**Market uptake of small modular renewable district heating and cooling grids for communities**

**Project No: 691679**

# *CoolHeating Study Tour in Austria*

***WP 2 – Task 2.3 / D 2.3***

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CoolHeating website: www.coolheating.eu

# Content

# 1 Introduction to CoolHeating

The objective of the CoolHeating project, funded by the EU's Horizon2020 programme, is to support the implementation of "small modular renewable heating and cooling grids" for communities in South-Eastern Europe. This is achieved through knowledge transfer and mutual activities of partners in countries where renewable district heating and cooling examples exist (Austria, Denmark, Germany) and in countries which have less development (Croatia, Slovenia, Macedonia, Serbia, Bosnia-Herzegovina). Core activities, besides techno-economical assessments, include measures to stimulate the interest of communities and citizens to set-up renewable district heating systems as well as the capacity building about financing and business models. The outcome is the initiation of new small renewable district heating and cooling grids in 5 target communities up to the investment stage. These lighthouse projects will have a long-term impact on the development of "small modular renewable heating and cooling grids" at the national levels in the target countries. A key objective of the project is to exchange information on best practices for small modular district heating and cooling systems.

CoolHeating organised three study tours for target country stakeholders and project partners to best practice (BP) examples in Germany, Denmark and Austria. The objective is to show stakeholders examples of small renewable district heating and cooling grids and to facilitate networking among the relevant partners.

More BP examples are described in the report "Best Practice Examples of Renewable District Heating and Cooling"[1]. The report presents best practice examples from Austria, Germany and Denmark, but also from the CoolHeating target countries (Croatia, Slovenia, Macedonia, Serbia, and Bosnia-Herzegovina). An overview of the best practice examples is also provided by a map that can be found at the following link: http://www.coolheating.eu/map/

The first study tour was organised for the project participants on the occasion of the Kick-off-Meeting in Germany on 26/27 January 2016. The second and third study tours were organised for project partners as well as external key stakeholders on the occasion of the project meetings in Denmark and Austria. The present report summarizes the third study tour in January 2018 in Austria.

[1] The report can be found at the following link:
http://www.coolheating.eu/images/downloads/D2.1_Best_Practice.pdf

# 2 Study Tour in Austria

The study tour in Austria was organized on the occasion of the CoolHeating progress meeting in Vienna. In total, 26 participants joined the study tour. The overall schedule for the study tour is presented below.

| **Tuesday, 23rd January 2018, afternoon:** |
|---|
| Visit in Kirchberg am Wechsel:<br>2x 50kW$_{el}$ wood chips CHP (by Fröling)<br>https://www.molzbachhof.at/[2] |
| Visit heating plant Wöllersdorf:<br>390kW boiler (wood chips), operated by a cooperative of farmers, supply of businesses and industry<br>http://bioenergie-noe.at/die-genossenschaft[3] |
| Visit absorption chiller at Klinikum Mödling |

| **Wednesday, 24th January 2018:** |
|---|
| Visit Fernwärme St. Michael im Burgenland:<br>Wood chips boiler and biogas engine for a village |
| Visits in Güssing:<br>- Cooling with district heating: absorption chiller to cool the technology centre Güssing<br>- Heating plant 2 (saw dust firing)<br>- Biostrom Güssing (steam turbine CHP)<br>- Technikum Güssing (research centre) |
| Visit in Pinkafeld at Herz:<br>Biomass boiler production company<br>Best practice examples<br>Types of biomass usage<br>http://www.herz-energie.at/en/?noredirect=en_US |

[2] https://translate.google.at/translate?sl=de&tl=en&js=y&prev=_t&hl=de&ie=UTF-8&u=https%3A%2F%2Fwww.molzbachhof.at%2Findex.php%3Froute%3Dcommon%2Fpage%26id%3D2476&edit-text=&act=url

[3] https://translate.google.at/translate?sl=de&tl=en&js=y&prev=_t&hl=de&ie=UTF-8&u=http%3A%2F%2Fbioenergie-noe.at%2Fdie-genossenschaft&edit-text=

| **Thursday, 25th January 2018, morning:** |
|---|
| Presentation via Skype: Small biomass CHPs from 200 to 500 kWel (Syncraft), by Mr. Marcel Huber (Syncraft)<br>www.syncraft.at[4] |
| Presentation by Mr. Christan Engel (Thermaflex): Laying techniques – what to consider for district heating pipes |
| Presentation by Mr. Andreas Längauer: ECOP heat pump – a new solution for using waste heat for district heating systems |
| Presentation by Mr. Christian Doczekal: Steps for optimizing heating plants |


