SUSTAINABLE PLACES 2025

8-10 October 2025

Milano

Comune di Milano

R2M RESEARCH TO MARKET SOLUTION

TOPIC

WORKSHOP

www.sustainableplaces.eu

Decarbonising DHC

Planning investments to decarbonise District Heating and Cooling networks

DH SYNERGY HUB

DHC SwEEtch

ENABLE DHC

GREENHEATLIFE

L2H Low2HighDH

SUPPORT DHC

SUBSCRIBE TO OUR NEWSLETTER

More information

www.supportdhc.eu

Contact us

Laura Junasova, lj@euroheat.org
Dominik Rutz, dominik.rutz@wip-munich.de
Evan Bernardi, eb@euroheat.org

DH SYNERGY HUB

SUPPORT DHC

Supporting a fast implementation of low-grade **renewable energy** and **waste heat** for **district heating and cooling (DHC)**

Paola Caputo, DABC - Polimi

The LIFE22-CET-SUPPORT DHC – LIFE-2022-CET project has received Funding from the European Union's LIFE Programme under grant agreement N°101119914

Details:

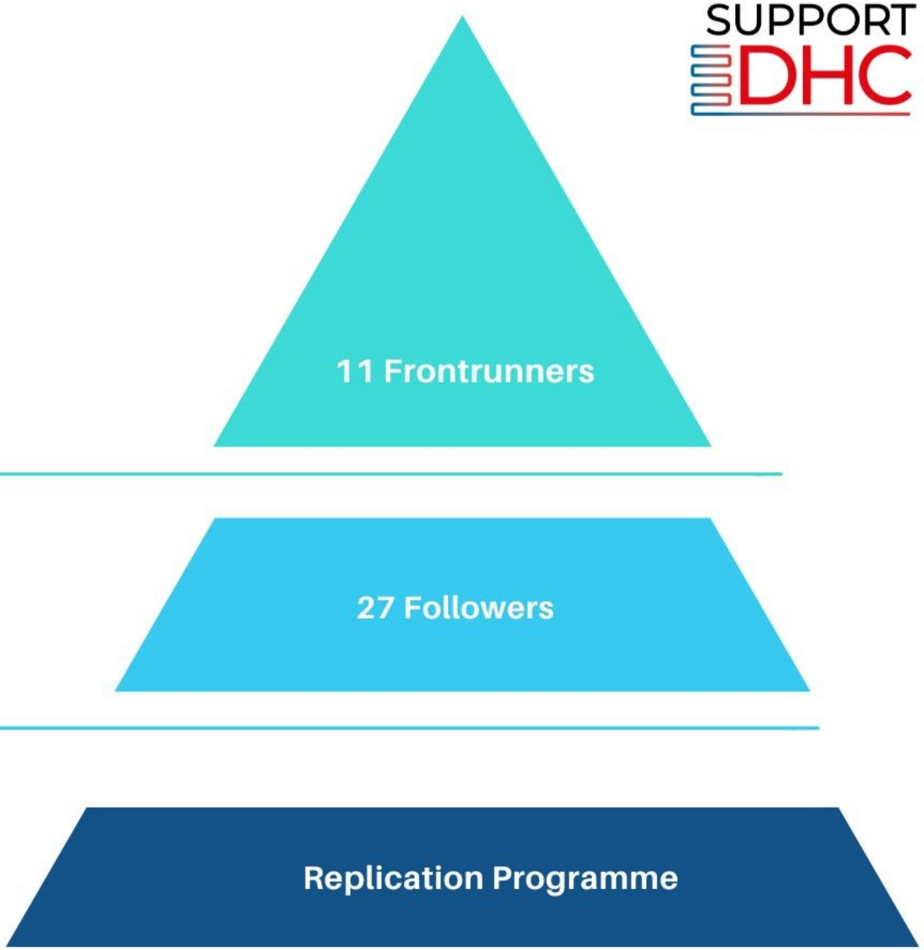
- Coordinated by WIP, Germany
- From October 2023 to September 2026
- To support a fast implementation of low-grade **renewable energy** and **waste heat** for DHC in Europe
    - supporting DHC operators in drawing-up **transformation plans** and in developing **investment plans** for a fast implementation of low-grade RE and WH for DHC

