

<b>City/region</b>	Graz
<b>Supporting partner</b>	AIT

**Map showing local heating and cooling demand and supply**

	City only	Neighbour- hood only	Individual installation		
			No details	Additional Info	Monitored data
<b>H/C demand</b>	X				
<b>H/C infrastructure</b>			X		
<b>Sustain- able H/C potential</b>	Energy efficiency				
	Excess heat		X		
	Geothermal				
	Bio-energy				
	Solar thermal	X			

Heat demand (main region - inside red boundaries):

2012: 2,829.1 GWh/a

2025: 2,304.6 GWh/a

The economic potential for district heating for a connection rate of 90 % and a heat demand density of  $\geq 10$  GWh/km<sup>2</sup>a is about 2,000 GWh/a. With a connection rate of 45 % and a heat demand density of  $\geq 20$  GWh/km<sup>2</sup>a it is about 800 GWh/a.

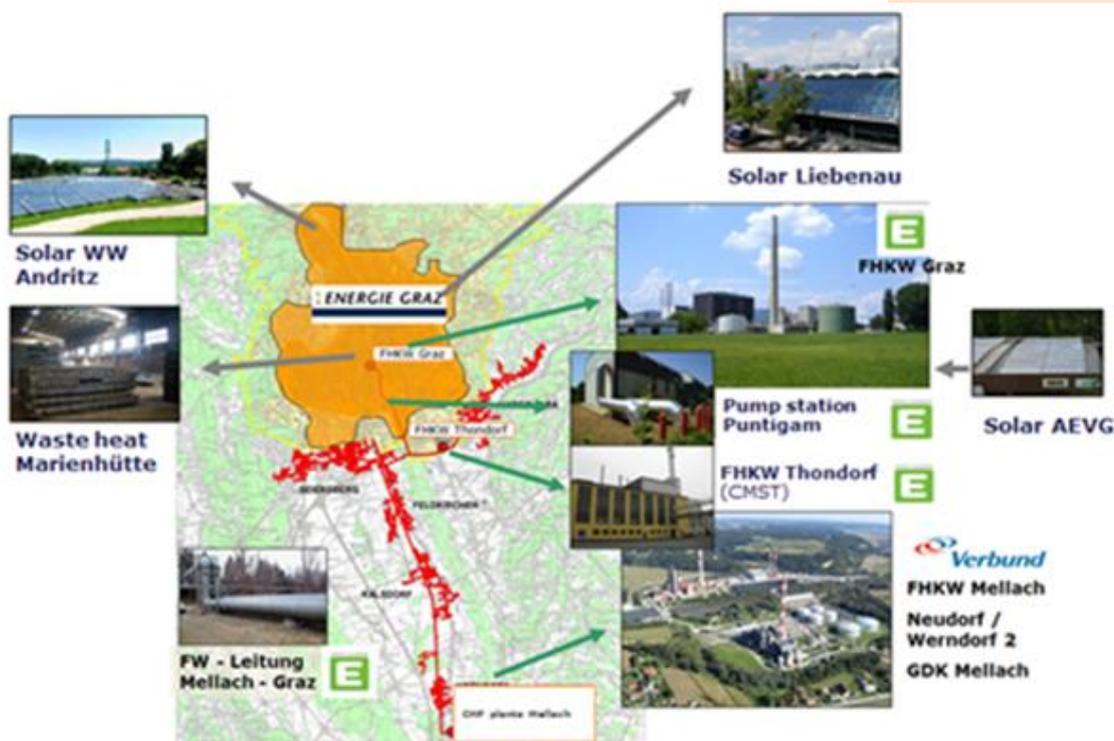


Figure 7: Map of the city Graz with its heat supplying plants (Source: Grazer Energieagentur GmbH / Energie Graz / Energie Steiermark)

Until 2013, one could assume that sufficient long term heat suppliers are available in Graz to supply the district heating system. The heat supply was done mainly by highly efficient cogeneration plants of Verbund Thermal Power (VTP) in Mellach, in the district heating plants Graz Thondorf, and from the use of industrial residual heat of Marienhütte in Graz and from some solar systems.

