European Commission

District Heating: Keep regions sustainably warm

Just Transition Platform Meeting

Coal Regions in Transition virtual week

16 November 2021

Recent developments – EU policy

75% of total greenhouse gas emissions in the EU comes from the energy sector

Decarbonising our energy system

Reducing greenhouse gas emissions by at least 55% by 2030 requires higher shares of renewable energy and greater energy efficiency in an integrated energy system.

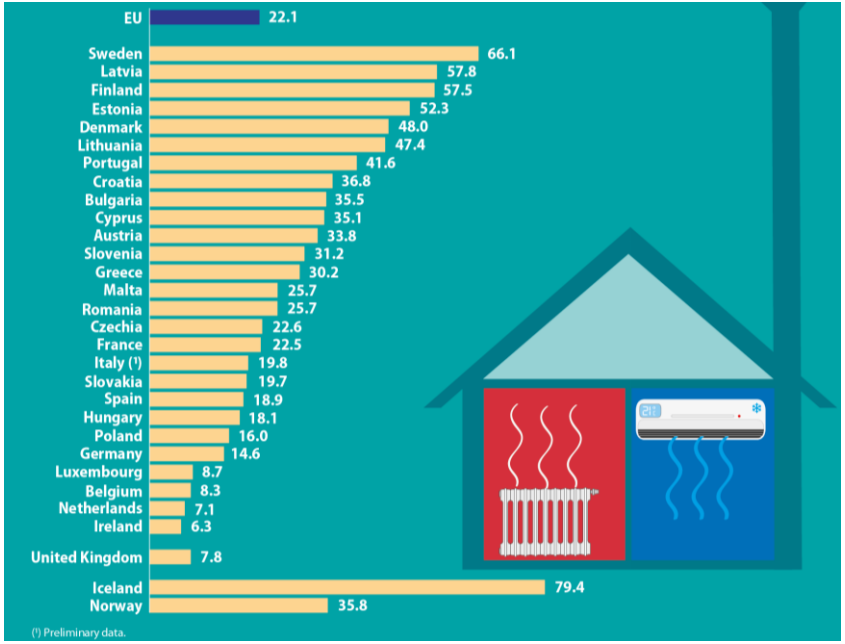
Annual binding increase of 1.1 percentage point renewables in heating and cooling at national level.

Indicative target of 2.1 percentage points renewable energy and waste heat and cold in district heating and cooling.

Source: Energy System Factsheet, EC 2021

Share of energy from renewable sources for heating and cooling in the EU

(%, 2019)



[eurostat, 2019]

Suggested optimisation hierarchy for DHS

KeepWarm
Renewing district heating

1st Retrofitting and optimising DHS networks for grid/production efficiency

2nd Accelerating the use of nearby renewable energy in heat production

3rd Integrating sustainable excess heat from industrial/commercial facilities

4th Using waste-to-energy solutions in line with waste-reduction strategies

5th Deploying smart heat distribution and control management systems

Explore the KeepWarm Learning Centre **–** ***www.keepwarmeurope.eu***

Act!onHeat – Support Facility

- **120 municipalities developing or improving their strategic H&C planning, assisted by support packages.**
- **30 municipalities carrying out prefeasibility studies, including THERMOS-based support.**
- **15 of the projects will be selected in order to perform an additional financial analysis**

Call for applications – www.actionheat.eu

European Commission

Line-up for Keeping Europe sustainably warm

Kaisa-Reeta Koskinen
Head of Climate Unit,
City of Helsinki

Maria Victoria Cambronero Vázquez
Project Manager,
ACCIONA

Thomas Gubsch

Researcher,
Zittau/Görlitz University
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Strategic
Development,
JP Elektroprivreda
BiH d.d. Sarajevo

Please use Slido for Q&A!

Step 1:
Go to Slido.com

Step 2:
Enter the code: DistrictHeating
Or follow the link on Swapcard

Step 3:
Submit your question, vote on other questions!

Please note this meeting will be recorded

16th NOVEMBER 2021

W.E. DISTRICT

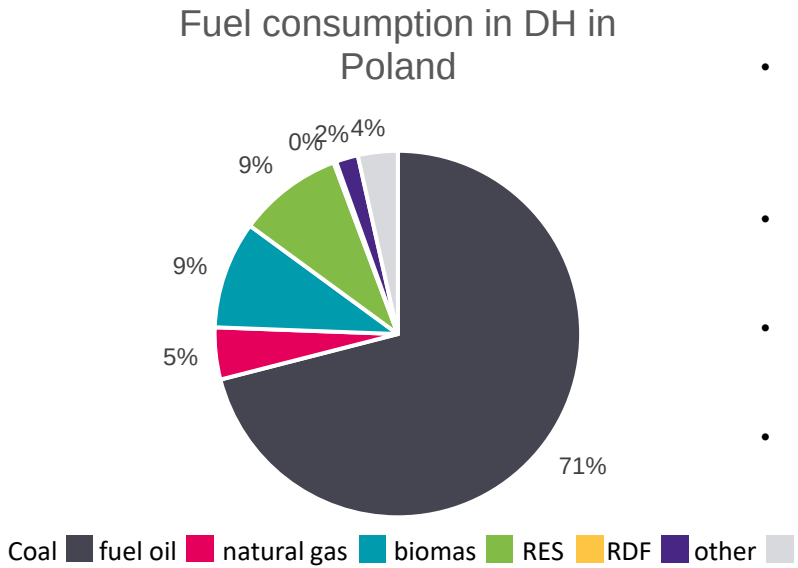
Smart and local reneWable Energy
DISTRICT heating and cooling solutions for sustainable living

Lessons learnt from demonstration case in Poland (WEDISTRICT Project)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°857801.

Status of sectoral background

(Poland)



- **Poland is the second largest (after Germany) DH heat producer in EU with around 400 licensed suppliers.**
- **>40% households in Poland use DH as a main heat source.**
- **Majority of DH are networks with total capacity below 50 MW.**
- **DH predominant fuel is coal-based.**

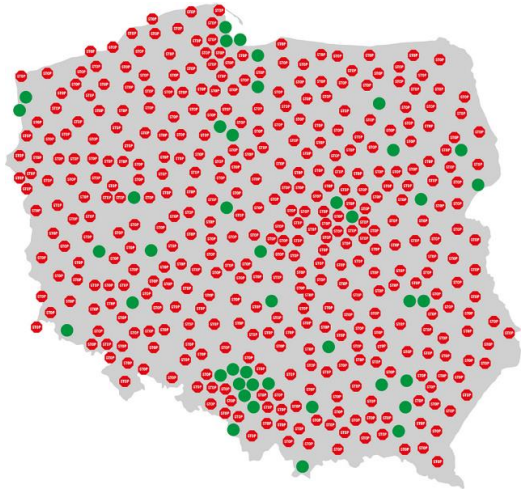
Source: GUS, EUROSTAT i URE

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°857801

Sectoral challenges

(Poland)

Efficient DHC systems in Poland



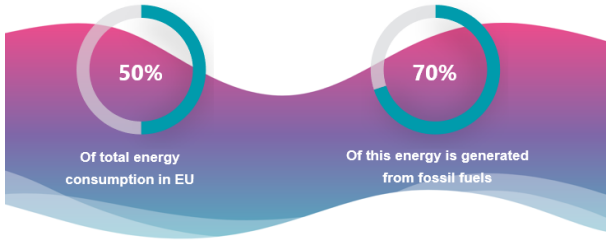
- **85% of systems do not have a status of efficient DHC systems.**
- **Increasing prices of fuels and CO2 emissions.**
- **Public pressure on keeping heat prices low.**
- **Regulated tariffs inefficient in covering the costs - can be a barrier in sustainable investments.**

Source: Forum Energii

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°857801

WEDISTRICT goal is

Heating and **cooling** buildings and industry in EU accounts for



To demonstrate innovative 100% fossil free heating and cooling solutions for new and existing district heating & cooling systems

- Multiple sources of renewable energy and excess heat from data centres
- Advanced thermal storage to redistribute heat to buildings as needed,
- Smart technologies to increase the operational efficiency of the systems.