### *1.1 Acknowledgements*

The consortium would like to thank the persons from the study tour in Austria for their time and efforts to guide the consortium through their facilities. Fotos of the study tour, which are included in the report and which were provided to the partners are taken by Christian Doczekal and Dominik Rutz.


### *1.2 Visit in Kirchberg am Wechsel*

The owner of the hotel "Molzbachhof" searched for heat production possibilities for his hotel. The company Fröling offered a new small-scale gasifier CHP technology, which was built close to the hotel. The total investment costs including DH grid (~500m pipeline), CHP, building and two additional biomass boilers were about 1.7 million Euro.

The input material for the two gasifiers is mainly soft wood (Figure 1) from the surrounding forests. Forest owners deliver the wood to the plant. The wood chips need to be dried to 10% water content, due to an optimal operation of the CHP.

Each CHP produces about 50 $kW_{el}$ and 106 $kW_{th}$ load. The annual operation hours are about 8,200. The oil of the CHP engines needs to be changes about all 700 hours. The time to get offline for maintenance is very short. There is also no danger for explosions or danger of poisoning by carbon monoxide. The wood gas engine is shown in Figure 2, the gasifier in Figure 3. A thermal buffer storage tank helps to decrease the peaks of the grid.

[4] https://translate.google.at/translate?sl=de&tl=en&js=y&prev=_t&hl=de&ie=UTF-8&u=www.syncraft.at&edit-text=&act=url

**Figure 1: Biomass storage, mainly soft wood**

**Figure 2: Wood gas engine**

**Figure 3: Gasifier unit of the CHP**

Carbon is an output material, that could be used for further processes or utilisation at heating plants, shown in Figure 4.

**Figure 4: Carbon as an output material**

### 1.3 Visit in Wöllersdorf

The cooperative “Bioenergie Niederösterreich” with more than 50 heating plants is operating a small biomass heating plant in Wöllersdorf, shown in Figure 5. The biomass boiler with about 390 kW nominal capacity (Figure 6), supplies about 4 larger commercial buildings with heat.

The heating plant operates in winter time and summer time. A buffer storage helps to decrease the peaks and lower the fluctuations. The biomass is collected by local farmers. The wood chips are stored at an encased bunker to protect the biomass from rain.

The building was built with pre-fabricated garages to keep the investment costs low. The DH pipeline is only a few hundred meters long.

The operation and investment is done by about 4 farmers, who are also owning forests. The system operates automatically (Figure 7), there is also a device to forward errors at the plant to the operators.