The district heating demand was in 2013 for the greater area of Graz 1,070 GWh/a, which corresponds for Graz 935 GWh/a (DH-share of the heating market Graz approx. 40 %). The currently required maximum power on a very cold winter day is 531 MW. Around 80 % of the annual amount of heat came in recent years as a favourable by-product of electricity from the CHP plant Mellach.

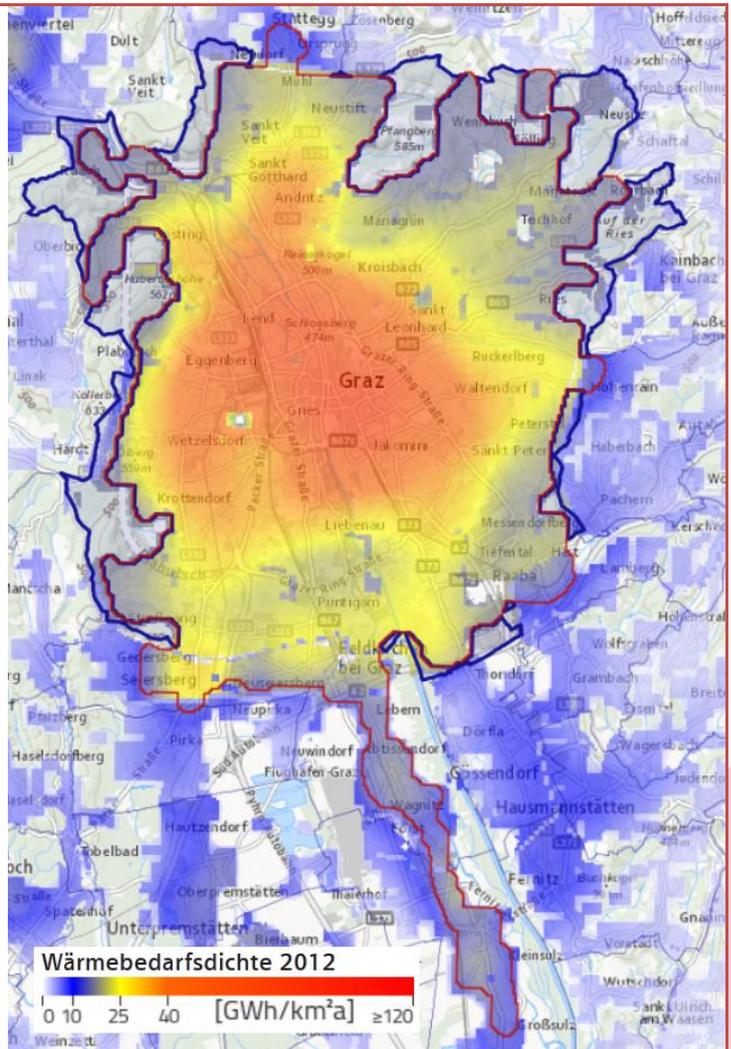


Figure 8: Heat requirement density of Graz in 2012 (Source: Austrian Heat Map)

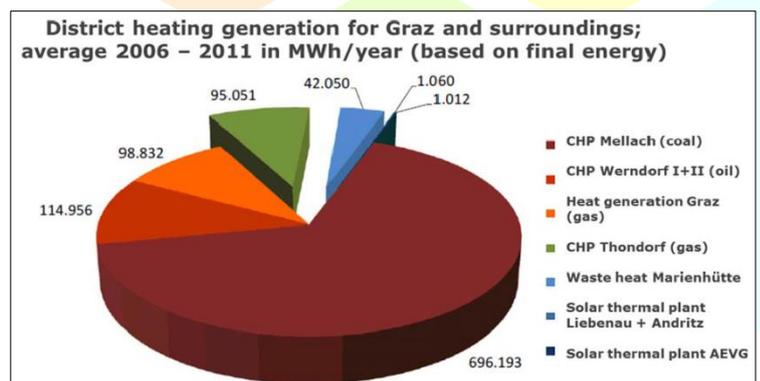
### Current challenges - opportunities

The success of the district heating development in the greater area of Graz resulted in significant reductions of the release of particulate matter and other pollutants; also with regard to CO<sub>2</sub> emissions the DH performs significantly better compared to renovated heating systems.

