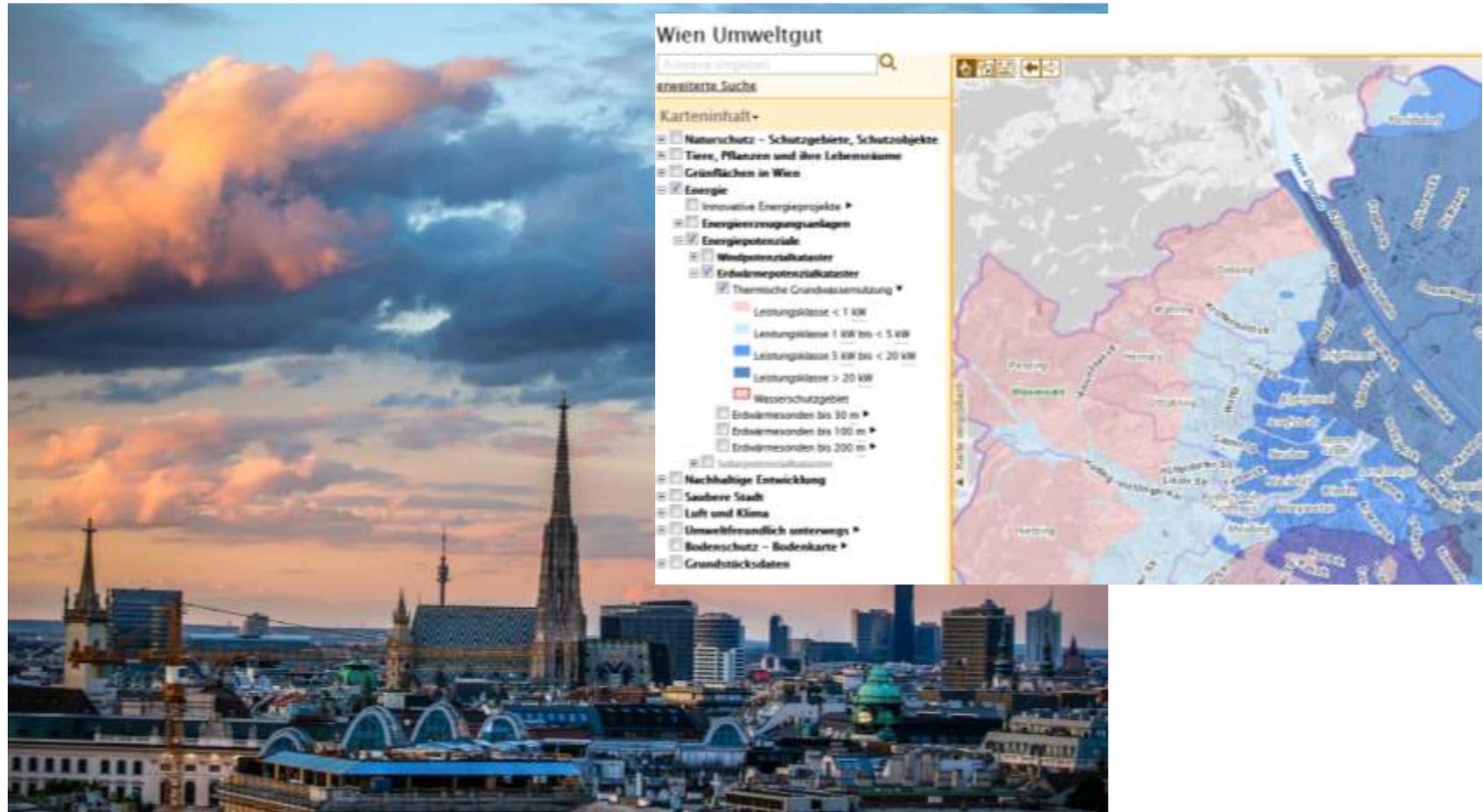


# Heat pumps in Vienna



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Project name: Heat pumps in Vienna – a heat pump promotion strategy in a fast growing city