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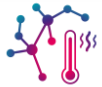
WEDISTRICT **technologies**

3 Different Solar Technologies

Data centre heat waste recovery

Low emissions Biomass technology



Molten salts Energy **storage**

Hybridation PV-Geothermal Energy

Advanced ICT system

2 different Cooling from renewable energy sources

Other **conventional technologies**

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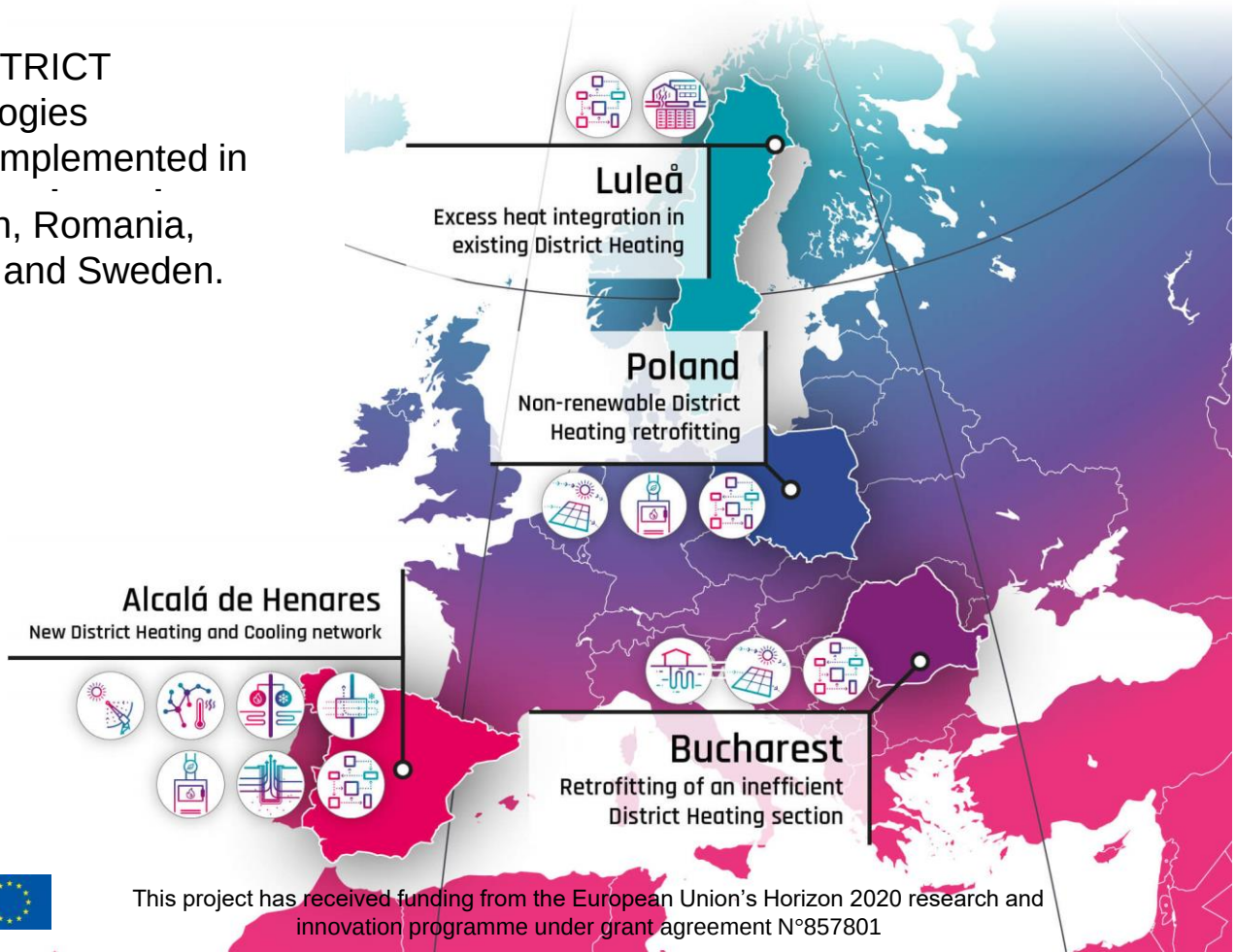
Smart and local reneWable Energy DISTRICT heating and cooling solutions for sustainable living

WEDISTRICT technologies will be implemented in [redacted] in Spain, Romania, Poland and Sweden.