The situation in the Central European electricity market has changed dramatically, however, in recent years. Sharp falling wholesale electricity prices make modern gas-fired cogeneration plants, such as the new built Mellach gas and steam power plant - although highly energy efficient - currently uneconomical. If these power plants shut down, the heat provided for district heating by this coupling process is not available.

The power plant park of VTP in Mellach consists of three power plants. VTP announced in May 2014 that

– the power plant Neudorf / Werndorf 2 (oil or gas),



which previously served as reserve capacity, will be shut down completely,  
– the coal operated CHP Mellach should supply heat at least until 2020 and  
– the recently constructed Mellach gas and steam power plant is to be temporarily shut down.

The contracted heat capacity is up to 230 MW.

A heat supply after the currently existing heat supply contract between Energie Steiermark and the VTP after 2020 is highly uncertain from today's perspective. Although there is interest from investor groups to take over the power plants in Mellach.

For a safe supply of district heating over the year 2020 alternatives have to be developed and implemented in time.

One of the relevant stakeholders for this project and mainly addressed in the STRATEGO project is the local energy agency, Graz Energy Agency GmbH (GEA).

*Figure 9: District heating generation for Graz and surroundings (Source: Grazer Energieagentur GmbH; Studie Emissionsreduktion durch die Fernwärme im Großraum Graz-Update 2012 im Auftrag der Energie Graz, Stadt Graz, Umweltamt)*

## Identified project

### Reducing the DH temperature level and increasing the share of RES

There are already some measures for integrating new heat suppliers in implementation (using waste heat via heat pumps, biomass plant, solar thermal plant in combination with storage tank, etc.). Some studies and concepts for the technical possibilities for integrating additional new heat suppliers (e.g. RES) are ongoing. For this target as well as the target of reducing the temperature level in the district heating network the financial possibilities are not completely clear yet.

For this reason new business model respectively new price models are needed.

