



Use of Industrial Excess Heat in District Heating

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Webinar 4: Use of Industrial Excess Heat in District Heating

ActIonHeat SF1

Time: 1 h 28 min

- Serial 2:
 - Webinar 4
 - Strategical Heating & Cooling planning
 - Group support for municipalities and stakeholders
- Presented by:
 - e-think / Austria
 - TU-Wien / Austria

Part I – Excess Heat: What it is, Why it is used and How

- Introduction to Excess Heat (EH) (5') - Giulia
- Best Practices: Common EH sources and uses (20') - Giulia
- EH Cadasters (10') - Marcus
- Challenges & Factors of success (5') - Marcus
- Discussion, Q&A (5')

Part II - Assess Excess Heat potential exploitation

- Hotmaps: Layers on Excess Heat in the tool; CM add industry plants, CM transport potential (20') - Salvador
- THERMOS: a simple example (10') - Aadit
- EMB3Rs: an overview of the tool (5') - Marcus
- Discussion, Q&A (10')

Part 1

- Introduction to Excess Heat use, some examples, and extra information

Part 2

- Three different tools that can be used for the use of Excess Heat in District Heating

Introduction to Excess Heat



Part I - Excess Heat: what it is, why it is used and how



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What is Excess Heat?

Excess Heat (EH) is the heat generated by any thermodynamic process whose main objective is manufacturing products or providing services, and which is released in the environment as a by-product.

Typical industrial processes that produce excess heat:

- Production: refineries, metallurgy, chemical industry, manufacturing ...
- Services: data centres, laundries, cold stores, water management, ...
- Waste Disposal: waste incineration, closing material cycles, ...
- Energy Conversion: condensation power plants, hydrogen electrolysis, ...

Short Introduction to Excess Heat

Which industrial process commonly generated Excess Heat

- Production Processes
- Provision of services
- Process of waste disposal
- Energy conversion plants

How is Excess Heat used?

Space Heating (Cooling, less common, but on the rise)

- District networks + pressure/pumping system
- Additional Heat pumps for low-temperature
- Heat storage and backup capacity to address fluctuations

Process Heating (Cooling)

- Internal network and pumping system

Benefits: increased energy efficiency and decarbonization, additional income/reduced disposal costs for the industry, improved public image, unbundling of consumers' heating price from market price

Challenges: needs accurate planning, detailed heat supply contracts, high coordination and substantial infrastructure investments

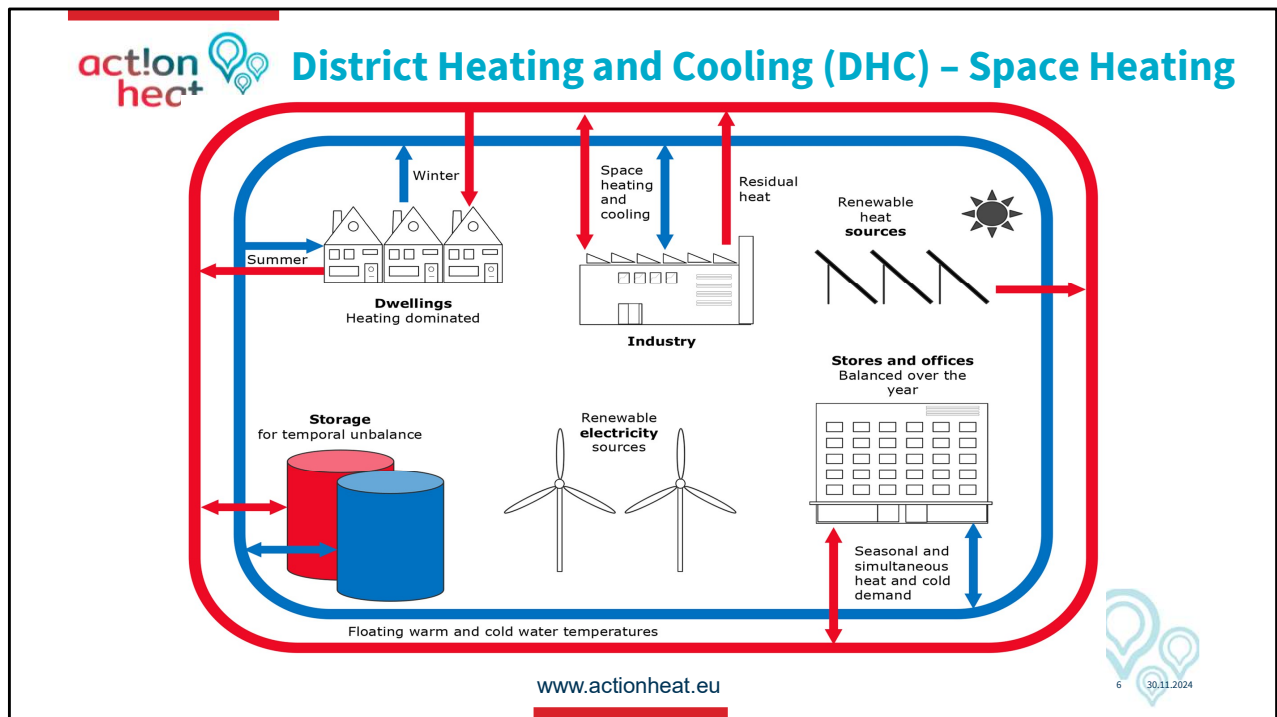
How is excess heat commonly used?

- Space Heating: The heat produced in the plant is distributed externally through different systems. Requires much infrastructure and needs to be planned
- Process Heating: The heat produced is used internally in the plant for other processes or internal Heating and Cooling. A ceramic factory is an example of that because it uses the production temperature for its drying process.

Excess heat for cooling is rising and is less common in space heating.

Why use Excess Heat?

Excess heat offers significant economic and environmental benefits for both industries and consumers. However, utilizing excess heat from industrial processes necessitates careful planning and the development of extensive infrastructure to meet the needs of stakeholders.



Elemental parts of a D&C network

- Sources

Different energy providers: like industries and other electrical renewable energy producers connected to the network

- Storage

System to store the produced Heating and Cooling

- Consumers

People living in residential buildings and commercial buildings

Best Practices: Common heat sources and uses



Part I - Excess Heat: what it is, why it is used and how



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- Refineries, Waste Incinerators
- Power Plants
- Metal Industries
- Pulp and Paper (Chemical) Industries
- Cement/Ceramic Industries
- Agri-food Industries (Bakeries, ...)

COMMON / WIDESPREAD

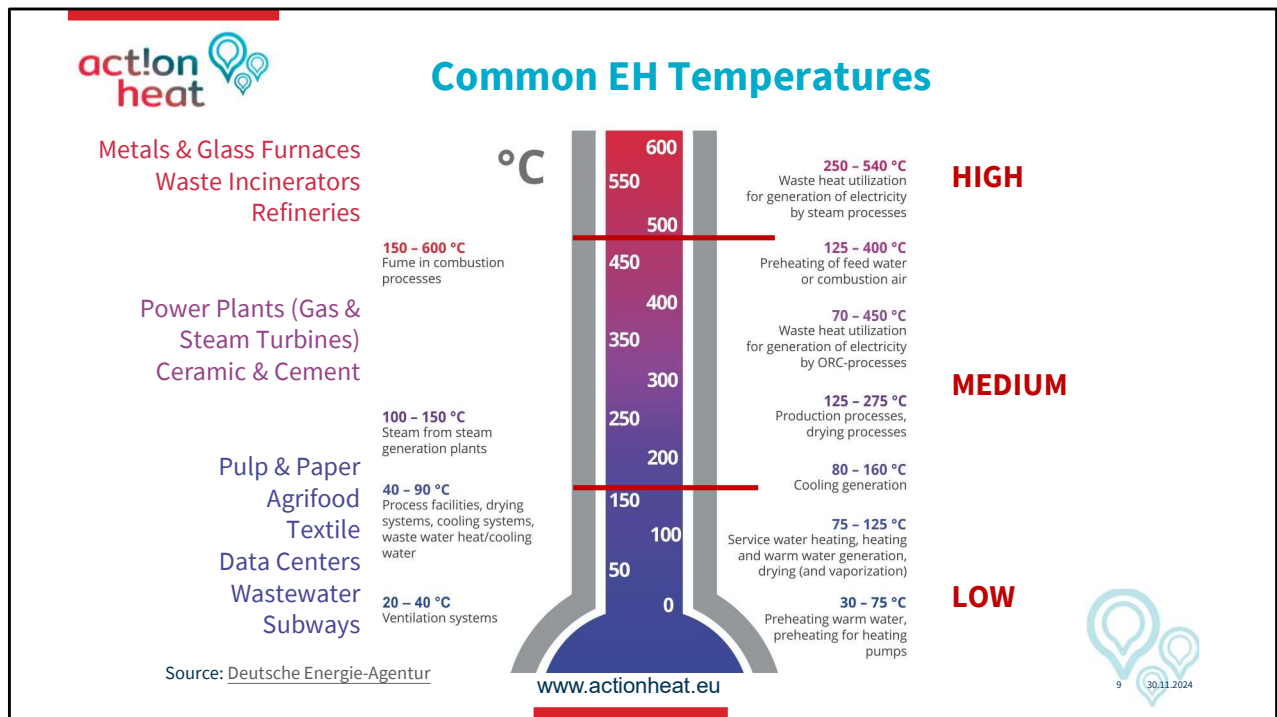
- Wastewater Treatment
- Data Centres
- Other Industries (Textile, Agrifood)
- Subways

LESS COMMON

Kind of Excess Heat sources

- High-temperature sources:
Refinery, Metal, and Cement industries...
- Low-temperature sources:
Agro-food, wastewater, data centers...

Note: The Excess Heat from waste water treatment plants and data centers will be the object of the next Webinar; therefore, those sources will be shown briefly.