Project Concept

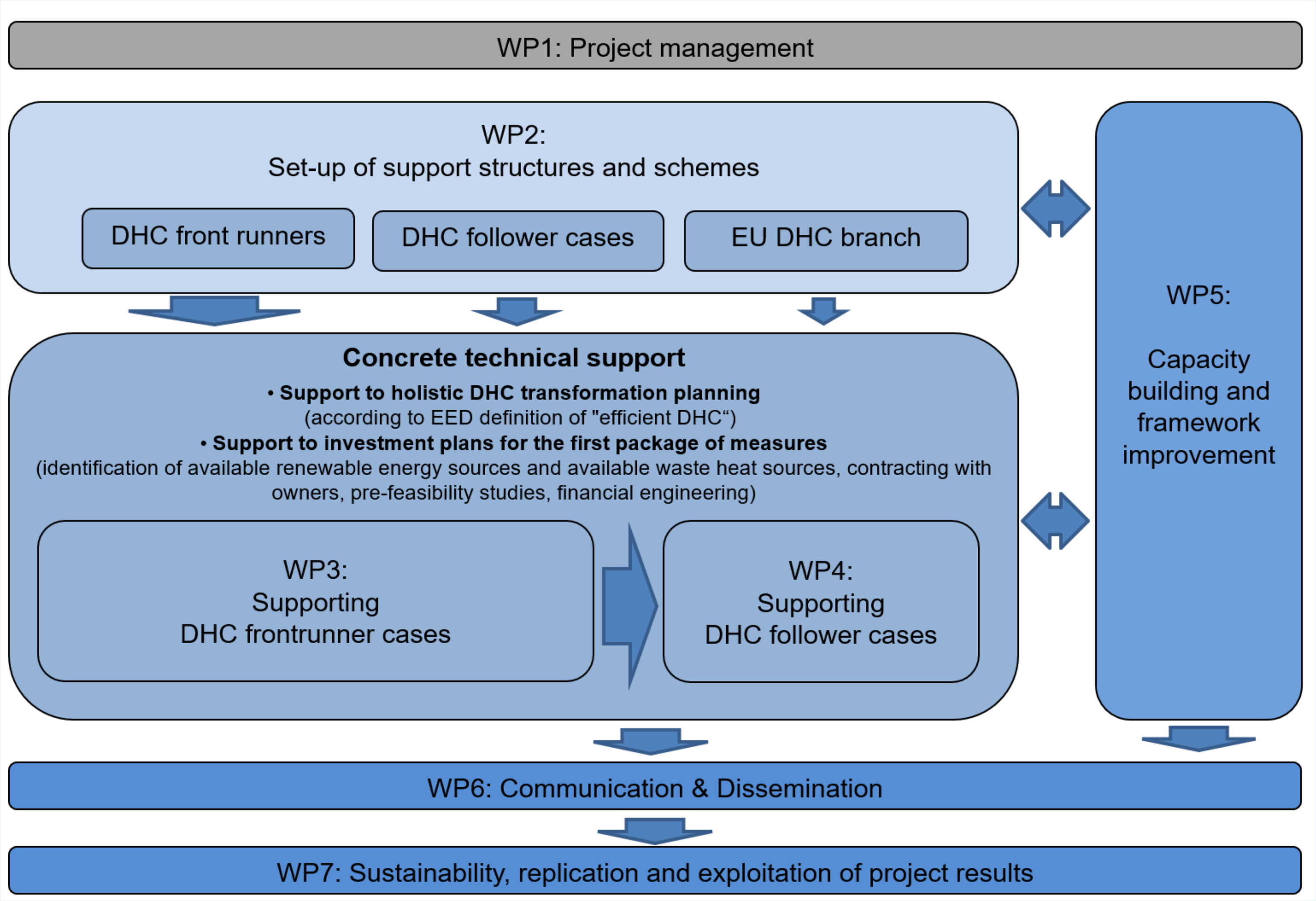
1. In-depth high-level support in drawing-up transformation plans and investment plans for the first package of measures.

2. Advice service through online services and, where necessary, on-site visits as well as online follow-up meetings with the DHC operators

3. Implementation of the replication programme in countries beyond the 6 target countries (***www.ReplicationHub.SupportDHC.eu***)