**Figure 5: Biomass heating plant in Wöllersdorf**

**Figure 6: Biomass boiler with about 390 kW thermal capacity**

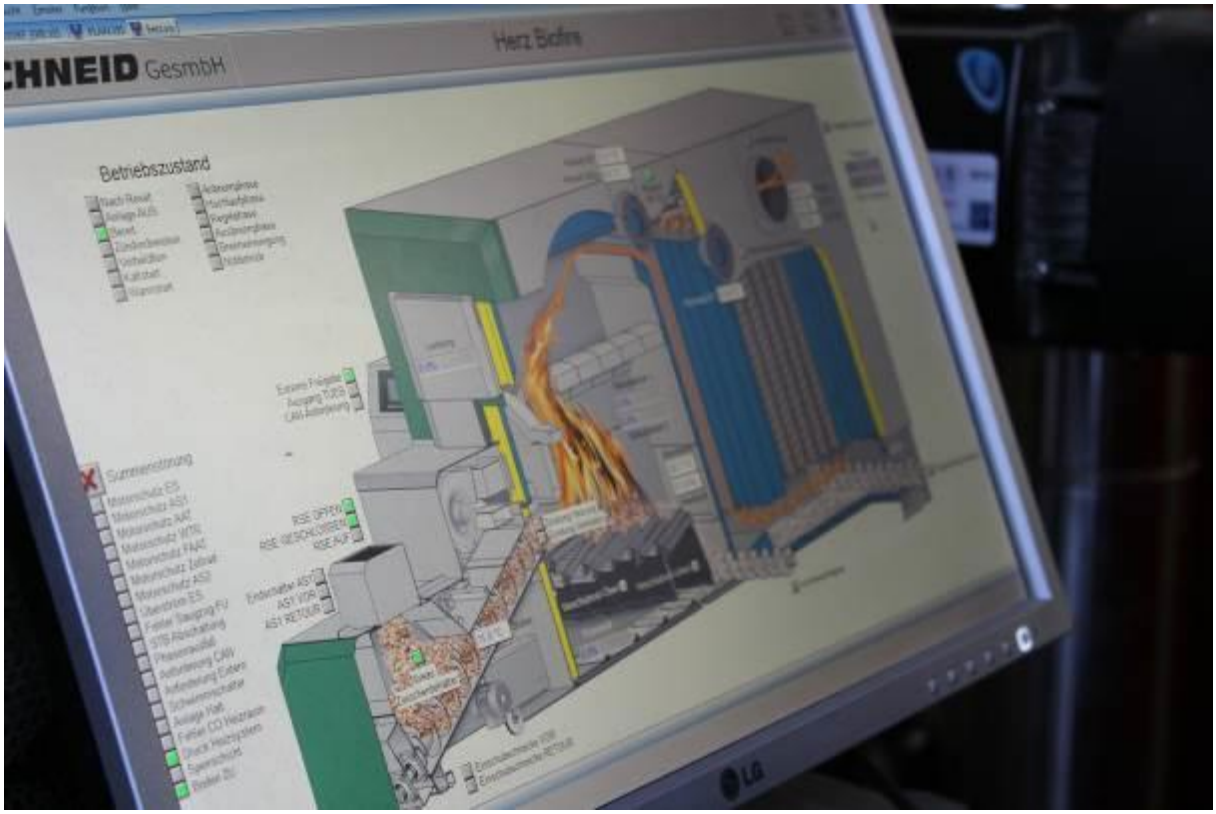


**Figure 7: The biomass boiler is operated automatically, including monitoring**

### 1.4 Visit in Mödling

The hospital Klinikum Mödling is using a steam double effect absorption chiller for cooling (Figure 8), that is operated by the energy supplier EVN (Figure 9). The building is supplied with a steam pipeline from a biomass CHP, that is about 1.7 km away. The steam is using the output from a steam turbine. The absorption chiller has a cooling capacity of about 1.4 MW and produce about 8°C cold water. An electric peak load chiller is additionally installed. The exhaust heat with about 30°C is released at cooling towers on the roof of the building.

**Figure 8: Steam double effect absorption chiller**


**Figure 9: The process for an absorption chiller is explained**

### *1.5 Visit in St. Michael im Burgenland*

A biomass heating plant (Figure 10) is operated by a cooperative in St. Michael im Burgenland. The board of the cooperative consist of 8 people, the supervisory board of 6 people. The plant was built in 2001, within half a year. There are 111 consumers, mostly households and small commercial buildings, that are connected to the 8.5 km long DH grid. The annual heat losses of the grid are about 34%, caused by the larger distances between the houses.

Wood chips are produced at the plant from trees from the local forests. Consumers also have the option to bring wood to the plant and pay less for their heat, or get money back if they provide more wood. The quality of the wood could also be very low.

The biomass boiler produces about 1.7 MW (Figure 11) heat and 2.44 GWh per year to supply the customers. A buffer storage with 2x 30 m³ decreases the load fluctuations of the grid, especially in the morning. The 12 m³ ash per year from the boilers are spread on the local fields, but there need to be annual measurements if the ash could be used.

There is a biogas plant in the neighbour village Tobaj, but there is no heat usage in Tobaj. That's why a biogas pipeline was built from the biogas plant to the about 5 km far away heating plant St. Michael. A biogas engine (Figure 12) is located behind the heating plant and supplies the DH grid with about 44% of the annual usage. The electricity is feed into the public grid, according to the green electricity law in Austria, with a feed-in tariff. So also the heat could be used at the DH grid.