EH temperature industrial ranges

- Low temperatures are everything that is below 100 degrees or max 150 degrees Celsius
- Medium temperature between 160 and 450 degrees
- High temperatures all above 450 degrees

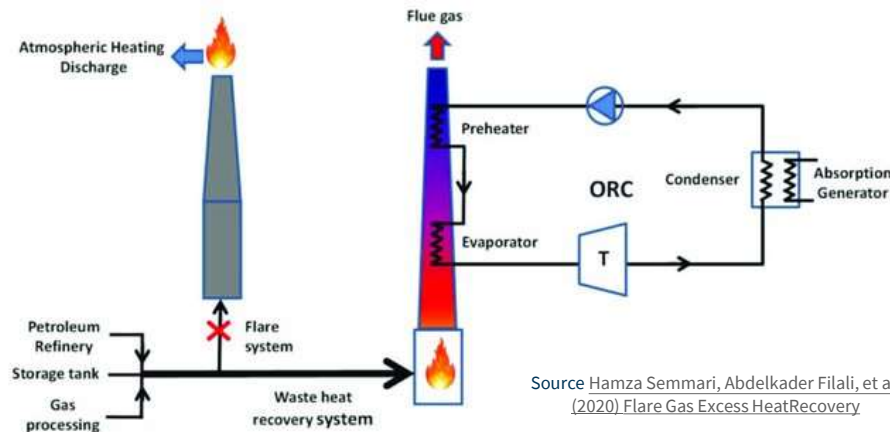
Note: the Industrial temperature of the process is not the temperature of the Excess Heat source. It is lower because of some loss during the process.

In the case of a low-temperature process if the Excess Heat is pretended to be reused, normally Heat Pumps are added to the system to increase the temperature.

Next: some excess heat industries

Excess Heat recovery from flue gas of:

- Fired heaters, steam boilers **14MW** from a 100kbbbl/day, 150-1200°
- Incineration stack 600-1200°(Vienna: **6MW**, 400GWh/y)



Incinerator is a High Excess Heat

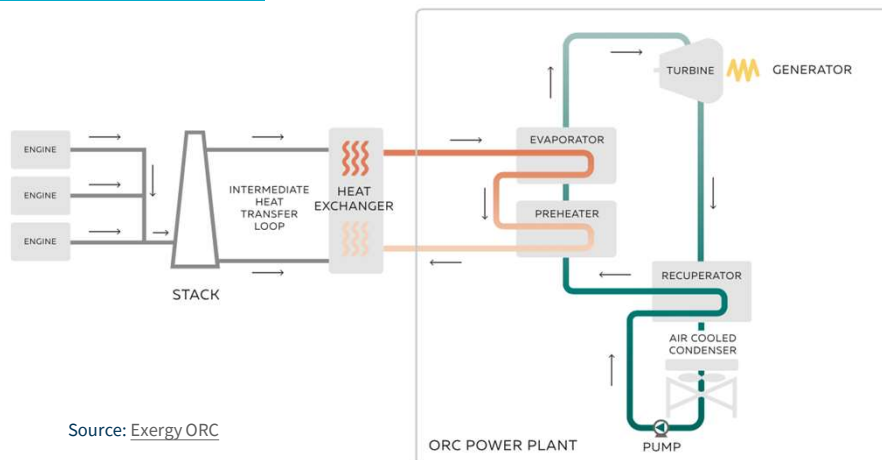
The Chart shows what happens in each industrial process.

- In this case, the incinerator: The flue gases that excess the incinerator process are reused for a heat exchanger to provide Excess Heat or for an ORC circle

The highlighting shows the typical capacities and temperatures of each industrial process. Each case needs to be distinguished by what could be the potential and the temperature.

- In the case of a refinery: Steam boilers operating with 100 thousand barrels per day and a temperature range between 150 and 1200 grades could be equivalent to 14 megawatts of internal power.
- In the case of an incinerator finding in Vienna: The incinerator stack has temperatures between 600 to 1200 grades, with a power of 6 megawatts.

Excess Heat recovered from flue gas of turbines and steam condenser
(150°-1200°, 10-30MW, average supercritical coal plant)



Power plants can also have High temperatures

Those that are around Europe with a capacity between 10 and 30 megawatts could be considered as a High temperature.

Metal Industries

Project cost:

4-36M€

Capacity:

3-120MW

EH recovered:

1-250 GWh/y

DH Network size:

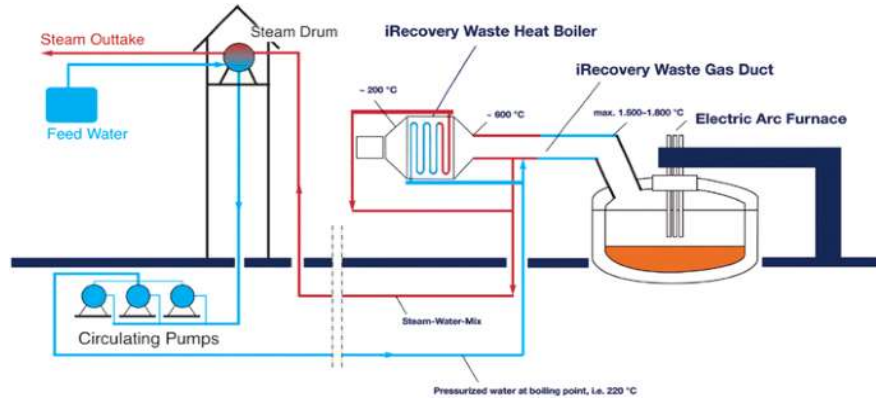
1-500 km

Distance: 2-8km

EH temperature: up to 200-1200°

Source: Lifeng Zhang, Excess Heat Recovery from Metal Industries

Examples: Thyssenkrupp AG (Duisburg/ Dinslaken), Arcelor Mittal (Saint Chely d'Apcher, Dunquirque)



Metal industries are common sources of Excess Heat.

They can have a capacity between 3 to 12 megawatts, depending on the size

The temperatures are going from 200 to 1200 degrees

Note: the temperatures that are highlighted are the industrial process temperature but not the Excess Heat temperature, which is lower

Project cost: 4-23M€

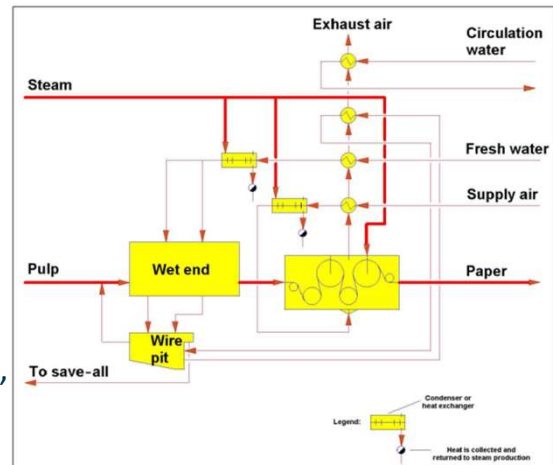
Capacity: 2-35MW

EH recovery:
5-175 GWh/y

DH Network size: 7-1200 km
Distance: 1-7 km from plant

EH temperature: 150-400° from vessels containing pulp, from flue gases of boilers, from sewage water and pulp drying

Examples: Zellstoff Pöls AG (Aichfeld, Austria)



Source: Paper Machine Heat Recovery

Pulp and Paper could be a medium temperature source

The Excess Heat can come from:

- The flue gases of the boilers
- The bases containing the pipe
- The waste water
- The drying process

Project cost: 1-5M€

Capacity: 4-5MW

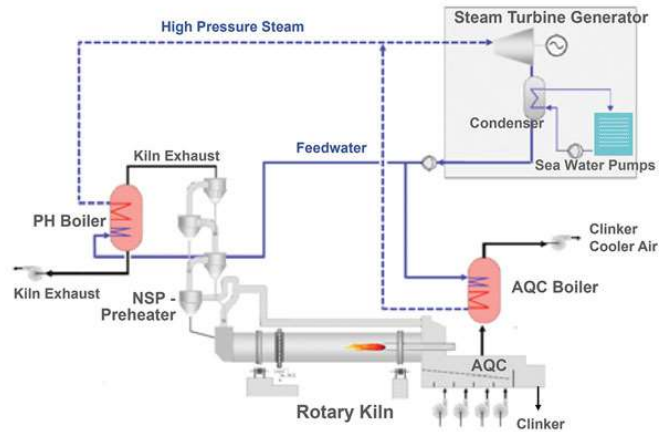
EH after internal recovery:
4-22 GWh/y

DH Network size: 4-22 km

Distance: 1.5-2km from plant

EH temperature: 300-350°

Examples: Kirchdorfer
Zementwerk Hofmann,
Zementwerk Hatschek, Lafarge Zementwerk Retznei (Austria)



Source: WHR in a Cement Plant, The international Cement Review

Cement industries are a medium-temperature source.

The chart information shows the development cost for small District Heating networks that were constructed in different parts of Europe described in the example part.

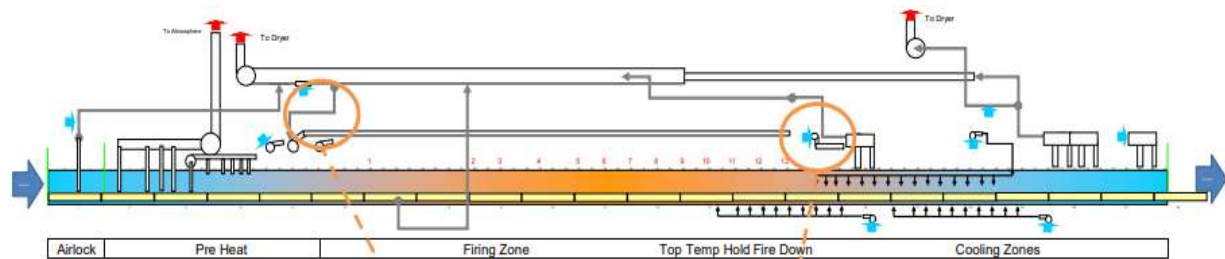
Ceramic Industries

Common heat recovery (150-200°) from roller kilns (750-1800°):

- Self-consumption for spray drying and drying phase
- CHP turbine/generator (~3-5MW) saving 10-50% of heat input

Additional heat recovery from firing roller kiln(s):

- KPM Porcelain - Vattenfall urban DHC, Berlin (110°- 1MWh/y)



2. Flue gas used in preheating 1. Hot flue gas recovered

Source: [Weinerberger and Ceramics Federation, The potential for recovering and using surplus heat from industry](#)

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Ceramic Fabric has a Medium temperature EH

The chart shows the recovered temperature of a ceramic industry which is lower than the used during the process but stays considered higher for its reuse.