Work packages



Partners & Frontrunners

Focus from 6 countries with frontrunners and followers

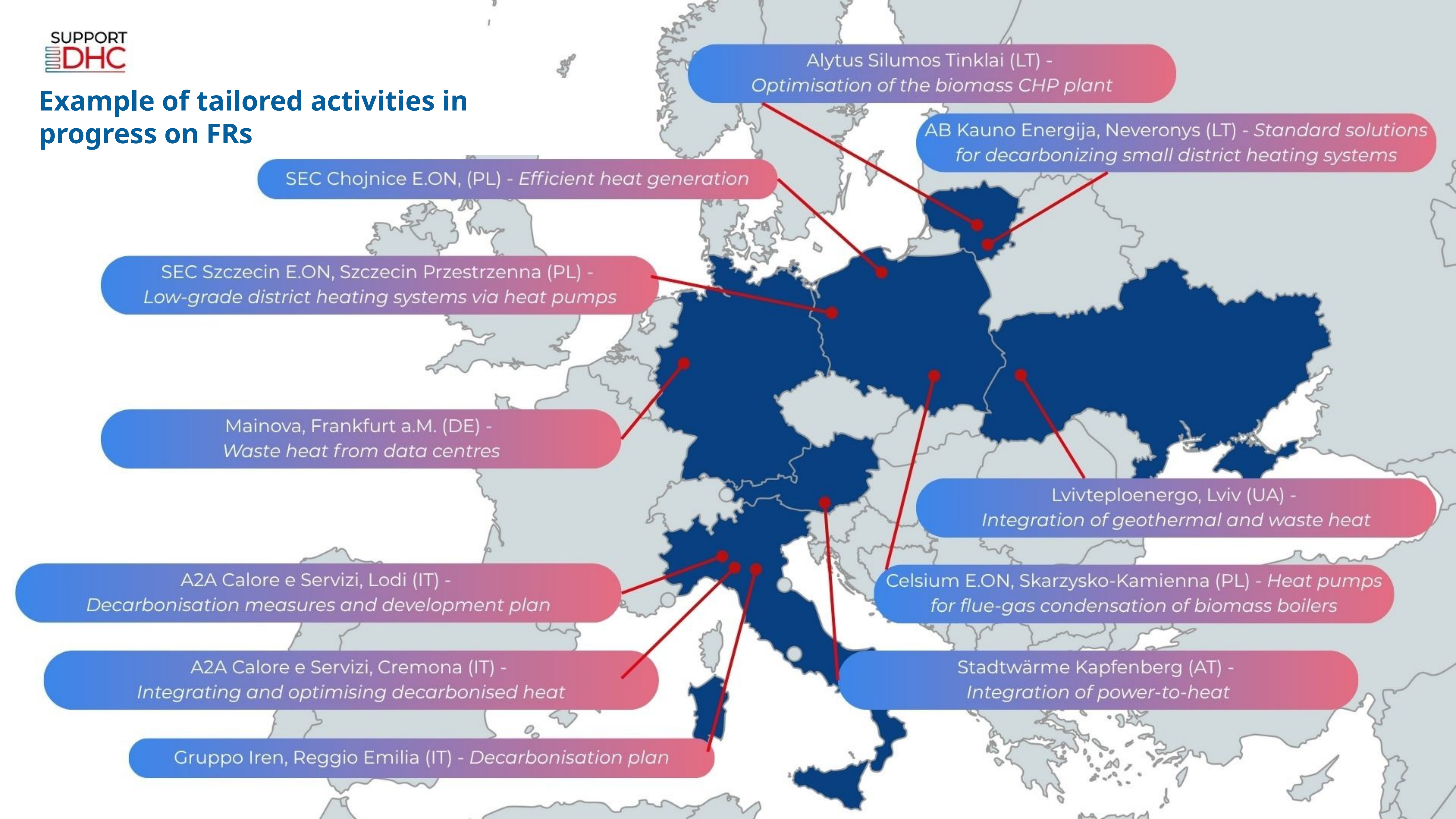
- *Italy*
- *Austria*
- *Germany*
- *Poland*
- *Lithuania*
- *Ukraine*

Supporting countries

- *Denmark*
- *Sweden*
- *Belgium (Euroheat & Power)*

SUPPORT DHC

Example of tailored activities in progress on FRs

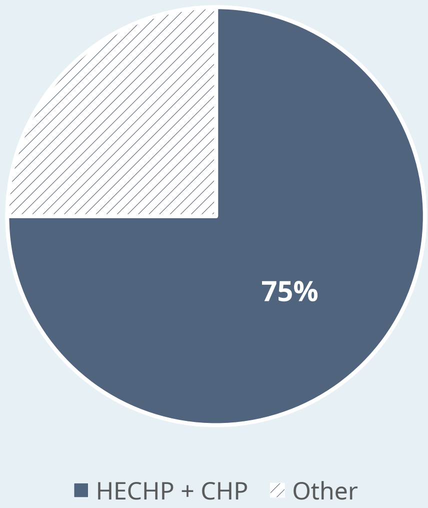


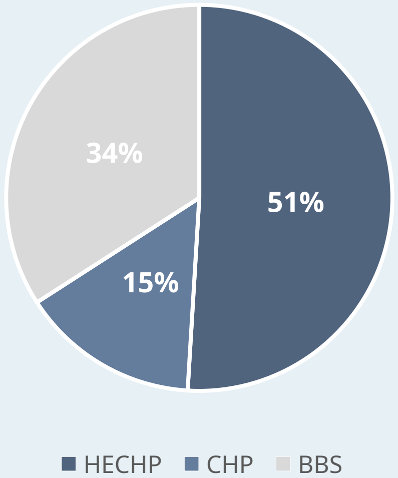
Example of supporting activities for a FR in Italy

Share of heat production required by EED Art.26%

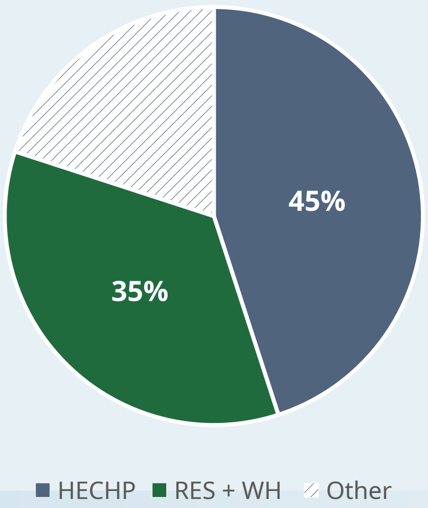
Scenario analysis based on the FR support activities