There are no costs, based on the needed load of the consumers. There is only an annual basic fee of €200,- plus costs per used kWh of about 0.0745 €/kWh to 0.063 €/kWh for higher consumptions.

**Figure 10: Biomass heating plant in St. Michael**

**Figure 11: Biomass boiler with 1,700 kW**

**Figure 12: Biogas engine for the DH grid**

## *1.6 Visit in Güssing*

**Absorption chiller for the centre of technologies in Güssing:**

The centre of technologies in Güssing is cooled with 3 absorption chillers (Figure 13), which are operated with heat from the DH grid Güssing.

These chillers are used for cooling the building. There is also an additional electrical chiller installed. Based on the used technology, there need to be wasted a lot of heat to the environment with a wet cooling tower, shown in Figure 14.


**Figure 13: Absorption chillers at the centre of technologies in Güssing**

**Figure 14: Wet cooling tower for the absorption chiller**

**District heating plant:**

One of the two district heating plants in Güssing is located in the industrial zone. The plant (Figure 15) is operated with saw dust from two wood floor production companies, close to the plant. The saw dust is transported via air transport pipes to a silo, where it is stored. The boiler uses a direct firing system to blow the saw dust into the boiler and produce 3 MW (Figure 16) heat with about 120°C for the district heating grid.

The cleaning of the exhaust gases is done with an electrostatic filter. There is a win-win situation, because the industries are selling the saw dust to the heating plant for a cheap price and the DH company is selling the heat also for a better price to the industry.

**Figure 15: District heating plant**

**Figure 16: Boiler operated with saw dust as a fuel**

**Steam turbine CHP:**

Next to the heating plant is also a biomass CHP located. Saw dust (Figure 18) is used as a fuel to produce steam with about 435°C and 27 bar. The steam turbine (Figure 17) produce about 1.7 MW electricity and 3.5 MW heat at 120°C. Most of the heat is wasted at an air-cooled condenser at about 53°C, so the total efficiency is lower there. There is a feed-in tariff, according to the Austrian green electricity law.


**Figure 17: Steam turbine and generator**

**Figure 18: Saw dust that is used as a fuel for the CHP and heating plant**

**Technikum Güssing – research centre:**

The Technikum Güssing is a centre for research for renewable energy, where several companies are located. Richard Zweiler, CEO of the Güssing Energy Technologies, showed the participants the status of the research projects in the Technikum hall (Figure 19). The projects are mainly based on renewable fuel production.

**Figure 19: Research hall of the Technikum Güssing**

## *1.7 Visit in Pinkafeld at company Herz*

The goal of the study tour was also to show how biomass boilers are produced. Company Herz (http://www.herz-energie.at) in Pinkafeld presented their field of work, sizes of biomass boilers, wood logistics and types of fuel. The participants had the chance to ask for possible projects to realise, such as using chicken dung, or agro biomass as a fuel. The technologies of biomass boilers were shown at a tour through the production hall (Figure 20).

**Figure 20: Production of biomass boilers at company Herz**

### 1.8 Study Tour presentations

On the last day of the study tour 4 presentations were held about technologies for DH grids to provide the participants (Figure 21) insights about the implementation of small modular district heating grids. The presentations are available at the CoolHeating website. The topics were:

- Presentation via Skype: Small biomass CHPs from 200 to 500 $kW_{el}$, by Mr. Marcel Huber (Syncraft), based on small scale gasification, website: https://translate.google.at/translate?sl=de&tl=en&js=y&prev=_t&hl=de&ie=UTF-8&u=www.syncraft.at&edit-text=&act=url
- Presentation by Mr. Christan Engel (Thermaflex): Laying techniques – what to consider for district heating pipes

  https://thermaflex.com/en
- Presentation by Mr. Andreas Längauer: ECOP heat pump – a new solution for using waste heat for district heating systems (Figure 22)

  http://www.ecop.at/en/home-4/
- Presentation by Mr. Christian Doczekal: Steps for optimizing heating plants (no powerpoint presentation)

**Figure 21: Participants at the presentations of the study tour**

**Figure 22: Presentation of ECOP heat pumps at the study tour**

# 3 Participants

All members of the consortium were represented at the CoolHeating study tour in Austria. In total, 26 participants were joining the study tour.