For example, in Berlin exists a ceramic industry supplying the local network with a temperature of 110 degrees with a capacity of 1 megawatt per hour.

Implementation example:

- 110 MWt at full capacity with over 90°C flow temperature

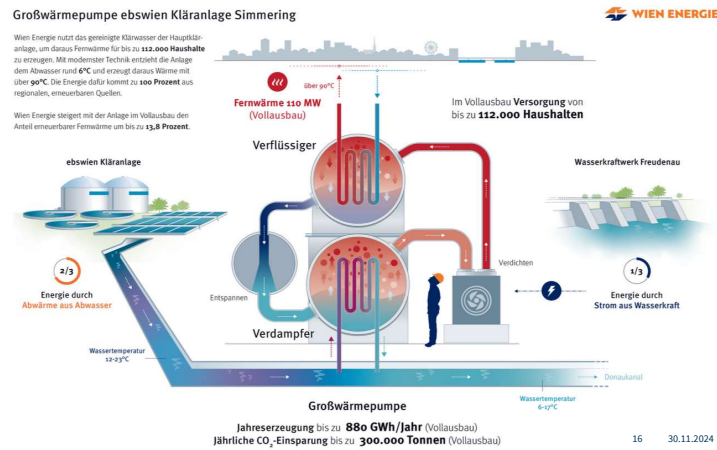
- 70 MEUR Investment

- Delta T: ~20-5°C

- 2/3 of energy by waste heat from waste water

- Production: 880 GWh/year

Source: Wien Energie



Wastewater treatment plants are low-temperature sources

Regarding treatment plants, there are two possibilities for recovering Excess Heat.

- The first is before the treatment of the water.
- The second is after the treatment of the water.

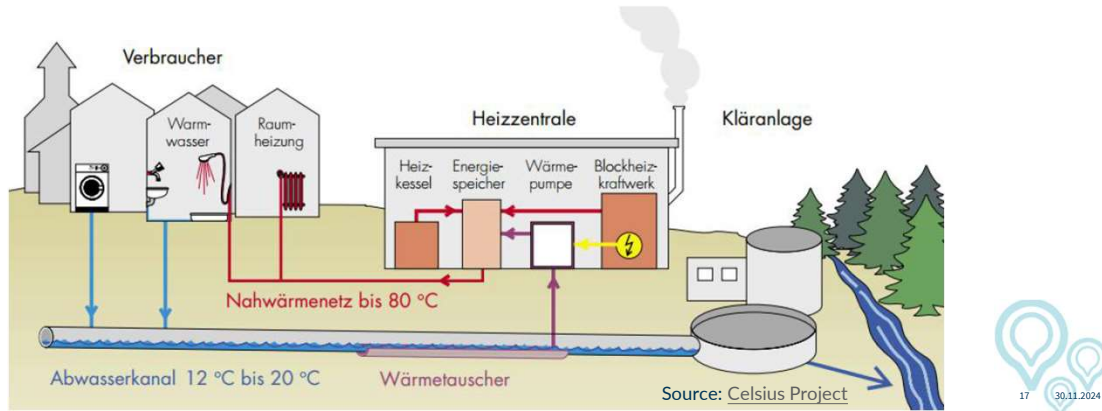
Wastewater before treatment

Example:

Capacity: 243 kW heating - 200 kW cooling (Singen)

Heat pump COP: 3.9 (Singen) Temperatures: ~15°C

Period: since 2004 (Singen) - GVV Städtische Wohnbaugesellschaft mbH

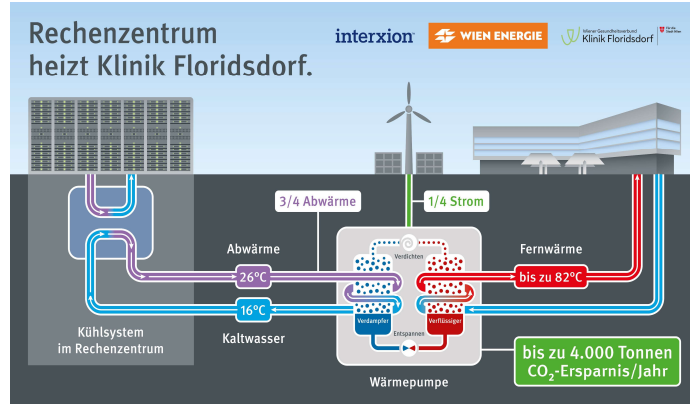


Waste water before and after treatment are low temperature

The Excess Heat reuse from waste water treatment plants will be explained in detail during the next webinar; here is only to show the places where the EH is recovered.

Implementation example:

- 3.5 million € investment (incl. support from the government)
- Approx. 120,000 servers
- Realization: mid-2023
- Delta T = 10°C
- Total of 3 HP:
- Heating capacity: 3 MWth
- Cooling capacity: 2.1 MW
- Flow: up to 82°C
- ¼ renewable electricity
- 3/4 of the energy by Excess Heat from the data center.
- Examples: Val d'Europe (FR), Mäntsälä (FL)



Source: Wien Energie

Data centers are low-temperature sources

Normally the use of Excess Heat from low-temperature sources, which is moderate, requires the assistance of a Heat Pump that increases the temperature to reach the desired temperature for the use in a District Network.

Project cost: 0.5-19M€

Capacity: 0.5-5MW

EH: 2-20 GWh/y

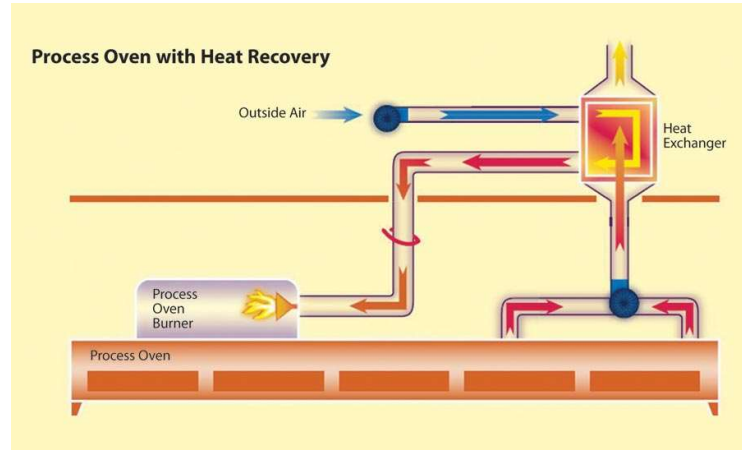
DH Network size: 3-30 km

Distance: up to 8km

EH temperature:

100-250° from flue gases of
baking ovens, 20-50° from
breweries, distilleries and
milk pasteurization

Examples: Manner, Meyer
Waffel, Breweries
(Puntigamer, Leoben), Tirol Milch



Source: Process Heating, [Heat Recovery for Process Efficiency](#)

The agri-food industry is at a low and medium temperature

The Excess Heat from the Baking ovens can be reused:

- Internally for distillation, fermentation process
- Externally for District Heating reuse

Project cost: 1M€

Capacity: 0.5-1MW

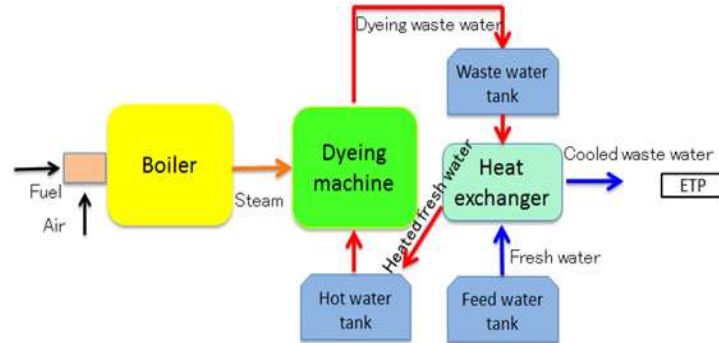
WH: 4 GWh/y

DH Network size: 1 km

EH temperature: 60-90°

from exhaust hot water
(washing machines,
dyeing process) and steam (dryers)

Examples: Getzner Textil (Bludenz)



Source: Excess Heat Recovery and Utilization in Textile and Garment Factories

Textile and Laundry industry are low-temperature sources

Textil industries have a limited production capacity. Nevertheless, the excess heat can be reused, which is normally coming from:

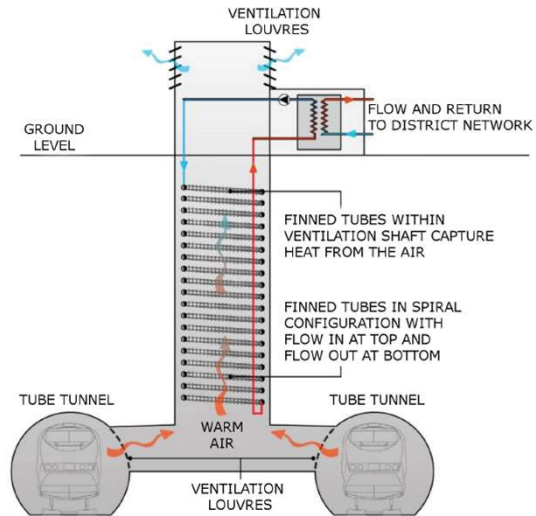
- Washing machines
- Drying process
- The steam of the dryers

Subways

Temperature:
10-30°
(winter / summer)

Capacity: **1MW**

Examples: London,
Turin, Vienna, ...



Source: Celsius Project

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Subway is a low-temperature source

The reuse of Excess Heat coming from the subway is a relative new discovery, that can be exploited in the most of the big cities and this is coming normally from:

- Brakes of the trains
- Air circulation on the tunnels

Excess Heat Cadasters: sources mapping, registry set-up, and examples of existing ones



Part I - Excess Heat: what it is, why it is used and how



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Purpose: mapping sources, raise awareness, provide data

Heat sources are identified by:

- Location
- Temperature level: low/medium/high
- Heat flow: water/fumes (GWh)
- Fluctuations: daily, weekly and annual

Exploitability is assessed in function of:

- Heat demand in the heat sink
- Proximity to the heat sinks -> cost of transport
- Costs of heat extraction
- Existence of generation and grid infrastructures

Overview of what is Cadasters

- Excess Heat Cadasters development is increasing.
- Some regions could have similar approaches or different ones.