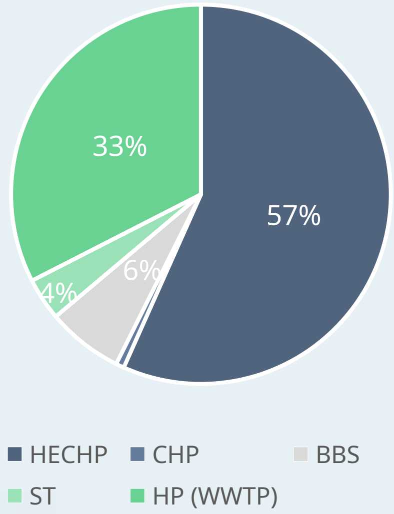
2025



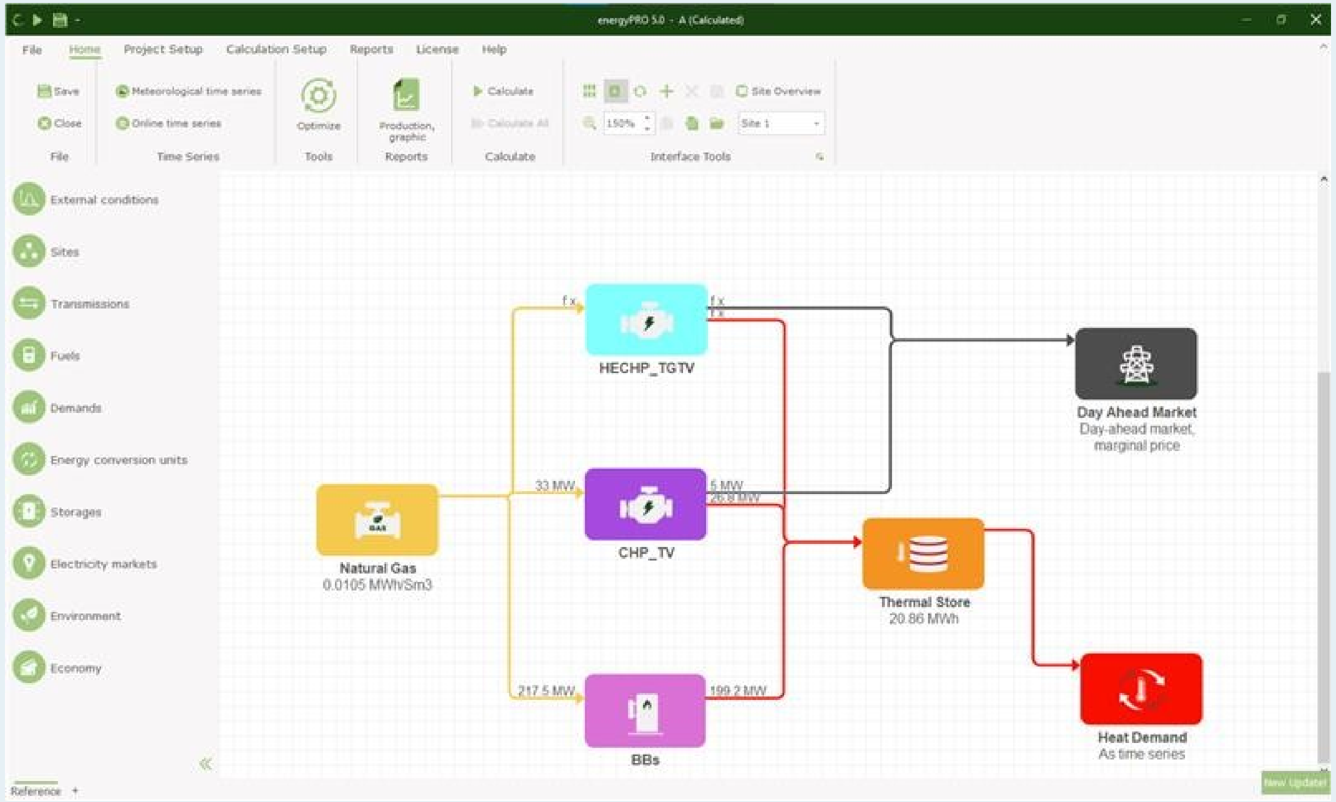


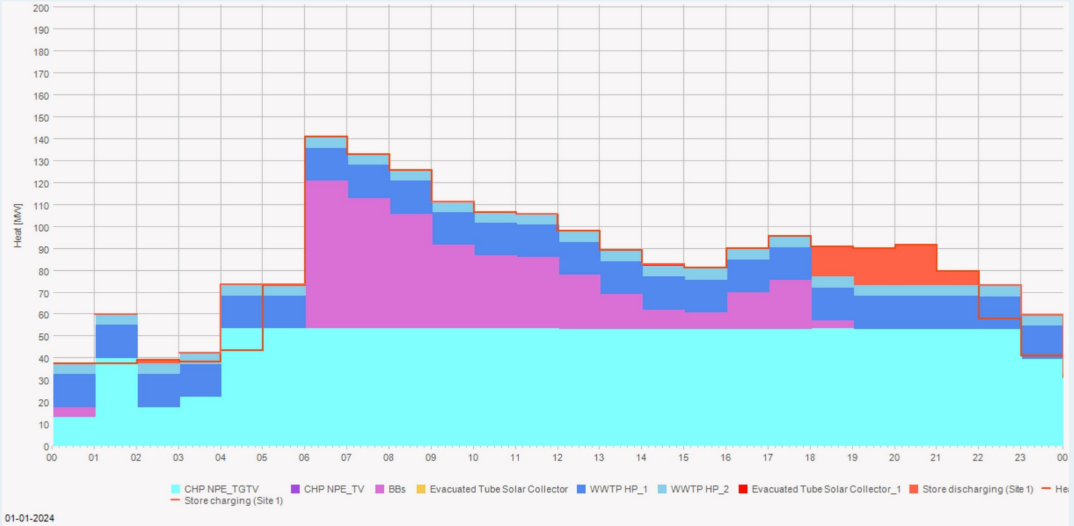
2035





Example of supporting activities use of tools and toolkit





Main lessons learnt

- **Strong interaction with FRs** -> tailored approach for supporting the development of investment plans
- **Different supports according to the needs of FRs and followers** and to the project goals (resource assessment, decarbonization scenarios definition, KPIs elaborations etc.)
- **Peer-to-peer exchanges** among operators and stakeholders from different countries
  - Opportunities and drivers
  - Possible decrease of discrepancies in local rules and regulations among member states
- Importance of **data interoperability and stakeholder involvement** (e.g., municipalities, wastewater treatment plant operators)
- **Analysis of possible discrepancies** between compliance with Article 26 of the EED Directive based on share of RES and WH (option 1) and on CO_2 emissions (option 2)

THANK YOU!

For further details:
www.supportdhc.eu

Paola Caputo

Associate Professor