# Short description of the project



## Vienna : Growing while saving energy

On an international scale, the Austrian capital scores with the achievements of its enterprises, educational system, environmental protection activities, public transport, social housing and social services available to everybody. Each of the mentioned is about to grow even further. Meanwhile, however, the used resources should be limited. Cities all over the world are growing and they currently cause 75 % of the CO<sub>2</sub> emissions. In the future, Vienna wants to reduce the use of fossils – which are enormously contributing to climate and causing immense consequential costs. Unfortunately the use of renewable energy in the densely-built city is still not state-of-the-art (as it is currently for the most parts in the rural areas in Austria). But in the predictable future, the heat pump technology will provide new possibilities, also for the densely built city.

## Decentralized renewable energy supply of urban development areas

The City administration has intensively studied different possibilities of renewable energy supplies, especially in urban development areas. The use and (seasonal) storage of local heat sources (such as solar energy, exhaust heat, i.e. of sewage or exhausted air, or air-conditioning) was identified and calculated. The huge advantage of these supplies is the possibility of both heating and cooling! The Life-Cycle-Analysis throughout 40 years showed a remarkable profitability. But the higher investment costs are a problem, since cities are not allowed to incur more debts (due to the Maastricht criteria). So if cities shall be successful in managing climate change, they must have the opportunity to invest in longterm infrastructure. Otherwise, the energy production must be decentralized and largely privately organized.

## Heat pump promotion strategy of the City of Vienna

Every heat pump is a (small) step to reach the climate objectives, no matter if it is working at a high or a low temperature level and regardless of its location (as a part of the local district heating or in a building). The city administration supports the installation of heat pumps in the city by several means:

**Online map of the geothermal potential of the city of Vienna:** The Vienna region has particularly good conditions for the use of groundwater and near-surface ground heat for energy purposes. A pilot study surveyed the geothermal energy potential in Vienna for the first time and it showed a huge potential. Each conditions: very good, good and fair are shown in different colours in an online map, which is available to all interested citizens and planners.

**Funding scheme:** The Vienna city administration has reformed the funding scheme for renewable heat, which provides attractive incentives. A new funding scheme was launched to promote the installation of heat pumps or seasonal storage systems combined with anergy grids. Anergy grids usually use low-temperature heat (e. g. exhaust heat from waste water or data centers) and decentralized heat pumps.

**Heat pump guidelines:** Vienna has published several guidelines containing the functional principles of different heat pumps and possible heat sources. The guidelines shall be a decision support for planners and property owners to install the proper heat pump system using the best heat source available.



## Technical details



### **Online map of the geothermal potential of the City of Vienna**

The Vienna region has particularly good conditions for the use of groundwater and near-surface ground heat for energy purposes. A pilot study surveyed the geothermal energy potential in Vienna for the first time and shows it on an online map. Approximately one third of Vienna's area is well suited for the use of near-surface geothermal energy and groundwater for energy purposes. The thermal use of groundwater is particularly auspicious in the rapidly growing districts of Floridsdorf and Donaustadt on the northeastern bank of the Danube. A pilot study commissioned by MA 20 and conducted by the Geological Survey of Austria is a comprehensive survey and assessment of the potential for energy use of near-surface ground heat in the city area. This knowledge can be used to inform precise measures for ensuring a sustainable energy supply. The data collected are particularly useful for the city's urban development areas. The results will facilitate the planning and construction of new plants for the optimum use of open and closed loop systems combined with heat pumps.