The main idea with Cadaster is to map sources:

- It helps to be aware of the existence of Excess Heat sources.
- Providing different kinds of data to connect possible suppliers with sinks.

The chart explains how to find Excess Heat sources and exploit them according to their location and operative data.

Set up an Excess Heat Cadaster

Steps:

- Identify potential EH sources: by sector (NACE codes)
- Estimate data: conversion tables for subsector and production
- Contact sites and confirm via surveys/interviews

Useful documents:

- [Manual for Excess Heat Cadaster Development](#)
- [Data Collection Survey](#)

Find a sources with Cadaster

Look and the industries that you have nearby, remembering that the information could be:

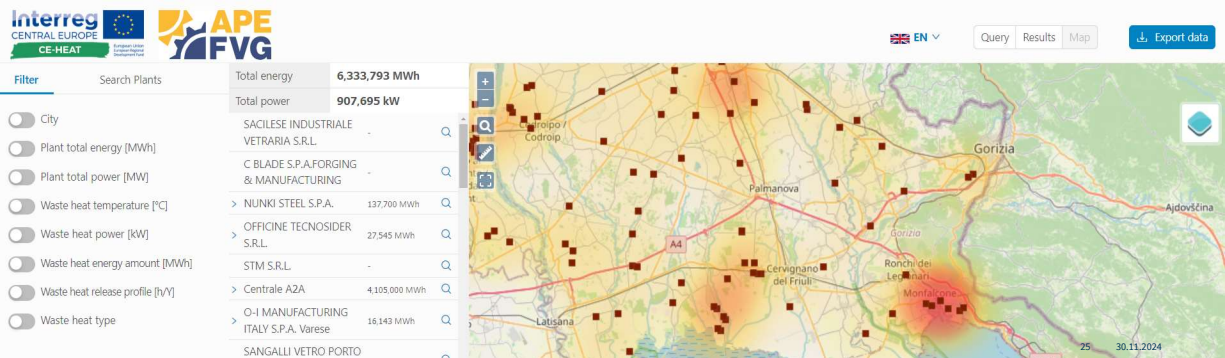
- An outside estimation for the potential EH
- Information provided by the industry

Note: The links can help to find extra information about cadasters and its data collection, and the presentation slide can provide questions in case a participant requires other regions.



Existing Excess Heat Cadasters

- [Styria Digital Atlas & Excess Heat Registry](#)
- [Bavaria Excess Heat Cadaster](#)
- [Interreg CE-HEAT Excess Heat Potential: United Kingdom, Slovenia, Croatia, Burgenland \(Austria\), Thuringia \(Germany\), Czech Republic, Lower Silesia \(Poland\), Friuli Venezia Giulia \(Italy\)](#)

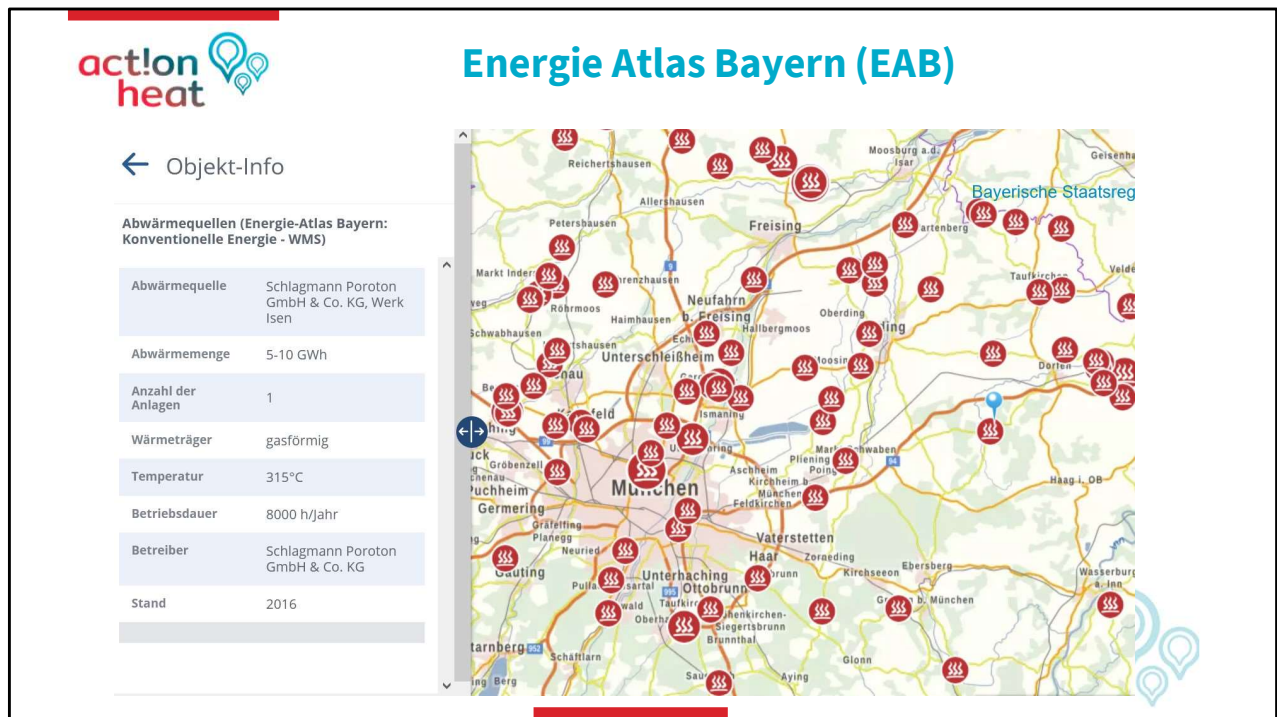


Different Cadasters

The chart shows two different cadasters,

- The Barvarian
- An interactive project with some Cadasters for region of Styria.

First, the Barvarian, was presented.



EAB is in the GIS mapping for Excess Heat and other renewable sources like:

- Geothermal
- Hydropower
- Wind energy
- Biomass

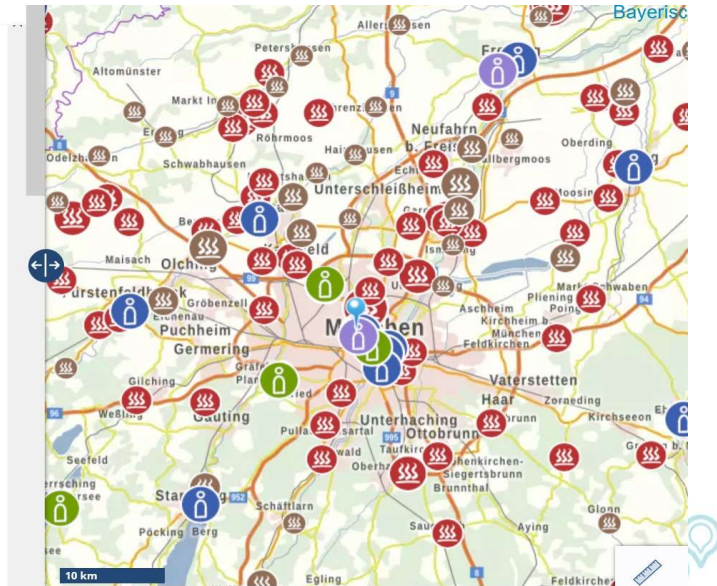
It is possible to go to Excess Heat and open the potential to see all the sources they identify. If you zoom in on the map, you can see where it is, and by clicking on it, you can identify:

Company name: Schlagmann Poroton

- Estimation of Execes Heat potential: 5-10 GWh
- Heat transfer medium: gaseous
- Temperature range: 315°C

- During how many hours in the day is it possible to have that: 8000 h/Jahr

Institution	Wasserwirtschaftsamt München
Angebot	Fachinformationen und Beratung
Angebot im Detail	Informationen und Beratung zu wasserwirtschaftlichen Fragestellungen bei (oberflächennaher) Geothermie, Wasserkraft und Energie aus Abwasser (Abwärme).
Anschrift	Heißstraße 128, 80797 München
Kontakt	Tel. (089)21233-03, poststelle@wwa-m.bayern.de
Webseite	Wasserwirtschaftsamt München
Institution	Amt für Ländliche Entwicklung Oberbayern



Implemented projects information

On the left side, it is possible to find:

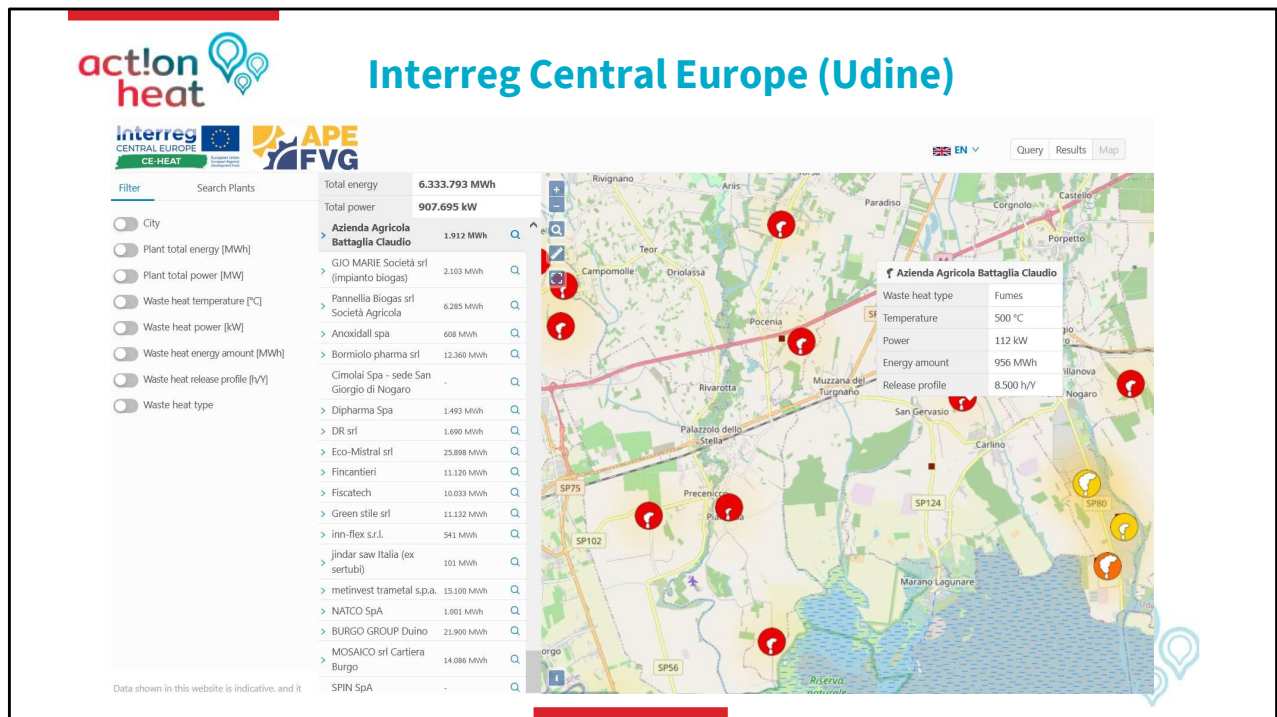
- Water potential
- Places where the Excess Heat is already reused

Those implemented projects can help as a significant driver.