Dept. of Architecture, Built Environment and Construction Engineering

Politecnico di Milano

paola.caputo@polimi.it

DHC SwEEtch

Marco Calderoni

R2M Solution

The DHC SwEEtch project

- Integrated tool chain for decarbonization roadmaps and investment plans towards efficient district heating and cooling systems

Financed under LIFE-2023-CET-DHC

Duration: 10/24 – 09/27

Provide technical support to operators of **existing DHCN** to prepare decarbonization roadmaps at 2050 and related investment plans within a 10-year time horizon in line with both the criteria for 'efficient district heating and cooling' set by the revised Energy Efficiency Directive and targets sets in local energy transition plans (e.g. SECAPs)

Partners

Project coordinator

Technical consultants

Simulation expert

Dissemination & Communication expert

Associated partners – case study coordinators

The 4-link approach

Mapping: Identifying demand and local renewable or waste heat resources to align with urban needs.

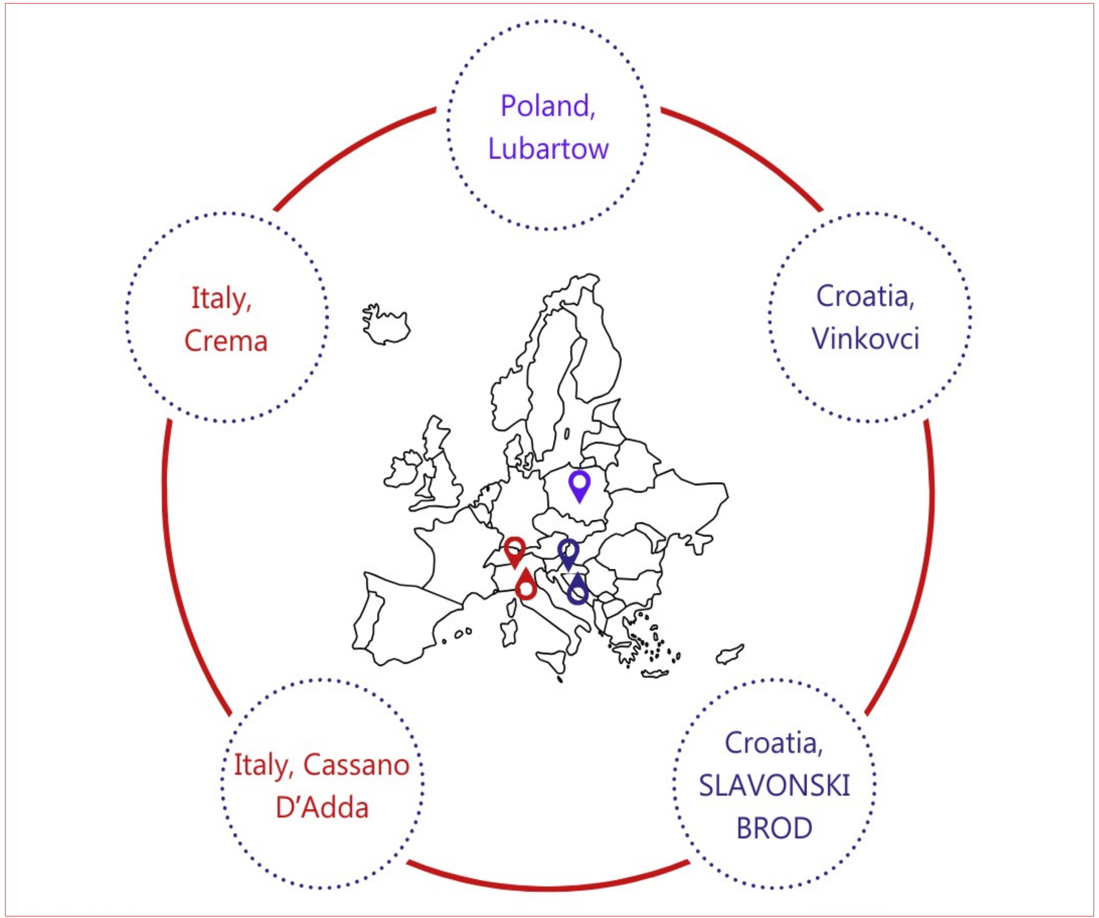
Modelling: Leveraging advanced simulations to design efficient, sustainable systems.