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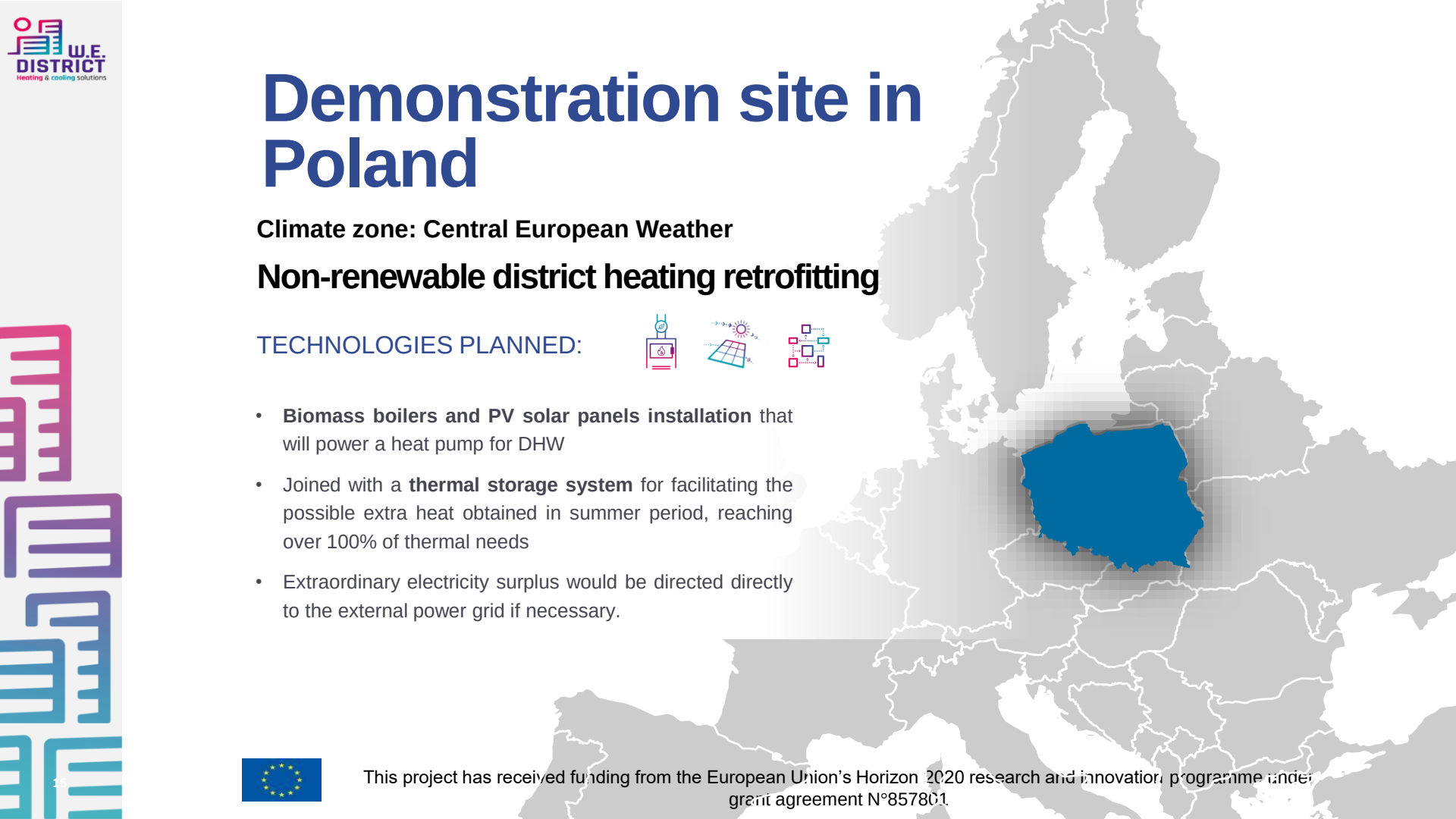
Demonstration site in Poland

Climate zone: Central European Weather

Non-renewable district heating retrofitting

TECHNOLOGIES PLANNED:

- **Biomass boilers and PV solar panels installation** that will power a heat pump for DHW
- Joined with a **thermal storage system** for facilitating the possible extra heat obtained in summer period, reaching over 100% of thermal needs
- Extraordinary electricity surplus would be directed directly to the external power grid if necessary.



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WEDISTRICT experiences

(Poland)

Challenges of small DH networks:

- **Local spatial and development plans do not foresee space for heat sources (sometimes even current source is not properly included in the plan).** → **Long procedures of changing the plans (up to around 1.5 years).**
- **Building code requirements are more strict for new solutions (e.g. fire safety requirements) – any changes require to analyse and adapt the solutions.** → **Scope of changes can be significant for a small entity (additional safety measures need to be added, new locations need to be considered, time and budget consuming procedures to verify).**
- **Pressure on keeping the heating costs low.** → **For small sources not under EU ETS (emissions trading system) traditional solutions (fossil fuel based) are currently most cost effective (without financial support).**

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WEDISTRICT experiences

(Poland)

Challenges of small DH networks:

- **Reluctancy of the network operators towards more innovative solutions.**

➡ **Fear of operators about complexity of the solutions (operation of a network with multiple weather dependant heat sources, maintenance, maintaining the parameters of heat etc.).**

- **Some smaller networks provide heat mostly or only for space heating purposes.**

➡ **Limitted availability for effective use of CHP or solar based solutions - requirements for the investments on the demand side together with introduction of new sources.**

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17

WEDISTRICT experiences

(Poland)

Positive aspects:

- **Local communities are positive towards changes (local authorities, tenants etc.).**
- **Increasing of the investment rate in DH networks (companies actively looking for investment possibilities).**
- **New financing possibilities and support for investment preparation (e.g. „Ciepłownictwo Powiatowe", „National Integrator of Investment Processes in District Heating Companies in Poland" programme).**

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Upcoming changes

(Poland)

- **New regulations for tariffs making the investment process easier.**
- **Strategy for Heating in Poland to be implemented by the end of 2021.**
- **Additional funding from Modernisation Fund dedicated for the transformation of DH networks in Poland.**

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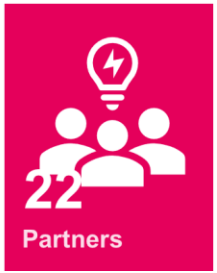
WEDISTRICT
Main data

EU Funding:
14.972.852,64 €

Start:
Oct. 2019

End:
March 2023



W.E. DISTRICT
Heating & cooling solutions

Follow us on :

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www.wedistrict.eu

Subscribe to our community of interest in: www.wedistrict.eu/contact/

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°857801

Thank you for your attention!

María Victoria Cambronero Vázquez

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AQVA-HEAT a building block for the structural transformation of district heating generation in a regional and supraregional context

Just Transition Platform Meeting Coal Regions in Transition, Virtual Week 16.- 19.11.2021

Thomas Gubsch – Institute for Process Technology, Process Automation and Measurement Technology (IPM) at the Zittau / Goerlitz University of Applied Sciences

The Project Team

- **AQVA-HEAT (phase 1)**

ILK Dresden

IPM Hochschule Zittau/Görlitz

Brandenburgische Technische Universität Cottbus - Senftenberg

- **AQVA-HEAT (phase 2)**

Fraunhofer IEG

- **AQVA-HEAT (phase 3)**

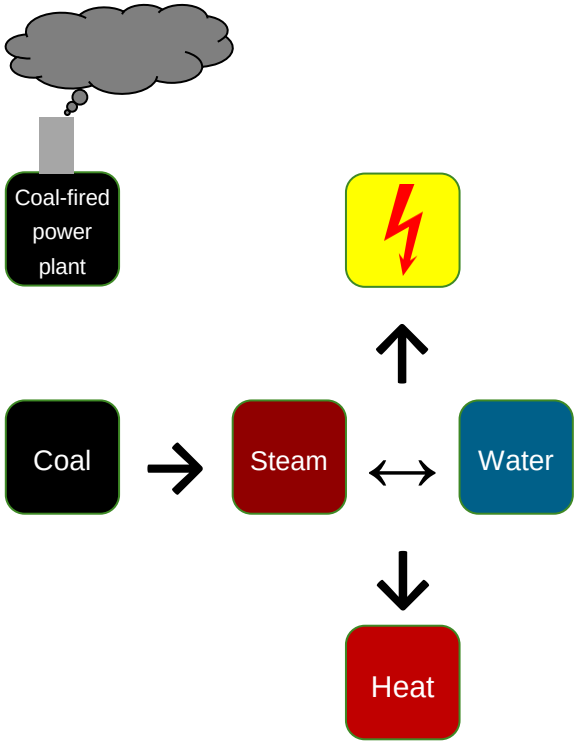
MEIN ZUHAUSE LANDKREIS GÖRLITZ WOKRJES ZHORJELC