A click on the info symbol, it will be possible to see:

- The contact person's data to get in touch and have more information.

Note: they are also heat networks implemented to understand how it mainly supplies one area.



The Interreg project.

It is a central European project for the region of **Udine, Venecia**. In its internet atlas will be possible to visualize the locations for:

- High-temperature Excess Heat potential industries in red
- Medium temperature potential and lower with other colors

If you click on one, it will be possible to see information about:

- The media
- Temperature
- Power
- Energy amount
- How stable

Excess Heat: Challenges & Factors of success



Part I - Excess Heat: what it is, why it is used and how



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Common Challenges

- **Lack of data** --> Excess HeatCadasters can provide a starting point
- **Lack of interest** from industries in participating in EH recovery projects
 - Economy -> heat supply can be paid to the EH source
 - Motivation -> Energy Industries can be subject to emission targets
- Industrial EH suppliers and Network Managers/Heat Suppliers usually have **different priorities** (reduce costs vs security of supply) and amortization periods (short for industry, long for heat supplier)
- **Misaligned heat load profiles** of supply and demand (daily/seasonal)
- **Default Risk:** the industry shuts down/relocates -> Backup capacity
- Managing temporal fluctuations -> Heat Storage, back-up capacities

Important challenges

To unify the information for sources and sinks

Contact with the information companies.

Convince companies about the importance because they have other priorities

The connection between companies as suppliers and the demanders.

The company stops working because it is closed.

Success Factors

- **Spatial proximity** of heat source/sinks reduces connection costs.
- The better the **profile** of the heat **source matches** the **profile** of the heat **sink** and the higher the **current heat supply costs** of systems to be replaced, the better.
- The more **constant and** the **higher** the **temperature**, the more valuable and better suited the Excess Heat is for recovery and use.
- **Accurate contract negotiations** between EH supplier, system heat supplier and customers.

Important Success Factors

The proximity between suppliers and users helps reduce costs. In some projects, distances exceeding 20 km are feasible due to the significant availability of excess heat (EH). Systems with consistent and higher temperatures are generally more advantageous.

Additionally, contract templates between sinks and suppliers are now available, streamlining agreements. These templates were offered to participants during the webinar as a resource.

Discussion - Q&A



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Hotmaps: EH Layers, CM Add Industry Plant, CM Excess Heat Transport Potential



Part II - Assess Excess Heat potential exploitation



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HOTMAPS is an open-access tool that allows public authorities to identify, analyse, model and map resources and solutions to start heating and cooling planning in their territory in a resource- and cost-efficient way.

Excess Heat Potentials

- **Industrial Sites Excess Heat**(layer of default database)
- **CM Add Industry Plant** (to upload own data)
Add industrial sites not mapped in the default database with their heating and cooling demand and Excess Heat potential through a stand-alone Excel form.

HOTMAPS is an open-access tool built in 2020.

Hotmaps is a platform with several layers and calculation modules, but for this webinar, we will focus on two-specific tools of hot maps.

Has a database that estimates excess heat potential for around 5000 energy-intensive industrial sites in Europe. This means you must find an Industry with excess heat in your territory, but if you don't find one, you need to start an action-heat plan. Then, the platform will allow you to add an industry plant, uploading some specific data in its calculation module.

How to do that; download a stand-alone Excel form and fill out basic information for the industrial plant, like sector, subsector, the location with coordinates, and an estimation for the production, in case you know it. Of course, If you have more precise information, such as the excess heat and the temperature distribution, it will be better.

Finally, this Excel has some macros that allow it to be uploaded as a CSV file to add to the program in the database.

Heat Demand

- **Visualize Heat Density Map** default layer/(upload own data)

Assessment

- **CM Excess Heat Transport Potential**

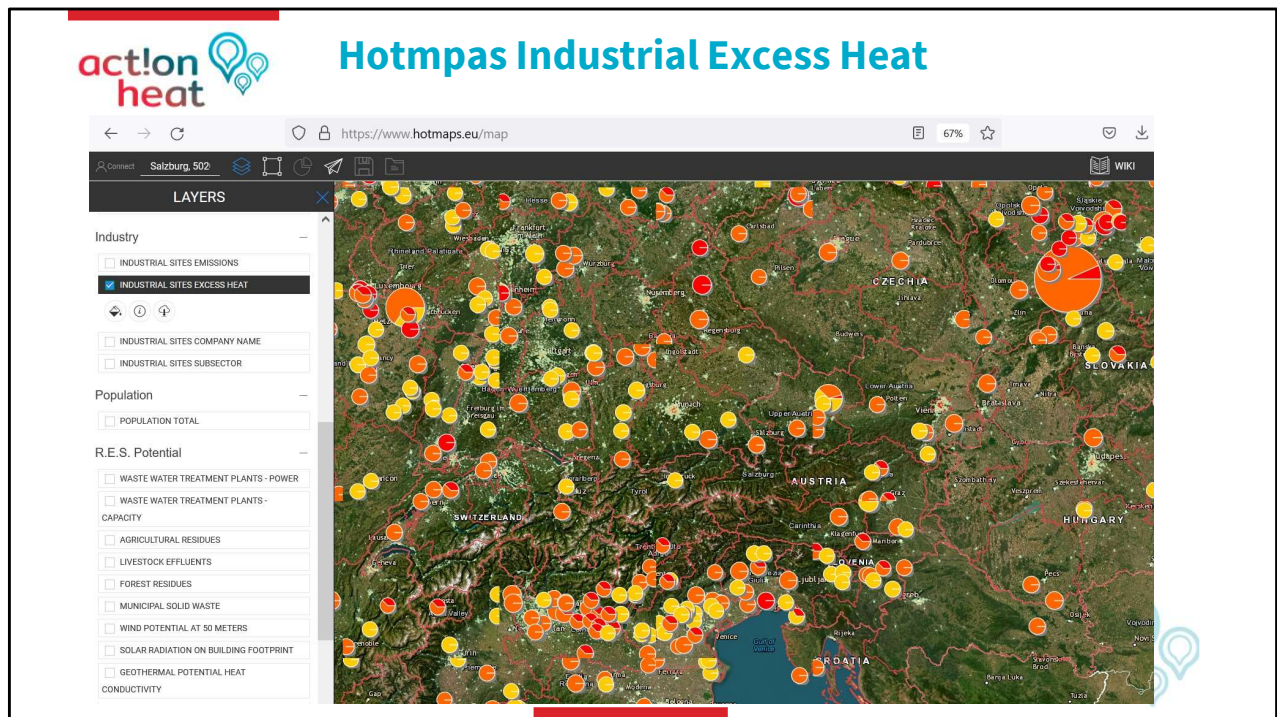
Calculate the flow and costs of heat transmission from potential Excess Heatsources to potential district heating areas.

- Thresholds data for Calculate DH potential within a selected region:
 - 1) Minimum heat demand per hectare, 2) Minimum heat demand in the DH area.
- Extra inputs: Industrial Site Subsector and Excess Heat

Heat demand calculation

The tool allows you to visualize if there is heat demand near the industrial excess heat site you are interested in and helps you calculate the economic potential to build a heating or cooling network and the cost for the distribution from the industry to that network area.

In other words, Hotmaps will help you visualize a specific heat demand area. The excess heat transport potential module will assist you in prioritizing the demand according to the percentage of users to create a district heating network. Then it will help you to calculate the flow and cost of heat transport from the industry source to that district heating network area, as I will show you next.



How does an industrial Excess Heat look in Hotmaps?

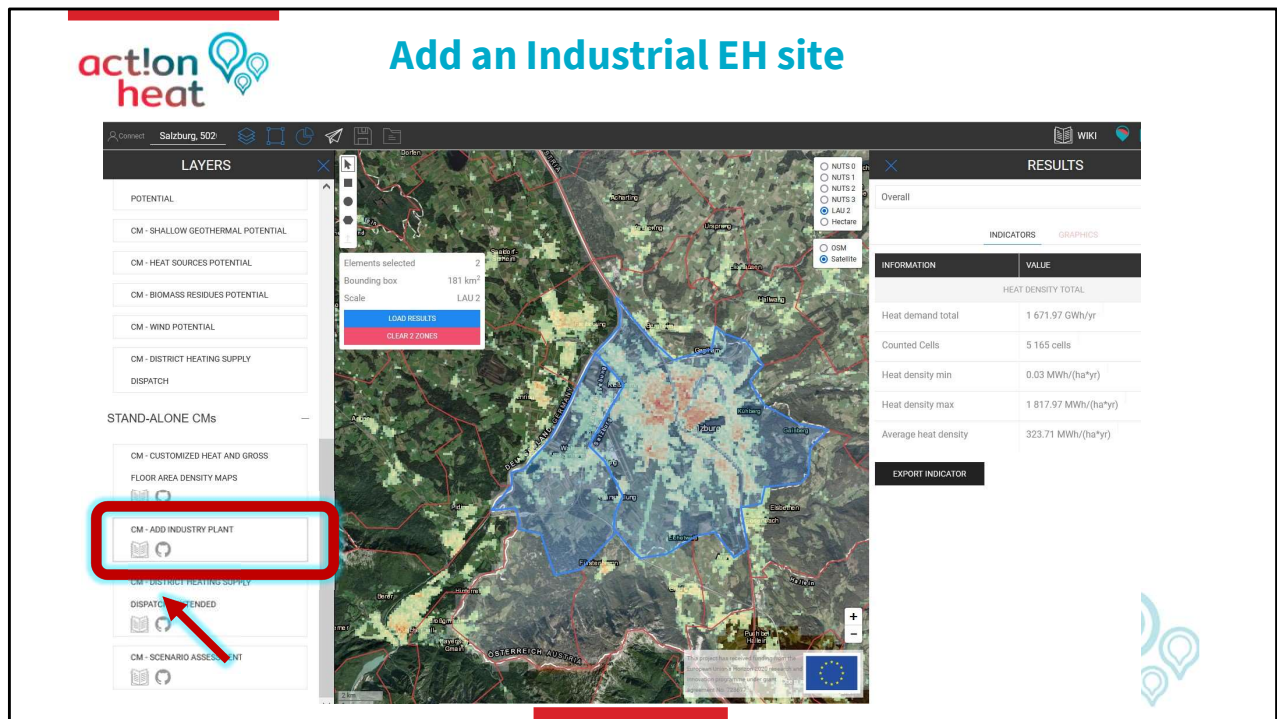
- 1.- Connect to the Hotmaps Toolbox: <https://www.hotmaps.eu/map>
- 2.- Search a location with the search bar (top left). In this case, it will be Salzburg
- 3.- Select the Industrial Sites excess heat layer and click to visualize (low, medium, high excess heat) and zoom out to see more industries:

Low temperature represented in Yellow

Medium temperature represented in Orange

High temperature represented in Red

Identify an area with significant heat demand near the industrial site and select it with the polygon at the hectare level.



How to add an industry source:

In case an industry you are looking for is not in the Hotmaps database, you can add one:

1. Search a location with the search bar (top left) giving the name of the place where your plant is located to see if it exists; for the case of this demonstration will be Salzburg.
2. Hotmaps do not show industrial sites in Salzburg, Nevertheless is necessary to select the place on the map at Hectare or NUT level (will appear selected in blue) in that moment, a small window on the left side will appear.
3. Click on the window Load Results to visualize (Heat Demand Total/ Res /Non-Res). The Calculation Modules option will also be open at this moment.
3. Open The Calculation Modules CM function (top left by the layers) and scroll down to find the **CM Add Industry Plant**.
- 4.-Click on the Wikipedia symbol

action heat

Download an Excel on the Wiki link.

Data input in Excel-tool by user

Please download the provided Excel-tool from [HERE](#)

The approach on how to use the Excel-tool is illustrated in the figure below and described in more detail in the following sections.

1st step: General information

Please enter general information about the sites for which heat and cooling demand and excess heat potential should be calculated
-> possibility to enter 10 sites

2nd step: Choose option in tab sheet

Option 1 - Manual input	Please fill in manually, if data on heat/ cooling demand and excess heat potential and its temperature distribution is available for the company
Option 2 - Plant selection	Please choose this option, if no information about heat/ cooling demand and excess heat of the company is available. The calculation is based on plant specific data.
Option 3 - Sector selection	Please choose this option, if your plant type is not available in option 2.

Step-by-step approach how to use the Excel-tool.

1) Add general information

Please go to tabsheet: [input - General information](#)

In the first step, please enter all necessary general information about the sites for which heating and cooling demand and excess heat potential should be calculated. It is possible to add up to 10 industrial sites.

HotMaps / add_industry_plant_cm Public

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Files master

add_industry_plant_cm / HotMaps_CM_Add_industry_plant_V14.xlsm

LisaNel Add files via upload 3 years ago

724 KB

Code Blame Raw View raw

CM Add industry plant: click on the wiki link to download the [Excel](#) file

1. The wiki link will be open; scroll down until you find Data input in Excel-tool by users
2. Click on Please download the provided Excel-tool from **HERE**
3. Another window will open; go down to find the icon where to download the Excel
4. Click on it, and decide the place to be discharged in your computer

Note: The instructions for adding industrial Excess Heat data in the Excel sheet CVS format are explained step by step in the first wiki link.

action heat Add the industry EH information

1st step: General Information Please enter general information about the sites for which heat and cooling demand and excess heat potential should be calculated
--> possibility to enter 10 sites

2nd step: Choose option in tab sheet

- Option 1 - Manual input
- Option 2 - Plant selection
- Option 3 - Sector selection

Enter company No. 1

General information

Subsector (according to NACE 2008) Please select

Company name

Site name

Address

- Street
- City code
- City
- Country

Site coordinates (decimal degrees)

- latitude
- longitude
- in t/ year

f. ex. 50.128074 Please use this URL to convert an address to its coordinates:
f. ex. 8.601274 <https://www.gps-coordinates.net/>

Enter company No. 2

General information

Subsector (according to NACE 2008) Please select

Company name

Site name

Address

- Street
- City code
- City

Content Input - General informati Option 1 - Manual input Option 2 - Plant selection Option 3 - Sector sele ...

Open the Excel and add the Industry information

1. Populate the general info for the industry. Important data are the subsector and the GPS coordinates to find the industry.

2. For the second step, choose an option and fill in the data on the Excel:

If you know the exact heat demand and supply

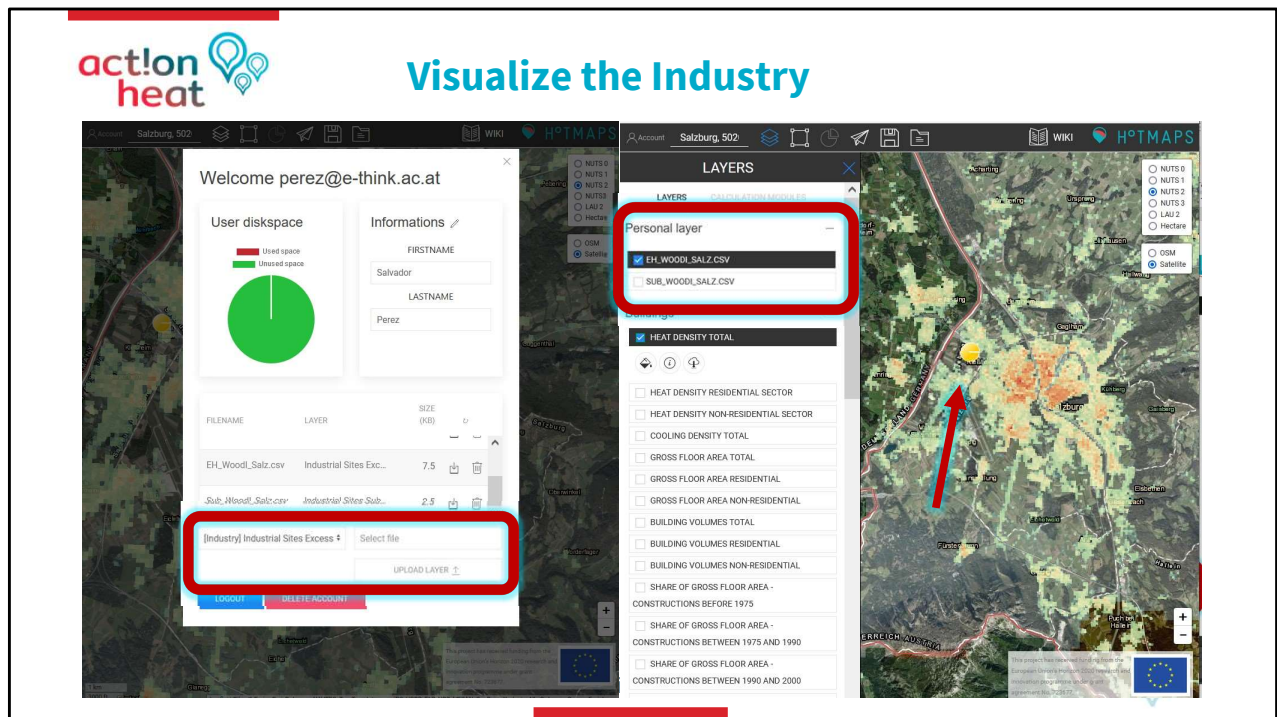
If you know only the subsector and annual production

If the subsector is not listed in Option 2 is it possible to add

3. Extract 2 CSV files from the last two sheets (after completing the data)

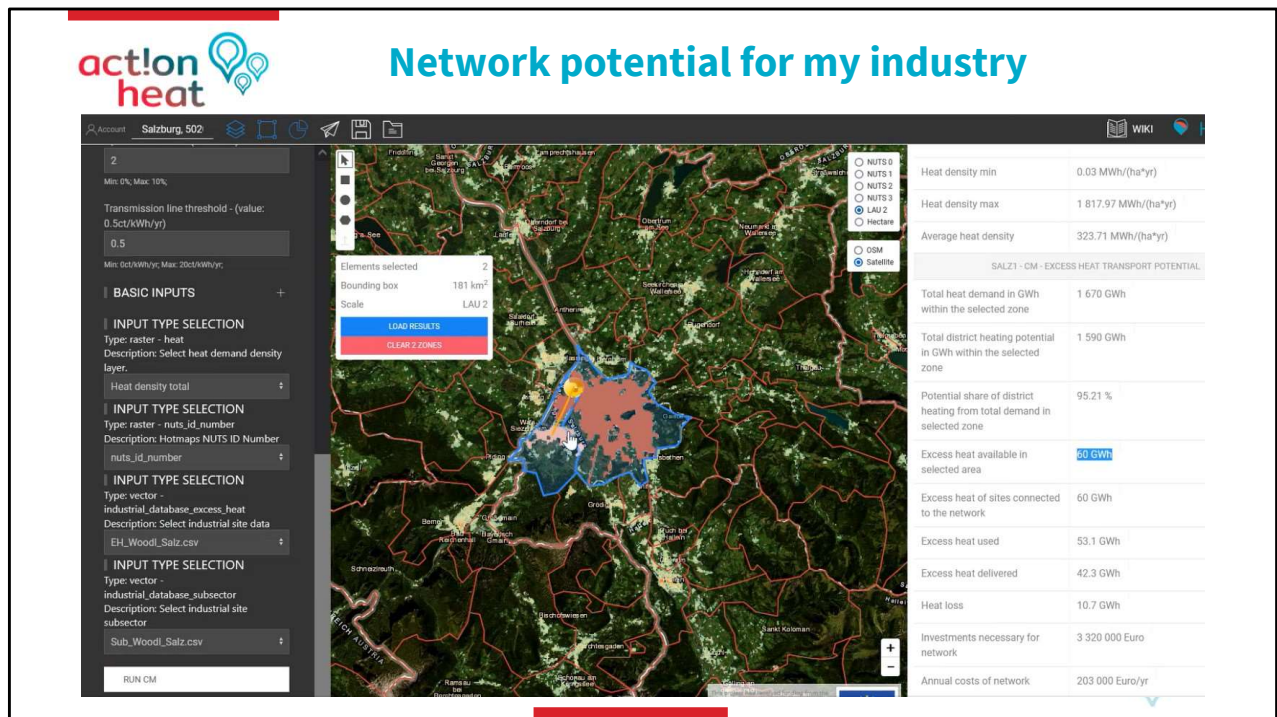
If you need help to understand read the Wiki link indication.