## Business model

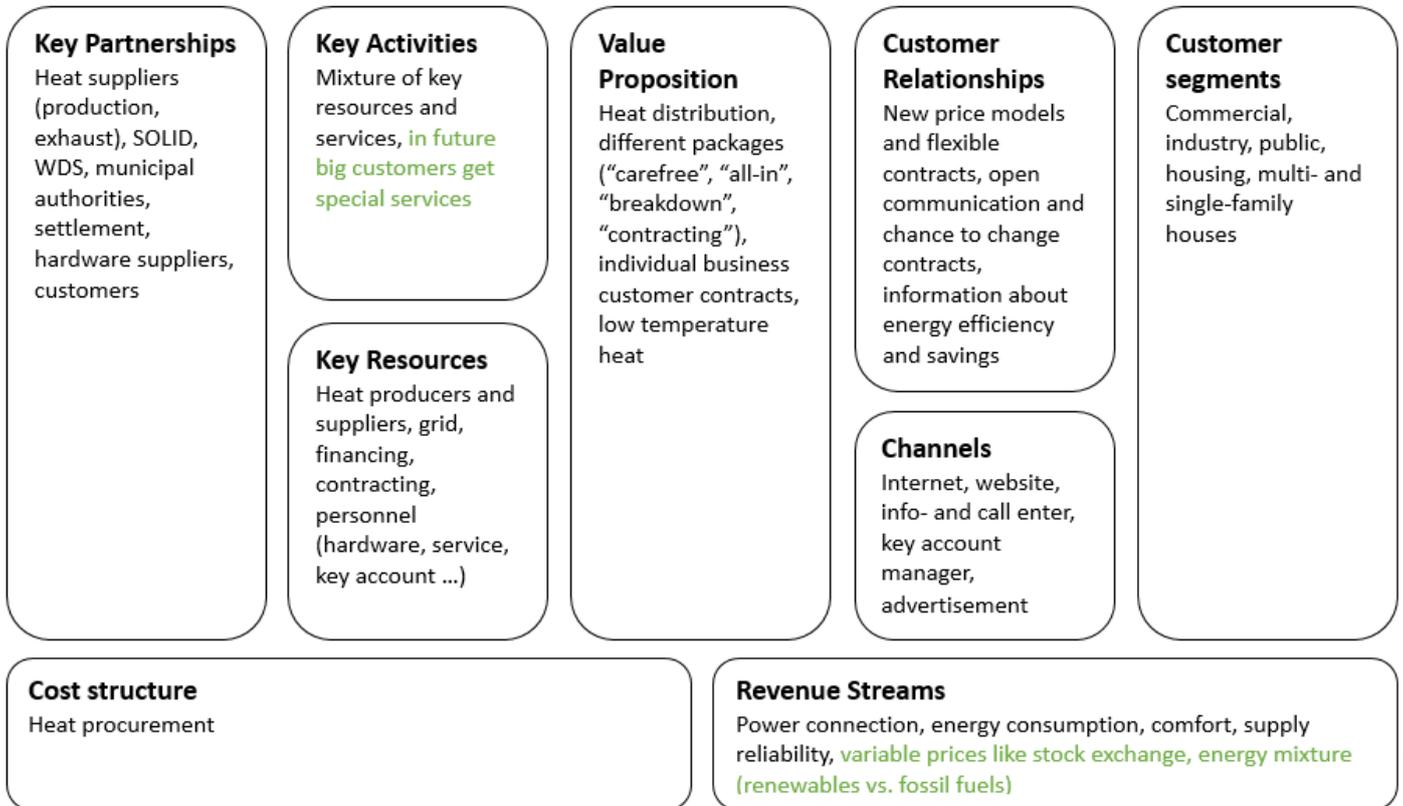


Figure 10: Business model of Graz (Source: own visualisation)

### Key Partnerships

For distributing heat in Graz, a lot of partnerships exist. This includes several heat sources among others from the power plant Mellach (operated by VTP – Verbund Thermal Power), solar thermal collectors and exhaust heat but also the municipality of Graz and both the energy suppliers "Energie Graz" and "Energie Steiermark" and the heat costumers. Beyond this, the company WDS (Wärmedirektservice), which is a subsidiary of Energie Graz, play a big role as they do financing and constructions. Concerning construction stuff, a lot of hardware suppliers are integrated.

### Key activities

The key activities is based on a mixture of key resources and services.

### The new business model:

*In future the hundred biggest customers should get a special service. This service includes e.g. analysis of the heat load, measures for reducing the return line temperature, shaping / flattening the peak loads to harmonize the load profile, reduction of the total consumption, etc.*

### Key resources

A reliable heat supply is the basement of the DH-grid. Therefore, reliable power plant / heat suppliers are needed especially after 2020 when Mellach will be out of operation. Due to this, the chance should be taken to improve the contribution of renewable energies in the DH-grid of Graz. Furthermore, the usage of waste heat from industry has

to be checked. To get a high reliable system, it is also necessary to have a grid in good condition. Therefore, the grid has to be maintained and personnel is needed to check leakages and the common status. Also qualified staff is needed to improve the grid expansion in Graz, for financing and accounting, planning and service, energy-savings and –efficiency and so on.

### **Value Proposition**

The value proposition of the classical district heating consists of supplying the customers with sufficient heat during summer and winter for a decentral preparation of space heating, (domestic) hot water and industrial heat. Different product bundles are offered which can be added to the classic district heating as well as whole service solutions for customers. The industry and business customers get individual contracts which are fitted to their requirements.

The power plants feed the DH-grid with hot water, depending on the ambient temperature, at temperatures between 120°C (winter) and 75°C (summer). That means, the DH-grid in Graz is running the whole year. In many of the existing contracts return temperatures between 40 – 60°C are agreed, but in reality they are higher. In order to reduce the return line temperature, new flexible contracts should give the possibility to use different temperature levels and the usage of the return line.

### **Cost structure**

The district heat supplier of Graz has to struggle with high costs through buying the heat from the heat producers.

### **Customer relationship**

The existing customer have tariff models which are not too flexible and with long term contracts. Both potential new customers and also the existing big/business customers need more flexible tariffs. Special communication and information material should help the customer to get a better understanding of the DH-grid and the heating system on-site in order to reach the aim of lower return line temperatures.