STADTWERKE ZITTAU

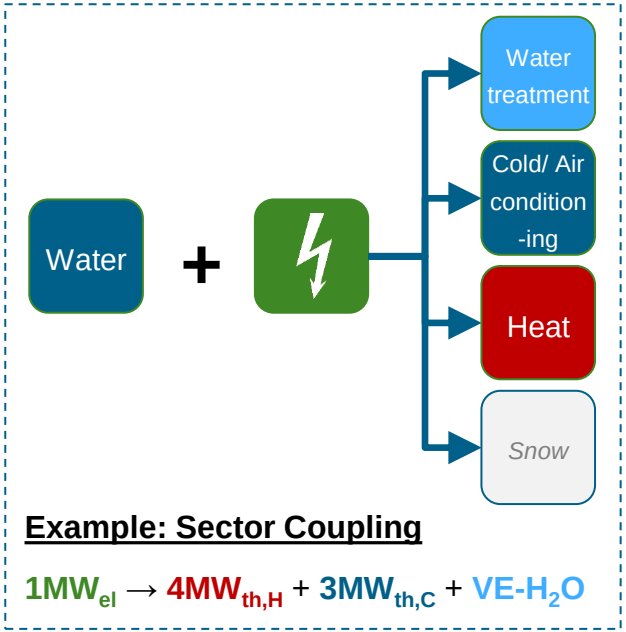
SWW Stadtwerke Weißwasser GmbH

VEOLIA

The role of water in energy technology sector coupling in Lusatia: "Today" & "Tomorrow"



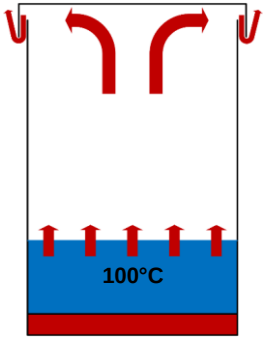
Basic technology "water as a refrigerant"