Note: It is necessary to allow macros when in order to add information and save the CVS data that will be uploaded on the Hotmaps platform.



To visualize the new industry on Hotmaps

1. Create a User Account (click on Connect on the top left) and activate your account by clicking on the link in the email you received.
2. Access to your user account, select the kind of file you will add, in this case, Industry Sites Excess Heat, the localization on your computer, and upload the 2 Excel CSV data.
3. Close the account window, and on the layers will appear two industry sites you add to the list as a personal layer.
4. Click on in and the newly added plant is visualized on the map, with a circle for Excess Heat potential and a triangle for the subsector



Calculate the Excess Heat Transport Potential on Hotmaps

1. Select a place near the industry side on the map at Hectare or NUT level (selection will appear in blue). Load the results in order to visualize the Calculation Mode CM function (on the top left by the layers)
2. Scroll down and go to the CM - Excess Heat Transport Potential and click on it.
3. The Calculation Mode window will be open, and there you can manually change the inputs for your heat demand or leave the default data.
4. It is important to Scroll down again and select the last two input type selection windows to add your own uploaded excess heat and subsector layers.
5. Run CM and assess results. If any potential area is found, it is colored on the map. Otherwise, lower the parameters until you find a potential DH area.

THERMOS and EMB3Rs Demo



Part II - Assess Excess Heat potential exploitation



This project has received funding from the EU's Horizon 2020 programme under grant agreement no 101033706.



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THERMOS is a free, web-based **DHC planning software** that analyses **network options including paths, load anchors and connection to single additional buildings** for the deployment of new and upgrade/expansion of existing DHC systems.

EMB3RS is a free web-based **matching-tool** that evaluates the **compatibility of Excess Heat and cold sources and sinks** in industrial processes, energy systems and District Heating and Cooling (DHC), based on the simulation of technical and economic supply-demand scenarios.

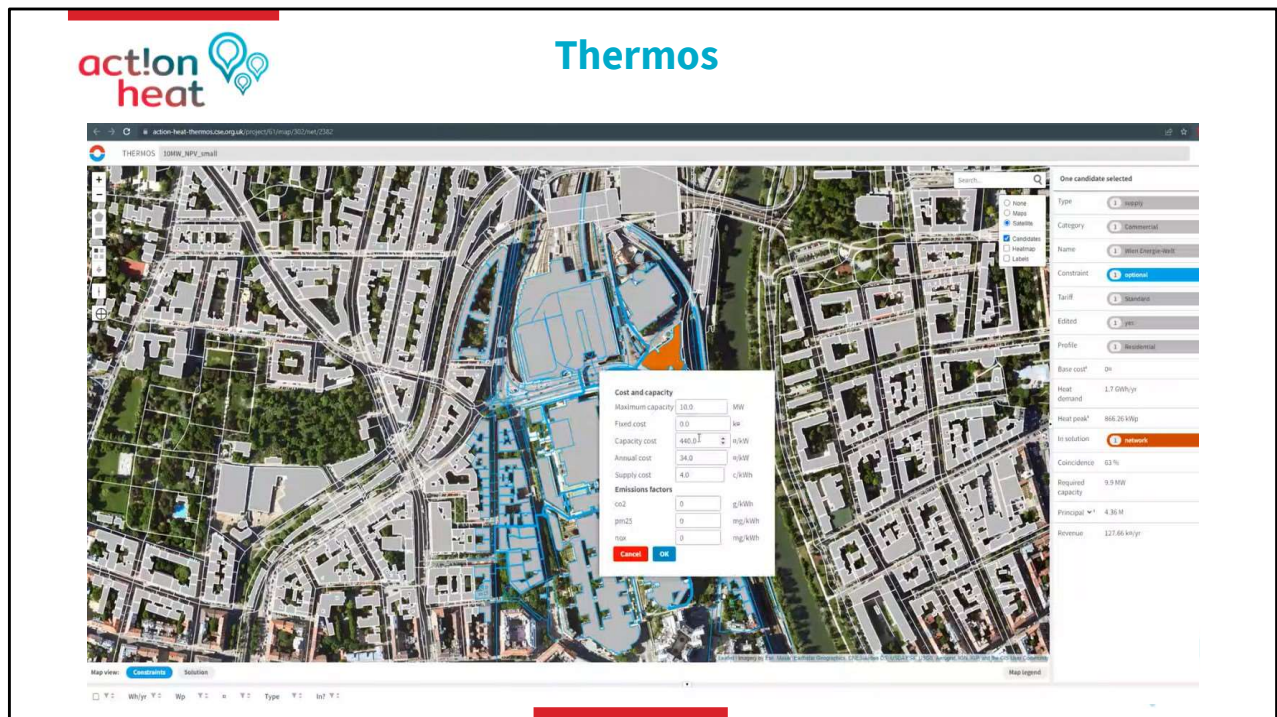
Tools for analysing the use of Excess Heat

THERMOS is a tool used for the support facility 2

- Allows to design a Network for the source to the surrounding buildings
- Has two parts, one is supply and the other is distribution to the networks

EMB3RS has the main focus to analyse Excess Heat projects,

- The platform matches sources and sinks
- It is more focused on the Excess Heat matching than on the distribution



Tool for the district heating network planning

THERMOS was not only developed for integrating Excess Heat into a district heating network but can also be effectively used for this purpose.

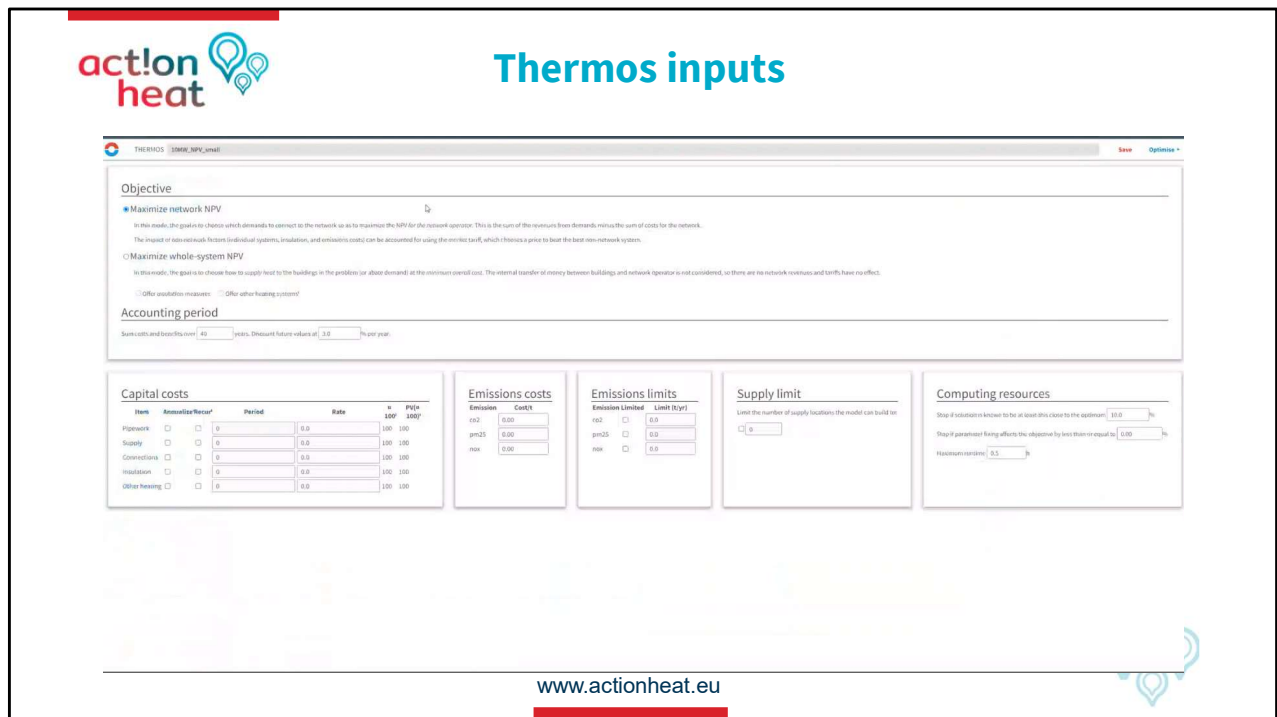
An example was presented to demonstrate the identification of optimal networks for Excess Heat supply:

THERMOS includes default data for demand and various pipe options, facilitating the construction of a regional network.

The example illustrates the creation of a network utilizing excess heat from a waste incineration plant in Vienna.

The incineration plant is represented in orange, along with its internal data, such as capacity, supply costs, and demand.

The blue lines indicate potential candidates that could benefit from the heat source through the construction of a network.