<https://www.wien.gv.at/stadtentwicklung/energie/themenstadtplan/index.html>

### **Funding priority: renewable heat and seasonal storage**

The city of Vienna aims to increase the share of renewable energy in heat production considerably from the current level of 10%. There is potential for the use of solar energy, exhaust heat, groundwater and near-surface ground heat in Vienna, but it remains largely untapped. Therefore, new funding schemes have been launched to encourage the installation of systems that produce or store renewable heat. Since March 2016, the city has been subsidising heat pumps in residential buildings using ambient heat, systems for the thermal use of groundwater and ground heat, and seasonal heat storage systems (for waste heat and renewable energy) that help balance the load between the different times of production and use of heat. Vienna is the first Austrian province to subsidise seasonal storage combined with energy grids (low-temperature heat grids), making it a trailblazer in the promotion of these innovative technologies. The city provides financial support for investment costs for heat pumps and storage technologies. This partially mitigates of the high initial investment costs, and the use of these technologies will lower heating costs enormously for decades to come.

<https://www.wien.gv.at/stadtentwicklung/energie/foerderungen/erneuerbare-waerme.html>

### **Heat pump guidelines**

Vienna has published several guidelines showing the functional principles of different heat pumps and possible heat sources. The guidelines shall be a decision support for planners and property owners to install the proper heat pump system using the best heat source available on site.

<https://www.wien.gv.at/stadtentwicklung/energie/pdf/waermepumpenleitfaden.pdf>

<https://www.wien.gv.at/stadtentwicklung/energie/pdf/waermepumpe-kundenbroschuere-bf.pdf>

<https://www.wien.gv.at/stadtentwicklung/energie/pdf/leitfaden-erdwaerme.pdf>

### **Citizens' power Plants on the rise - Citizens' heating plants have to be created**

For the last years, the city-owned energy supplier Wien Energie has provided citizens with the opportunity to participate in the expansion of photovoltaics. The demand is considerable and shows that public participation in renewable energy projects is a successful concept. In the future citizens should have also the chance to participate in renewable heating plants but the feasible business models are costlier and the investment involves a high risk.



# Technical details

## Heat pump showcase projects in Vienna

- Aspern IQ, D12 and D18: located in the 22<sup>nd</sup> district of Vienna; Groundwater, ambient heat and heat storage systems combined with heat pumps are used in optimised properties (optimisation of energysystem and construction physics). The demonstration plants are installed in an office building, in a residential house and in a school building. The data of the user behaviour is stored and analysed.
  - <https://wirtschaftsagentur.at/immobilien/technologiezentrum-seestadt/technologiezentrum-seestadt/>
- Campus WU: located in the 2<sup>nd</sup> district of Vienna; Using groundwater for heating and cooling for 6 buildings and approx. 100.000m<sup>2</sup> floor area and 23.000 students.
  - <http://www.big.at/projekte/campus-wu/>
- Plus-Energie-Bürogebäude der TU Wien, Getreidemarkt, Bauteil BA: located in the 6<sup>th</sup> district of Vienna; perfect optimisation of energysystem. Use of ambient heat and heat storage systems.
  - [http://www.tuwien.ac.at/aktuelles/news\\_detail/article/9083/](http://www.tuwien.ac.at/aktuelles/news_detail/article/9083/)
- Viertel-Zwei: located in the 2<sup>nd</sup> district of Vienna; It was the first energy grid in Vienna which used ambient and geothermal heat. VIERTEL ZWEI is one of the most successful residential projects in Vienna and an example of the ideal way to improve working and living standards. More than 4,000 people are already working at 26 different companies occupying office space of more than 80,000 m<sup>2</sup>, living in 78 apartments and 250 hotel rooms and enjoying the 5,000 m<sup>2</sup> lake and over 13,500 m<sup>2</sup> of parkland.
  - <http://viertel-zwei.at/en/>
- Goldegg Gardens: located in the 4<sup>th</sup> district of Vienna; The Goldegg Gardens are located in very densely built city. This is the biggest geothermal probes field in the inner-city (almost 4.000m probes). The system uses heat pumps with heat recovery technology to supply the buildings' heating systems.
  - [http://eos.top-real.at/iol/bilder/DB30507150\\_5423.PDF](http://eos.top-real.at/iol/bilder/DB30507150_5423.PDF)
- Garden of Eden – living in paradise: located in the 19<sup>th</sup> district of Vienna (former Präsidentenvilla); 100% energy independent; Comfort guaranteed: Temperatures remain virtually unchanged throughout the year in the clay soil, even during the freezing winter months. The 50 geothermal probes placed at 10-metre intervals across the one-hectare plot, reaching depths of up to 150 metres, will collect this geothermal energy to meet the properties' heating requirements. The system uses heat pumps with heat recovery technology to supply the buildings' heating systems.
  - <http://www.gardenofeden.at/>