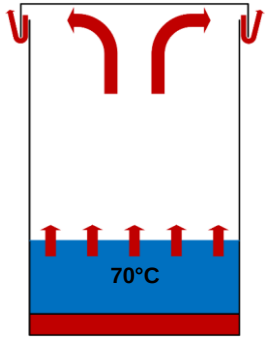
Water as a refrigerant

Technological approach

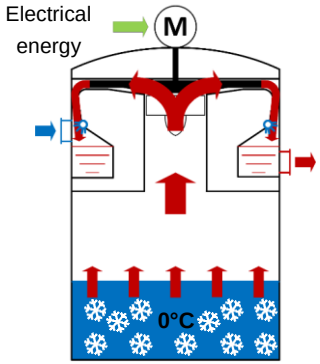
0 m above sea-level



8.848 m above sea-level

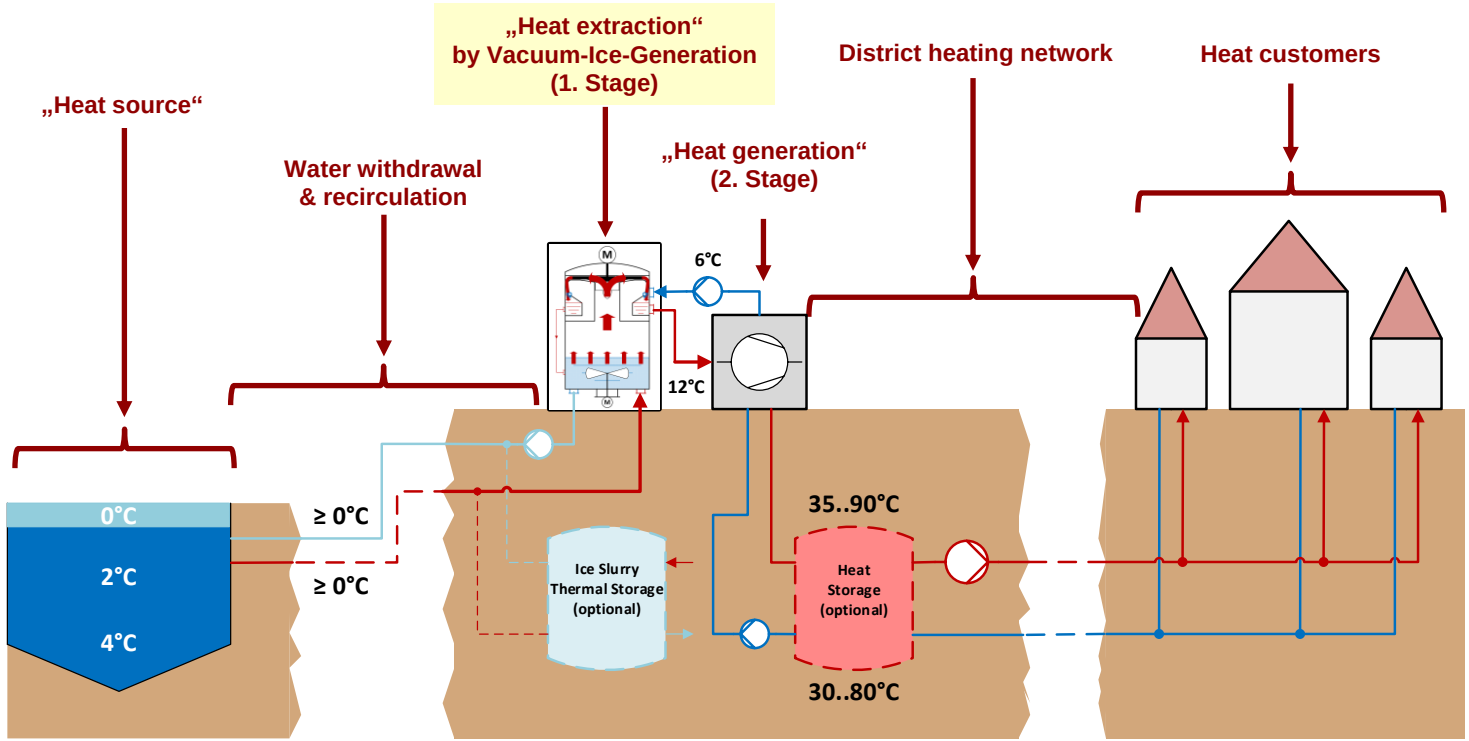


28.500 m above sea-level



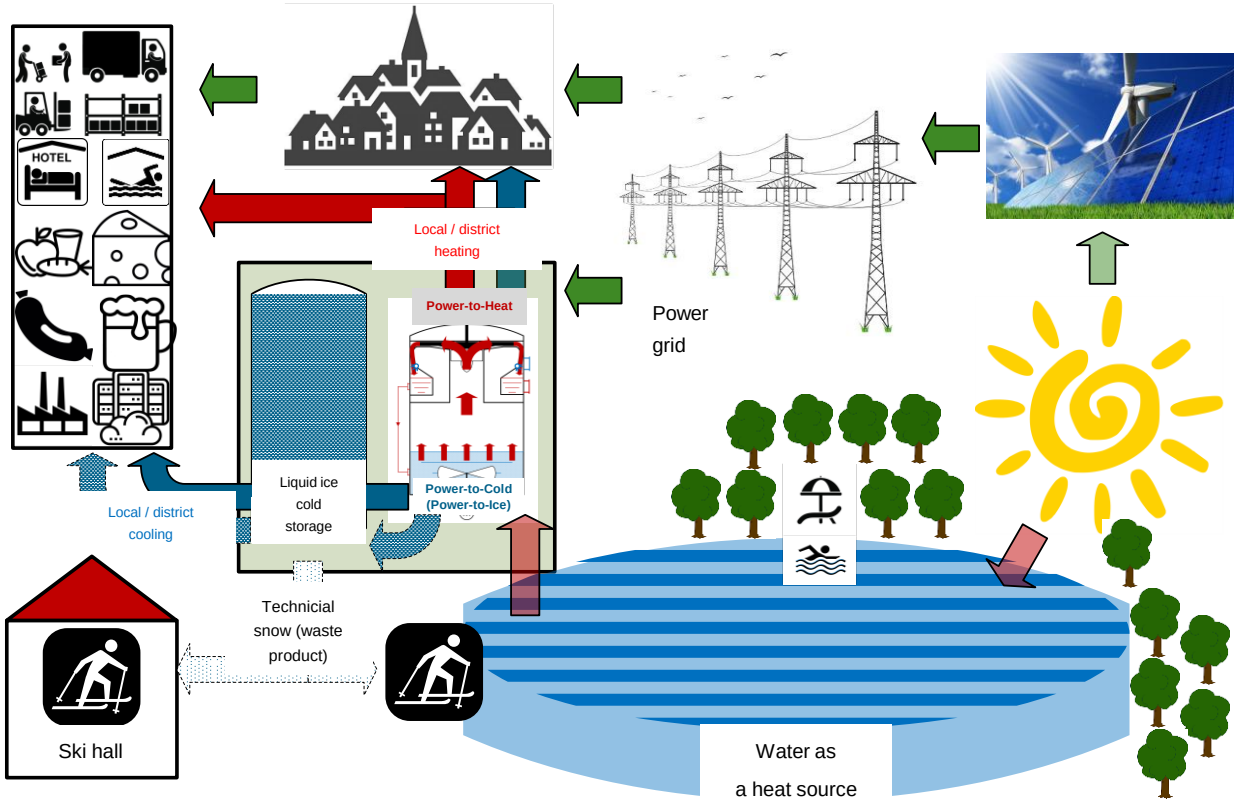
District concepts

Surface water bodies as a year-round heat source „AQVA HEAT“ → Basic system concept



Vision Lusatia

„ Water as a working material in networked energy systems“



AQVA HEAT

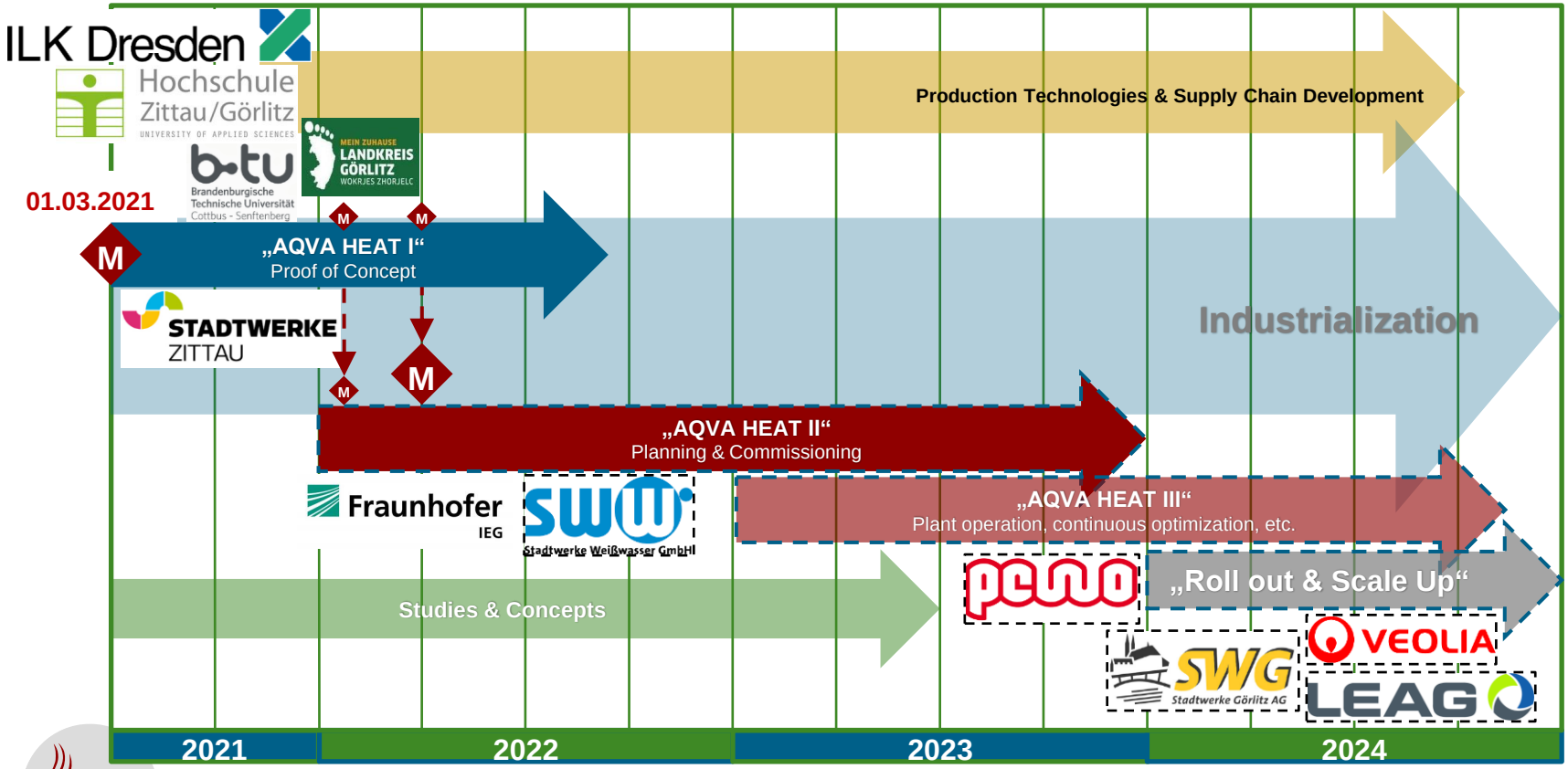
Advantages

- **Natural, non-toxic, non-flammable & cheap refrigerant → Water (R718)**
  - Contamination of water bodies impossible
- **Monovalent system design („planable“ heat source with constant temperature)**
  - Year-round utilisation of nearly all water bodies
  - Capacity of heat extraction: No limitation driven by low water temperatures (Winter)
- **Low volume flows for water withdrawal & recirculation**
- **Low space requirements in comparison to other sustainable heat sources**
- **No fouling within heat-exchangers**
- **Reduction of costs for heat source exploration (Industrialization planned / modular design)**
- **Integration within sustainable overall energy supply systems**
  - e.g. Heating & Cooling / HVAC-Concepts → Power-to-Heat & Cold)