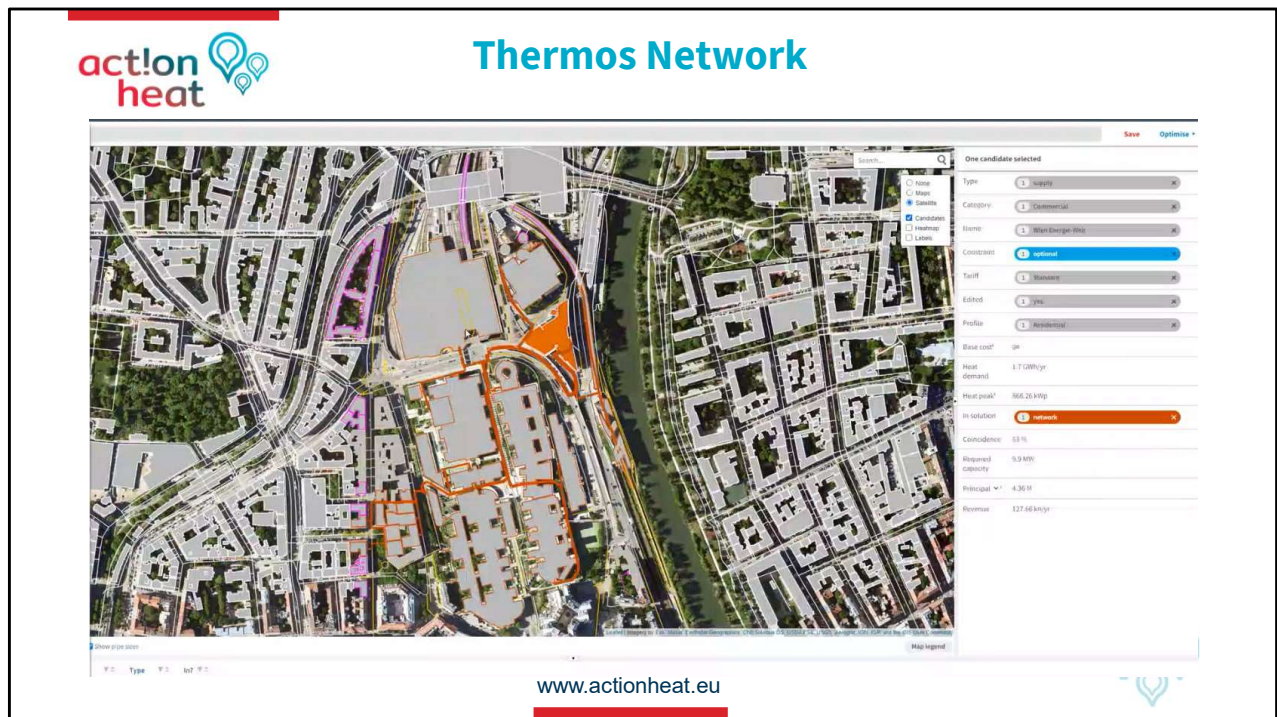
THERMOS allows for the optimization of your network

THERMOS enables you to maximize your network's Net Present Value (NPV) or overall NPV.

It is also possible to operate as an operator aiming to maximize profits by increasing the number of connections to demand points.

From an NPV perspective, the focus is on planning, where the objective is to minimize the overall system cost as much as possible.

The example will demonstrate maximizing the network's NPV to identify which demand points are most optimal to connect within the system.



Running the module provides a visual solution

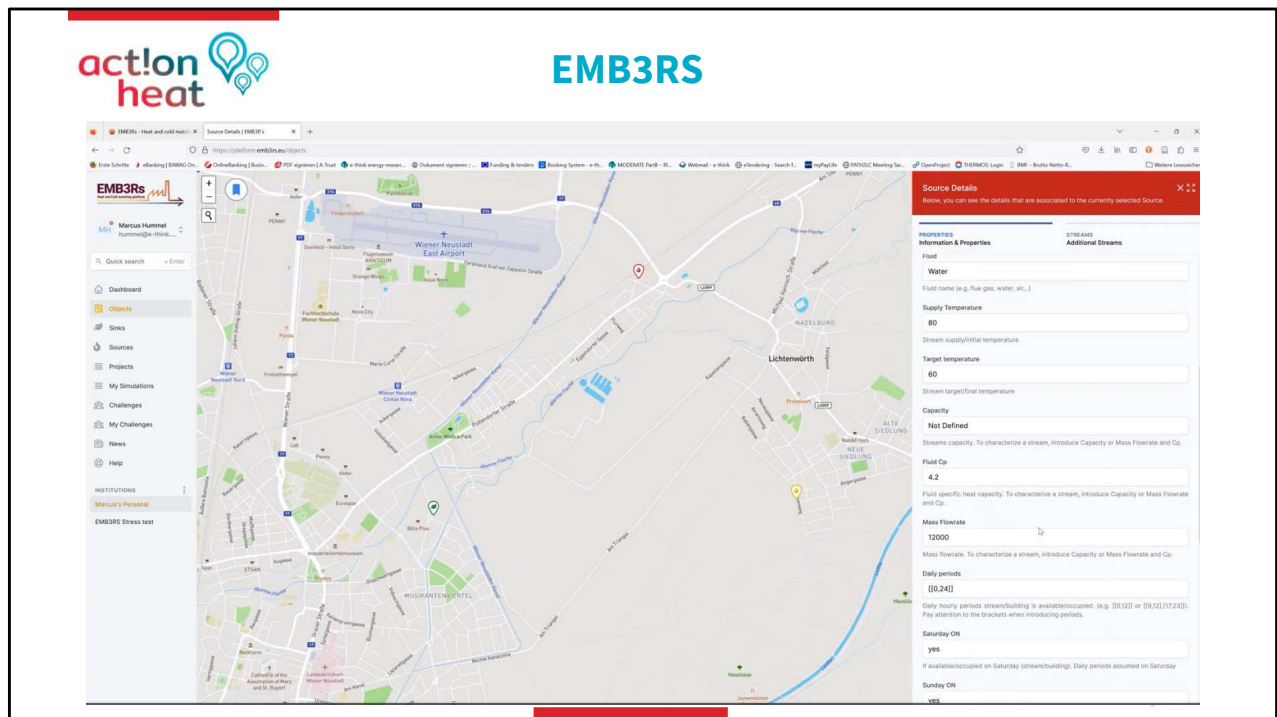
Buildings displayed in orange represent the connected buildings optimized for supply by the source.

In the window on the right side, detailed network information can be viewed based on the solution results.

It is also possible to download a summary of the solution, including the NPV and connection points.

Using preliminary data, the tool offers a preview of how your network could look with the available sources in the region. However, if specific demand and supply data are provided, the network design will be more accurate and detailed.

This tool can also be helpful for policymakers.



EMB3RS is a map-based tool

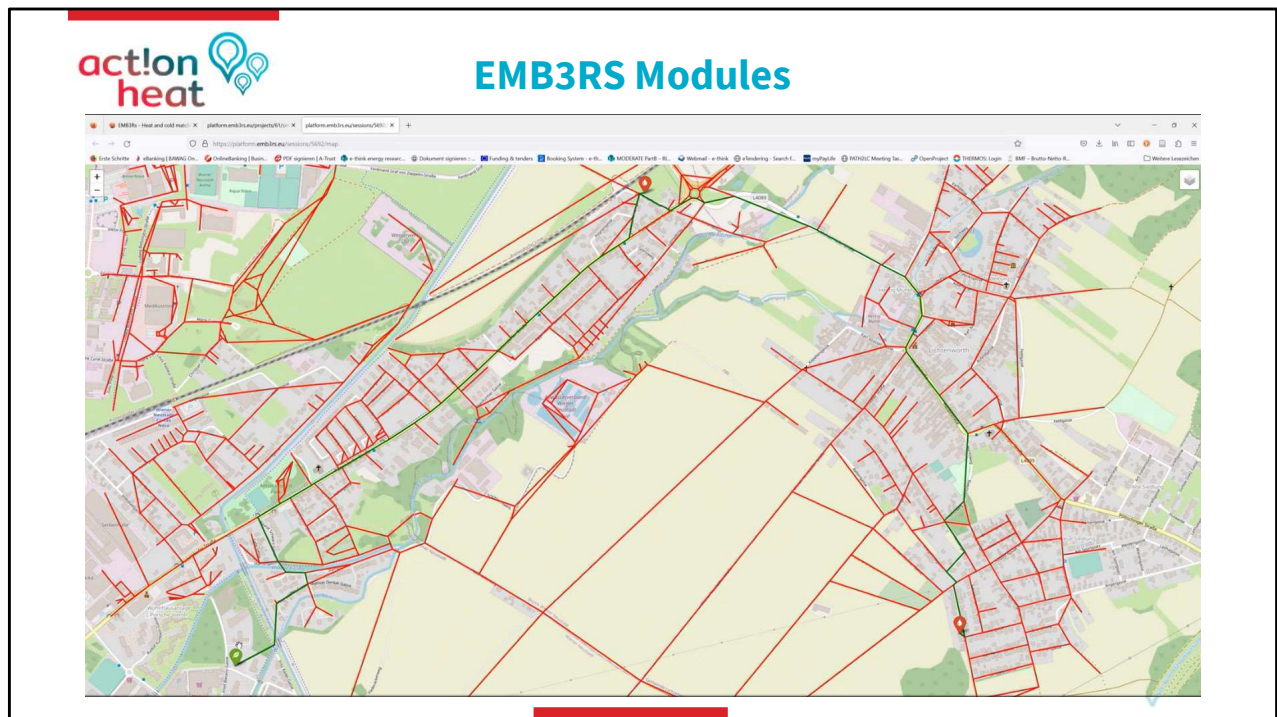
You need to define your project, territory, and the sources and sinks.

In contrast to Thermos, where buildings are not part of the background, you need to manually enter or upload all your supply and demand points.

The example shows three sources and one sink, and the platform provides options to define the sources and sinks in the template.

The Source Detail allows you to specify the capacity and availability of each source, with the option to define multiple streams per source.

The Sink Detail allows you to set the desired temperature, based on the starting temperature for the district heating system.



The simulation consists of different modules:

- GIS: Simulates a geographical match to find the shortest connections, calculates the size of the pipes to be installed, and estimates the resulting prices and costs for the entire system.
- Techno-Economic Dispatch Module: Determines which sources can be used and when to supply the sink. It also calculates if extra capacity is required or if storage is needed, and the app can perform the necessary calculations.
- Business Module: Helps calculate ownership details, determining who owns which sources, who supplies which sinks, and the ownership of the network.
- In general, EMB3RS evaluates how well the sources and sinks align and identifies reasonable methods for price discussions. It also considers the value of excess heat in a region based on temperature fluctuations, which can inform pricing discussions for its use.

Discussion – Q&A



Part II - Assess Excess Heat potential exploitation



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Thank you for your attention!



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