## Multiplication potential

Vienna is on top of innovation with its decision to support heat pumps by several means. Neither the geothermal potentials have been shown on an online map before, nor heat pumps and seasonal storage systems combined with energy grids were subsidised. Vienna is the first Austrian province to support this innovation financially.

Vienna is a rapidly growing city with many large development areas where housing and infrastructure are being created for thousands of people. The currently largest one is Aspern – Vienna's Urban Lakeside, which can accommodate approx. 20,000 inhabitants - but there are other major projects at the North and Northwest Railway Stations, Donauefeld, Hausfeld and Berresgasse, to name just a few.

On the one hand, we are one of the trailblazers internationally, but on the other, we are just about to develop administrative processes, which we are now also working on in a joint EU project with 7 other European cities (Berlin, Zagreb, Warsaw, Stockholm, Paris, Amsterdam & Zaanstad). The new strategic concept on high-rise buildings now makes an energy concept compulsory for high-rise projects as well. It is very important to consider the issue of energy when planning new urban development areas or high-rise buildings.

We have to consider locally available renewable energy sources when planning heating, in particular, but also for the general electricity supply for buildings. This is absolutely indispensable in the medium to long term and our daily work is to explain this to citizens and planners. Our survey of geothermal heat potential in the Vienna region was an important step in this direction, because we should use more geothermal energy.

We commissioned the Geological Survey of Austria to create a geothermal heat zone map, which will be available as an overlay on the online city map as a resource for housing developers and people who are building their own home. It enables interested people to check what potential energy sources are available at a given site, e.g. whether a groundwater heat pump or a geothermal probe makes more sense. The 21st and 22nd districts are extremely well suited for thermal groundwater use. Geothermal probes are recommended particularly in the western part of Vienna, where you sometimes do not even need a permission to install one, depending on the site.

Generally speaking, geothermal heat is a safe energy supply system – making a well or bore-hole is a one-time investment, but then it reduces heating costs considerably for decades to come. If you combine this with a PV system on the roof, you are even more independent on market prices, because you can generate some of the electricity needed for the operation of the heat pump. You can check whether PV is feasible on our solar potential map, which has been popular for many years.

We are constantly looking at new developments in other countries and cities and trying to learn from their ideas. One important trip was to Switzerland and Vorarlberg, in western Austria, where we looked at innovations and technologies in the areas of buildings and heating. The standard of their buildings is very high – they have an extremely low energy demand due to thoughtful planning – and that brings the energy system to the next level. Locally available energy sources can provide a considerable part of heating. In future, it will be possible to use relatively low temperatures for heating supply, e.g. low-temperature waste heat, which was not possible before. This is a huge step which we are working on in Vienna as well.

An important part of such modern heat supply systems are energy storage systems that can store thermal energy during summer for the winter months or balance peak loads. In urban areas we figure out that ground heat storage systems, which can take up cooling loads and solar energy gains in summer, are feasible and efficient.

Another important topic is integrating renewable energy sources into district heating and thinking about new sources for district heating. We can also combine district heating with locally available energy. With district heating, we are currently highly dependent on a single technology and we need to diversify.

The heat pump is in future an essential technology for all the mentioned systems.



### Attachments

- *Energiebericht2014-en.pdf*
- *Energiebericht2015-en.pdf*
- *Energiebericht2016-en.pdf*
- *Leitfaden-Erdwaerme.pdf*
- *Waermepumpenleitfaden.pdf*
- *Waermepumpe-kundenbroschuere-bf.pdf*

Please send your application to [heatpumpcity@ehpa.org](mailto:heatpumpcity@ehpa.org)