Timeline / RoadMap AQVA-HEAT and further activities

- **AQVA HEAT I** 01.03.2021 – 31.08.2022
  - Proof of concept: „heat extraction from surface water bodies“
  - Operation with tap water (laboratory) → surface water (Municipal utility company / Zittau) anticipated: Q1-Q2 / 2022
- **AQVA HEAT II** anticipated: 01.09.2022 – 30.08.2024 (Weißwasser and Zittau)
  - Installation & commissioning of a fully-integrated heat pump cascade at municipal utility of Zittau & Weißwasser
- **AQVA HEAT III** (anticipated: starting from 01.01.2023)
  - Long-term tests and advanced development (interdisciplinary R&D with a local partner network)
- **Roll-out / Scale-Up**
  - Enlarge number of projects / increasing heating (cooling) capacities & system complexity / applications

Timeline / RoadMap AQVA-HEAT and further activities



Project-Link: https://fis.hszg.de/1170.html

Zittau / Goerlitz University of Applied Sciences

Institute for Process Technology, Process Automation and Measurement Technology (IPM)

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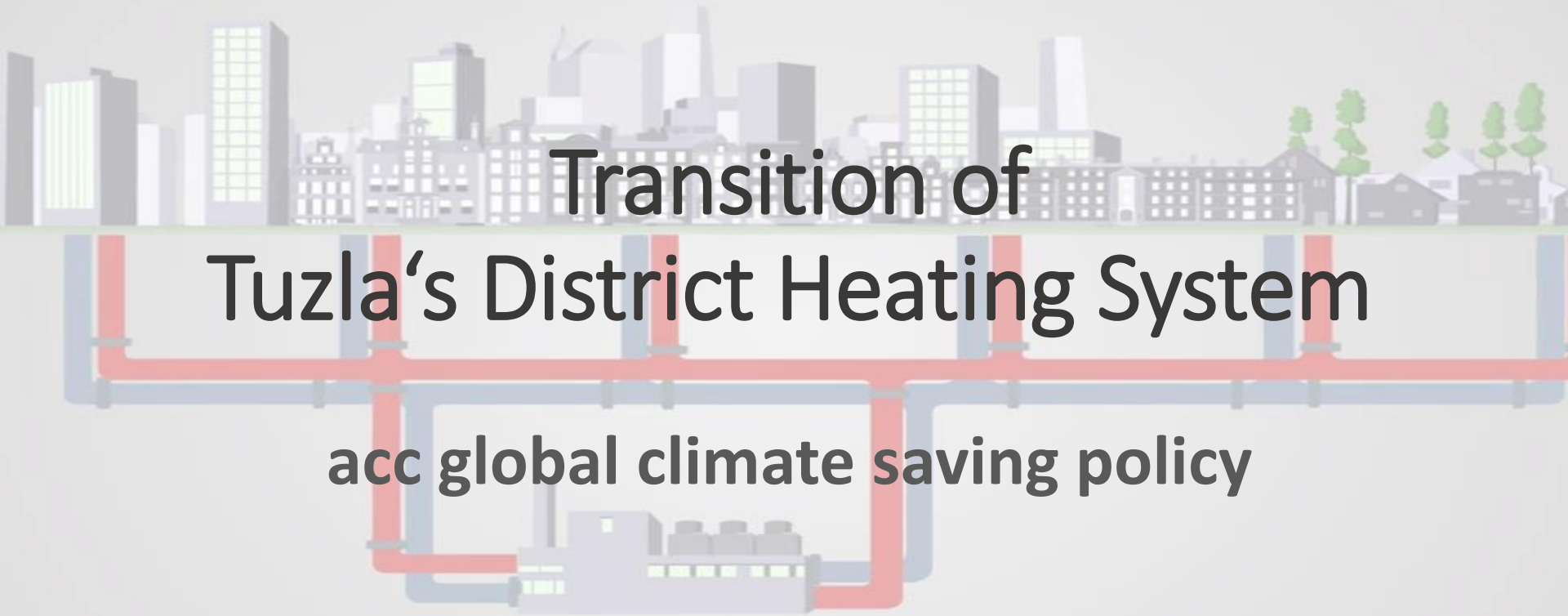
Gefördert durch:

Bundesministerium für Wirtschaft und Energie

Projektträger Jülich Forschungszentrum Jülich

aufgrund eines Beschlusses des Deutschen Bundestages



Transition of Tuzla‘s District Heating System

acc global climate saving policy

City of Tuzla

- Tuzla is a city located in the north-east part of Bosnia and Herzegovina.
- The city has approx. 170,000 inhabitants. After Sarajevo and Banja Luka, Tuzla is the third largest city in Bosnia and Herzegovina.
- Tuzla is the seat of the Tuzla Canton and is the economic, scientific, cultural, educational, health and tourist centre.
- Tuzla is largest coal region in the country.

Tuzla Coal region transition – key facts and hints

- Tuzla region coalmines are owned by the state power utility EPBiH.
- Tuzla coalmines deliver coal to CHP Tuzla (780 MWe + 220 MWt) owened and operated by the EPBiH power utility.
- EPBiH power utility and Tuzla region are involved in *Initiative for coal regions in transition in the Western Balkans and Ukraine*.
- Energy transition of EPBiH power utility, incl. coalmines, are based on:
  - REAP BiH – Renewable energy Action Plan of BiH.
  - INDC BiH – Intended nationally determine contribution (climate action plan).
  - NECP BiH – National Energy and Climate Plan 2020-2030 (draft).
  - NERP BiH – National Emission Reduction Plan.
  - EPBiH Elaborate 2050 – Analysis of Coal phase out plan of EPBiH.

Tuzla Coal region transition - activities

- Planning of coal phase out – ongoing.
- 2 units in Tuzla power station were decommissioned in early 2000, while 2 units planned to be decommissioned until end of 2023.
- Plan of EPBiH power utility: 1 CHP Tuzla unit will operate until 2040/2045, while 1 CHP Tuzla unit will operate in biomass co-firing muilty-fuel mode.
- Photovoltaic power stations have been developed to be installed on coalmine Kreka (45 MW) and former ash landfill Divkovici (56 MW).
- SRC and bioenergy crops will be planted on Kreka coalmine (600-1,000 ha) and Djurdjevic coalmines (40 ha), to diversify business and keep jobs on coalmines and extend biomass co-firing in Tuzla CHP to cut CO_2 emissions.

Plantation of SRC plants at coalmine areas of EPBiH – *Tuzla coalmine Kreka (Apr-May 2021)*