Assessment: Evaluating current infrastructures to pinpoint opportunities for enhancement.

Investment planning: Creating detailed strategies for securing financing and supporting modernization efforts.

- The project envisages to organise the technical support required by District Heating (DH) operators in the form of a "**4-link support chain**".
- The chain's links represent the interconnected steps required for properly planning DHCN retrofitting/modernisation/fuel switch/system integration

Mapping of the DHC SwEEtch project



- 2 networks in **Italy (Crema and Cassano D'Adda – 35 and 20 MWt)**, intergrating waste heat recovery from wastewater treatment plants
- 1 network in **Poland (Lubartow – 20 MWt)**, combining waste heat recovery from wastewater, renewable sources (biomass, solar thermal, thermal storage), and exploring cogeneration
- 2 networks in **Croatia (Slavonski Brod and Vinkovci – 17 MWt each)**, intergrating waste heat recovery from wastewater, geothermal energy, biomass, solar thermal, and cogeneration

Specificities of DHC SwEEtch

- Methodologies to estimate the available waste heat and the increase in energy demand will be validated in the project.
- The commercial software IES (partner in DHC SwEEtch) will be further developed with an investor-friendly dashboard. Additional features to simulate waste heat-driven heat pumps and to prioritize energy sources based on the price are also being developed.
- Bankability evaluations will be performed by experts from financing institutions.

Task force approach

Working in a **task-force mode** seems to be crucial.

Discussions around the different phases (RES and waste heat – extension – scenarios planning – economics – bankability) need to happen with all technical partners around the table instead of a sequential approach (one-by-one) **to avoid continuous iterations**.

Michael Marais via Unspash

Where can we be found ?