### **Channels**

The customers of the DH-grid Graz are not only reached by the internet via website but also through their info- and call-center. Additionally, the customers are informed about special campaigns, like reduced connection costs, via advertisement in newspaper and newsletter. Furthermore, key account manager stay in contact to big customers and also to housing cooperatives.

Also the municipality of Graz do inform their inhabitants about different DH topics. They publish which regions are priority area for DH-expansion. In some regions, it is obligated to connect buildings to the DH-grid. Therefore, the local energy suppliers are involved in the planning phase of such city development areas. Moreover, they also subsidy the DH-grid connection and disseminate several information to the citizens through media channels.

### **Customer segments**

The customers' structure is built up from commercial and industry customers as well as public housing and both multi- and single-family houses. Actually approximately 50,000 households (responsible for about 40% of the heating demand) are connected to the district heating grid of Graz.

### **Revenue streams**

The project "Multi level actions for enhanced Heating and Cooling plans – STRATEGO" (IEE/13/650/SI2.675851) is co-funded by the Intelligent Energy Europe Programme of the European Union. Project website : [www.stratego-project.eu](http://www.stratego-project.eu)

The customer prices consists of two parts. On the one hand a fixed price (depending on the maximum power which is needed and on measurement fee) and on the other hand on a variable price (energy which is consumed). Furthermore, the customers are willing to contribute something for the additional comfort they received through district heating (e.g. no own boiler, less space, ...) and they have the option to pay a higher price for enhanced supply reliability through if they choose a “complete carefree” package.

The new business model:

Maybe the heat customers are open for flexible tariff system which is hourly based like on the stock exchange consider supply and demand (that means they could save money if they cover their heat demand during low price times). Also a flexible price models for waste heat or renewable energies or etc. could be implemented (for both procurement and sales).

It could also be, that some customer groups will pay a higher price if the delivered heat includes a higher renewable energies mixture (e.g. like electricity-customers pay a higher price if they get “ökostrom”) in comparison to standard DH-supply.

**Results of the stakeholder meeting**

Date	11/18/2016
Participants	Grazer Energieagentur, AIT
<p>The results of the Pan-European Thermal Atlas (PETA) – (<a href="http://stratego-project.eu/pan-european-thermal-atlas/">http://stratego-project.eu/pan-european-thermal-atlas/</a>) and the developed Heat Map (<a href="http://www.austrian-heatmap.gv.at/karte/">http://www.austrian-heatmap.gv.at/karte/</a>) for Austria were discussed and seemed to be very helpful. However, the question was discussed, if all heat sources are considered (e.g. some industrial waste heat units are missing) and it is unclear, how much other energy sources such as the river Mur and the sewage water can be used.</p> <p>The current situation in Graz: the City of Graz and related stakeholder are engaged in the new national funding program “Vorzeigeregion Energie”. Within this framework, the project GreenTechValley_2022 is funded, looking at an innovation path towards 100% renewable supply for the region of Graz. One focus is the interaction between heat, electricity and mobility.</p> <p>The Impact of the STRATEGO project is well received among the stakeholders. However, it is evident to the stakeholder in Graz, that the transformation of the current district heating networks following business-as-usual measures will take generations and STRATEGO contributed to the initial phase. It should also be noted, that the solutions from the Swedish systems are not 1:1 transferable to Graz, this is especially related to the energy prices and the regulative boundary conditions.</p>	

**Input into the local heating and cooling plan**

<p>The two heat supplier of Graz, „Energie Steiermark“ and „Energie Graz“, have plans to expand their grid as they are interested to improve the connection ratio and also in order to improve the efficiency. Connecting new areas was also decided in the “KEK-Beschluss” in the year 2011. For new city development areas, low temperature heating grids should be implemented similar to the energy model “Reininghaus” which is actual in the implementation phase. Through this, better suppositions for integrating renewable energies in combination with waste heat should be created. A positive side effect through this, would be reduced CO<sub>2</sub> emissions and less environmental pollution, because Graz has to struggle with fine dust also due to its basin location.</p>
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