Tuzla/Kreka miners planting energy crops, April 2021

District heating systems in Tuzla region

CHP Tuzla

50 MWt

Lukavac

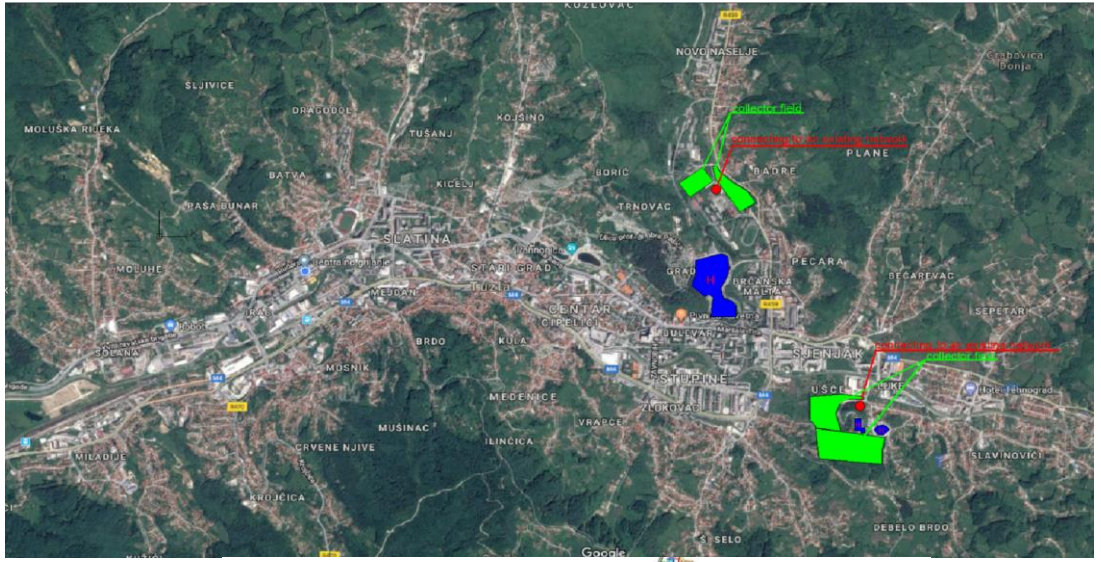
220 MWt

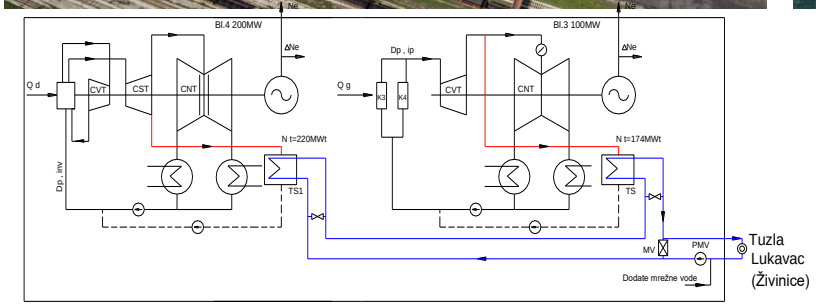
Tuzla

70 MWt

Živinice

CHP Tuzla, owned by EPBiH Power utility → Distribution utility, owned by Tuzla City → End users





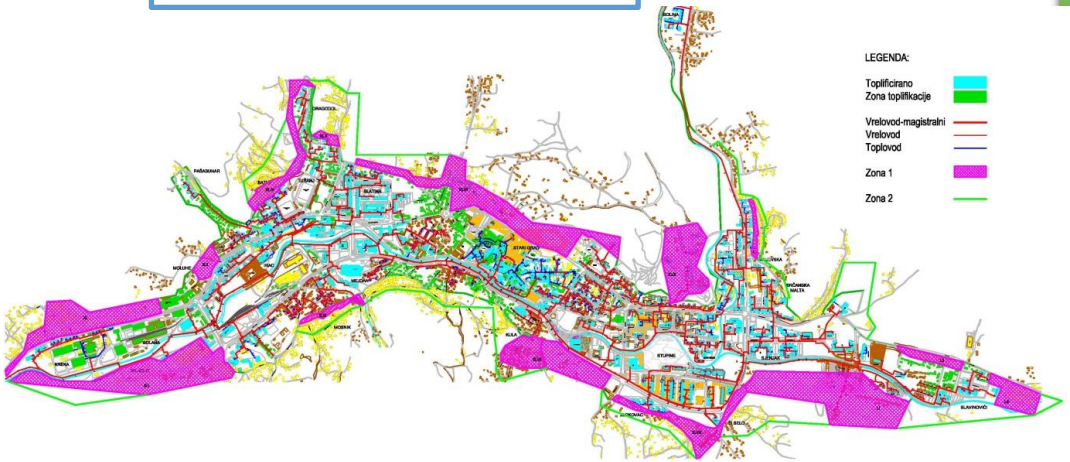
1977
construction year, gradually expanded and substantially upgraded in the past 15 years

220 MWt
instantaneous power

310 GWht
primary heat energy demand with annual 20 GWht tendency increase

TUZLA DHS

23,500
users (ca. 90% flats, other 10% commercials)



1,732,660 m²
total heating area

1,030
heat substations

10 km
primary pipeline (DN600-DN250) length

170 km
secondary network length

80% +
consumers in Tuzla City are connected to the DHS

145/75 °C
designed temperature regime at -17°C outdoor air temperature and steady fluid flow

DHS Tuzla –upgrading measures - I phase, 2010-2016

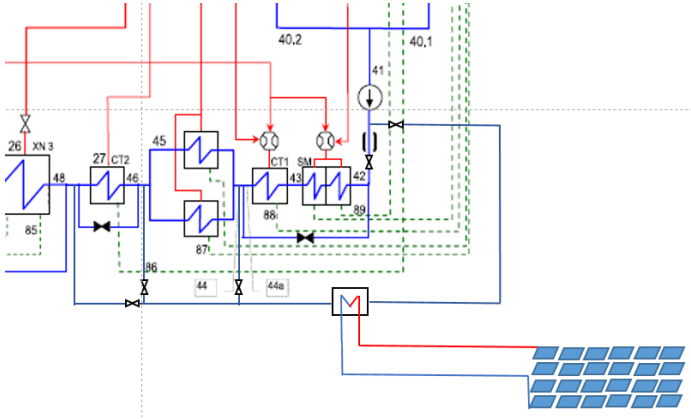
- **Replacement of heat exchangers in thermal substations.**
- **Replacement of old distribution pumps by electronic pumps**.
- **Replacement of distribution pipe networks.**
- **Introducing SCADA and Thermis.**

DHS Tuzla – targets of the UPGRADE DH - II phase, 2018-2025

- **20% of energy savings -** reducing annual primary energy demand (PED) from 350 GWh down to 270 GWh in PED (80 GWht).
- **20% of GHG emissions be reduced** - CO_2 cut from today 115 000 t/a for producing 350 GWh of heat down to max. 92 000 tCO_2/a.
- **20% of RES to be introduced -** Solar thermal collectors, biomass co-firing and heat pumps (geothermal).

Integration of solar thermal collectors

TPP Tuzla: collector area 25,000 m^2; 10 GWh/a



KPI	Baseline	Expected	Evaluation method
Primary Energy Demand [GWh/a]	350	337.7	Estimated
GHG emissions [$t_{CO2(equiv)}$/a]	115,271	110,989	Estimated
Use of renewable sources [%]	0	3.51	Estimated

University Campus and Hospital, Soline settlment: collector area 4,000 m^2; 2.3 GWh/a

Biomass co-firing and cogeneration on Tuzla CHP Unit 6

- *Retrofitting case CHP Tuzla -EPBiH*

<u>BIOFIT Horizont 2020 project</u>

-Case study owner: EPBiH

-Scope (evolving and up for discussion): Up to 30% co-firing with local biomass sources (sawdust, agricultural residues and SRC) in Unit 6 (223 MWe) of Tuzla power plant.