www.construction21.org/project/h/dhc-sweetch.html

@DHC SwEEtch

ENABLE DHC

October 2025

Enable DHC: Promoting decarbonization across Europe

Presented by:
Stefano Morgione - Optit

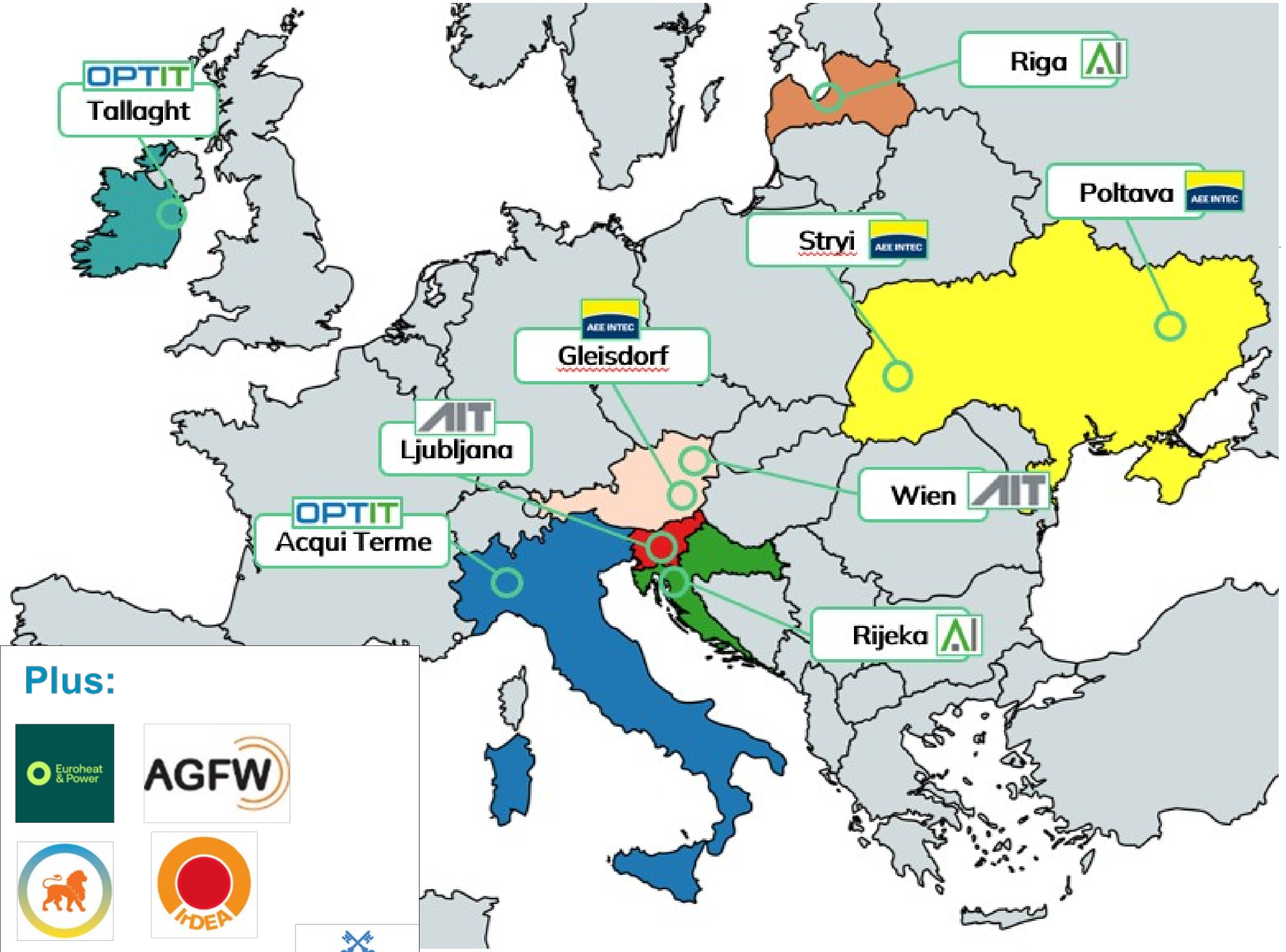
Co-funded by the European Union

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

Promoting decarbonization across Europe

- **Mission**: foster improved efficiency in DHC by developing **investment plans** for 9 case studies in 7 countries

- **High replication potential**: assess **feasibility of decarbonization pathways** in a heterogeneous portfolio of case studies



Plus:

