioning for buildings. In most cases, the same infrastructure is used as for district heating, in which the thermal energy is transported from the place of generation to the connected buildings via a system of pipes. If the operating temperature of a thermal grid is below 20 degrees Celsius, connected buildings can be cooled directly. In this method, known as 'free cooling', cool water is pumped through the heating pipes in the building and can cool the rooms by 2 to 3 degrees Celsius. Ambient heat, for example from groundwater, lakes or rivers, is the most suitable energy source for such grids. District cooling can also be used to actively cool buildings.



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A strong partner throughout the life cycle

For more than 130 years, our core expertise has been in the creation of energy infrastructure solutions with complex requirements. As a strong partner, we support property owners, site developers, cities and municipalities throughout the entire life cycle of their properties and take on responsibility for all energy-related matters in the background – from planning and implementation to efficient, safe operation.

We provide a comprehensive range of services across our business fields of ‘integrated energy solutions for complexes and sites’ and ‘thermal grids for municipalities and cities’. Our core expertise lies in the creation of a tailor-made energy infrastructure for the environmentally friendly supply of heating, cooling and electricity. We make consistent use of local energy sources and employ innovative technology to make them viable for your project.

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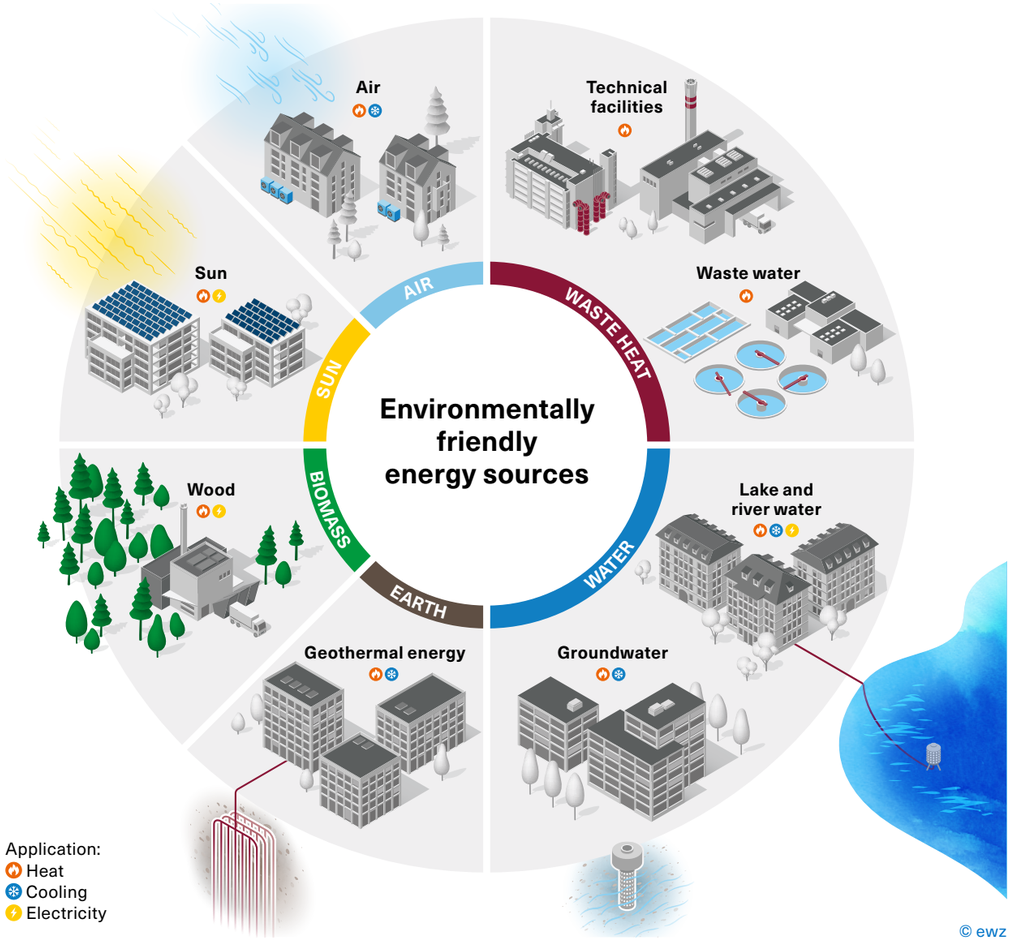

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Rooted in the region, committed to the whole of Switzerland

We are a Swiss company with locations in Zurich, the Grisons and Vaud. With a large number of successfully completed projects throughout Switzerland, we can call on extensive, in-depth expertise and a strong network of proven experts.

As a city of Zurich company with over 130 years of experience in the implementation and operation of energy infrastructure solutions, we are a reliable partner in every respect. We guarantee maximum security of supply and short response times thanks to regional operating teams and 24/7 remote monitoring of the systems. As we have been operating a large number of different systems ourselves over decades, our practical experience is continuously incorporated into the planning and implementation of new energy solution projects.

Based on the positive experience gained from the energy solution for the Vaudoise Arena, ewz is now working closely with Service Industriels de Lausanne (SIL) in the Lausanne region. The joint venture LaZur Energie SA was founded in 2017 as part of this process.

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Optimised operation cuts costs

The operation and maintenance of energy systems account for a significant part of the life cycle costs of energy infrastructure. Optimal system operation is crucial for sustainable, cost-effective and resource-friendly building technology.

After commissioning, we take responsibility for the smooth operation of systems. The ewz operational organisation comprises more than 120 employees who work in regional operating teams. Our daily motivation is to ensure that our customers are optimally supplied with heating, cooling and electricity, to continuously improve the energy efficiency of our systems and thus to keep energy costs low in the long term.

Remote monitoring of the systems and a 24/7 on-call service guarantee maximum security of supply. This ensures satisfied tenants and users of your properties. Property owners and managers can rely on a reliable energy supply round the clock, allowing them to focus on their core business.

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Integrated energy solutions deliver an overall system that creates added value for owners, users and the environment.

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