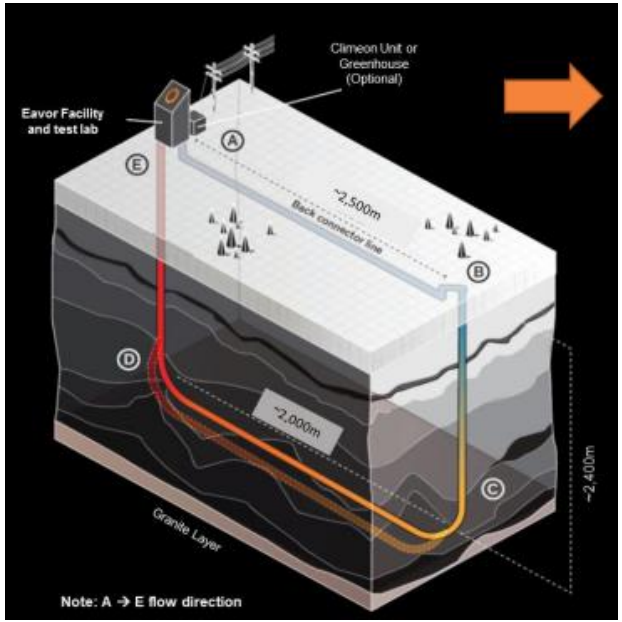
TPP Tuzla unit 6 (223 MWe) – planned trial run with biomass co-firing (up to 30% of biomass) to be performed until end of 2021.

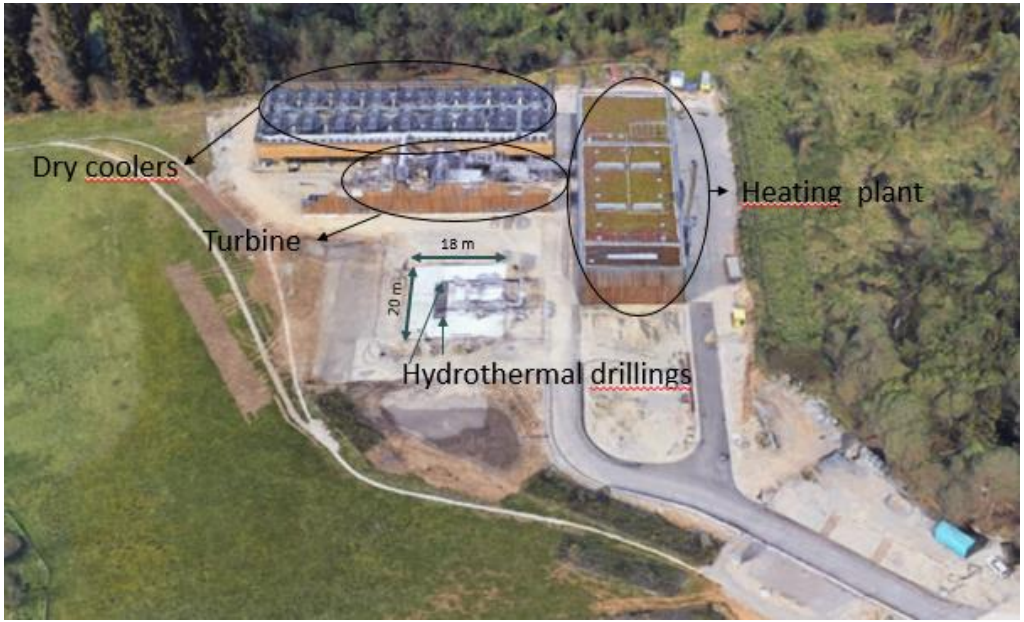
TPP Tuzla unit 6 (223 MWe) is being converted into cogeneration - project is ongoing; design to be completed during 2021, in operation by 2022.

KPI	Baseline	Expected	Evaluation method
Primary Energy Demand [GWh/a]	350	350	Estimated
GHG emissions [$t_{CO2(equiv)}$/a]	115,271	80,690	Estimated
Use of renewable sources [%]	0	30	Estimated

Deep Geothermal

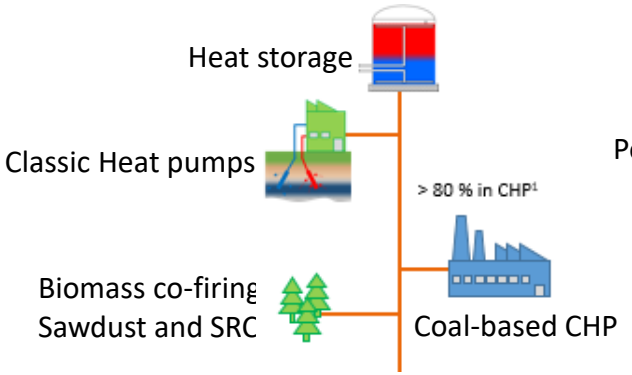
- Considerations ongoing in cooperation with AGFW (Eavor technology).
- Demonstration installation to be considered in Tuzla region.
- Former coal area under consideration for project installation.



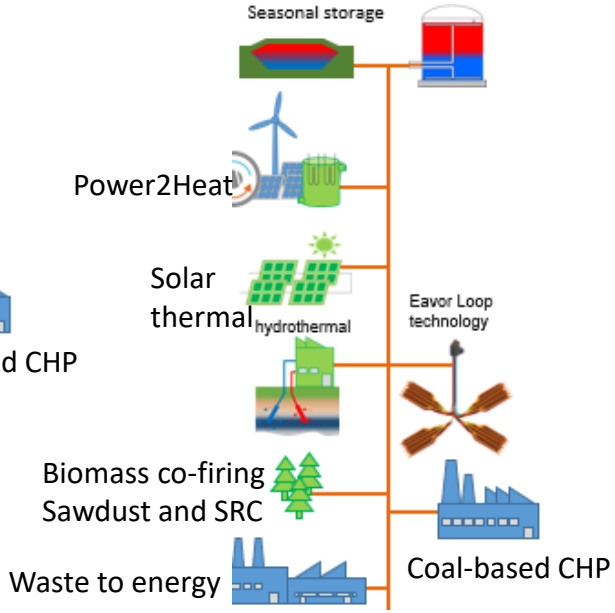


Tuzla heat technological mix 2030 and 2050

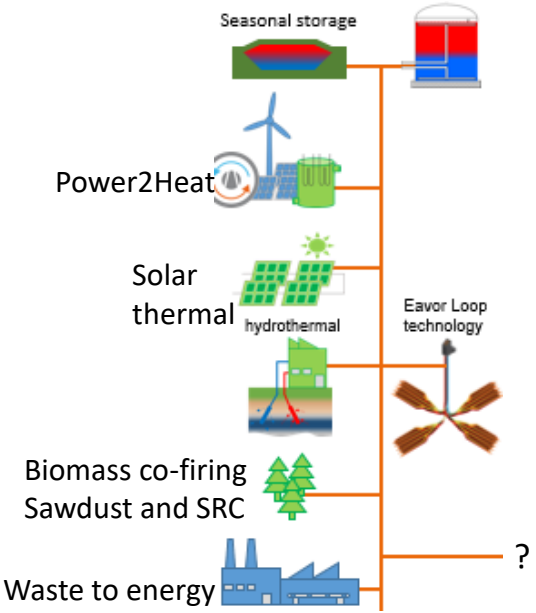
2021-2025



2030



2050



THANK YOU FOR YOUR ATTENTION!

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