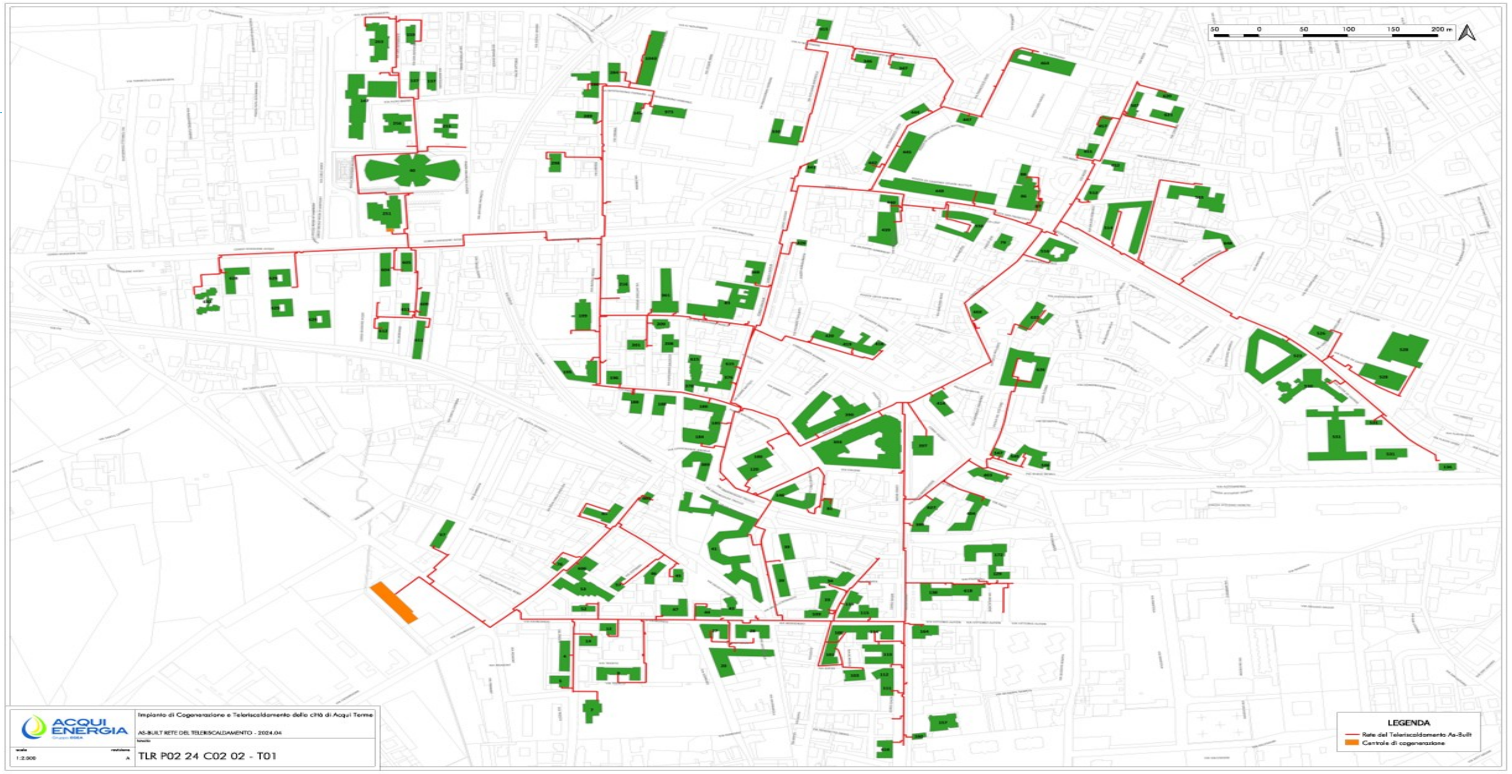
Acqui Terme (IT): key figures

- **Yearly heat supply**:
  34.8 GWh/year

- **Network Length**:
  12.8 km

- **Production mix**:
  - ❑ Gas-fired **CHP**
    (3.7 MW_{th} & 3.7 MW_{el})
  - ❑ Gas-fired **Boilers**
    (23 MW_{th})

- **Main investigation lines**:
  RES exploitation *(Geothermal)*

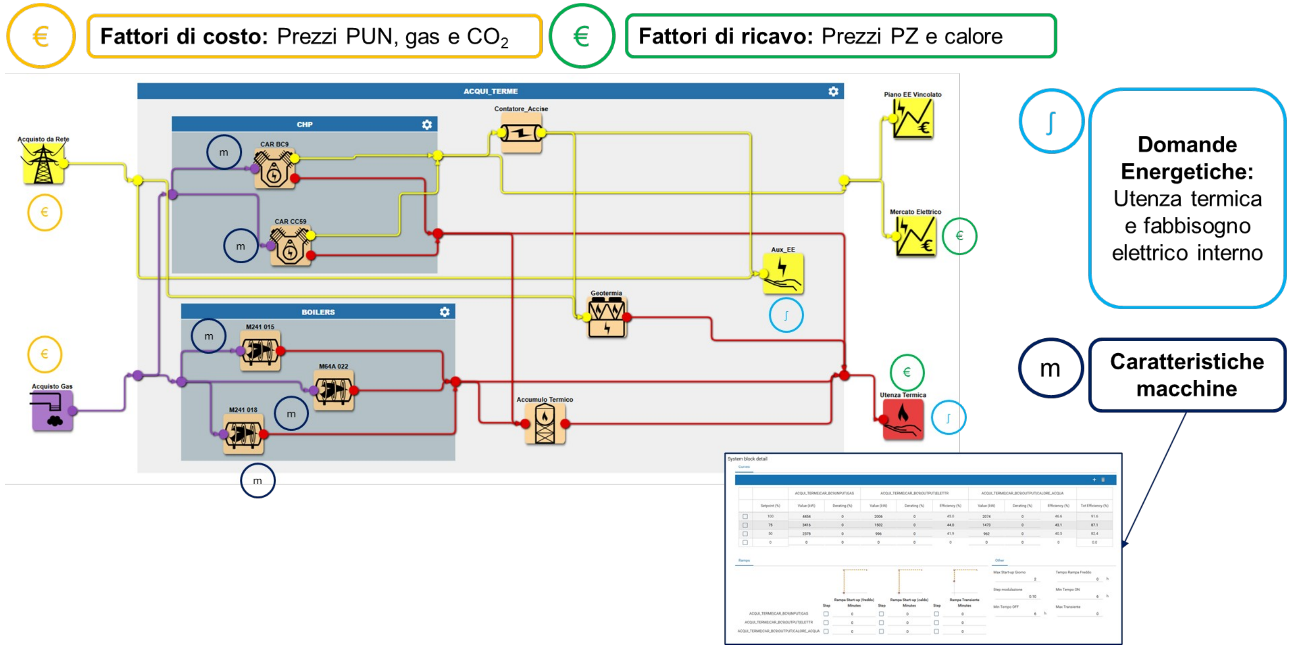


Acqui Terme (IT): optimizing current assets and exploiting RES potential

1 Optimization of current assets

- Increase the **daily dispatching efficiency** through the use of **advanced digital tools**

A **Digital Twin of the system** was implemented in **Optit's solution (*OptiEPTM*)**, and the analysis of an alternative optimized dispatching plan allowed to **assess the potential economic and environmental impacts**



Acqui Terme (IT): optimizing current assets and exploiting RES potential

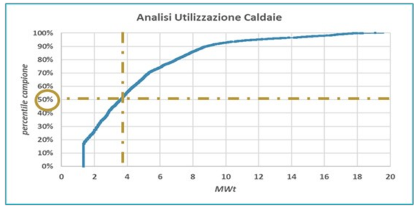
1 Optimization of current assets

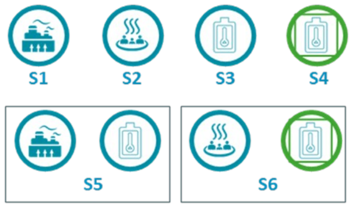
2 Asset portfolio expansion

- Optimize the **design of the future technology mix** to maximize available **RES potential**

The **optimal design of the future asset portfolio** can be determined through the Digital Twin, assessing the **impacts of different technology sizing and configurations**, to provide a sustainable and effective solution for **EED compliance**

Design criteria consolidation → Scenarios analysis → Feasibility Assessment





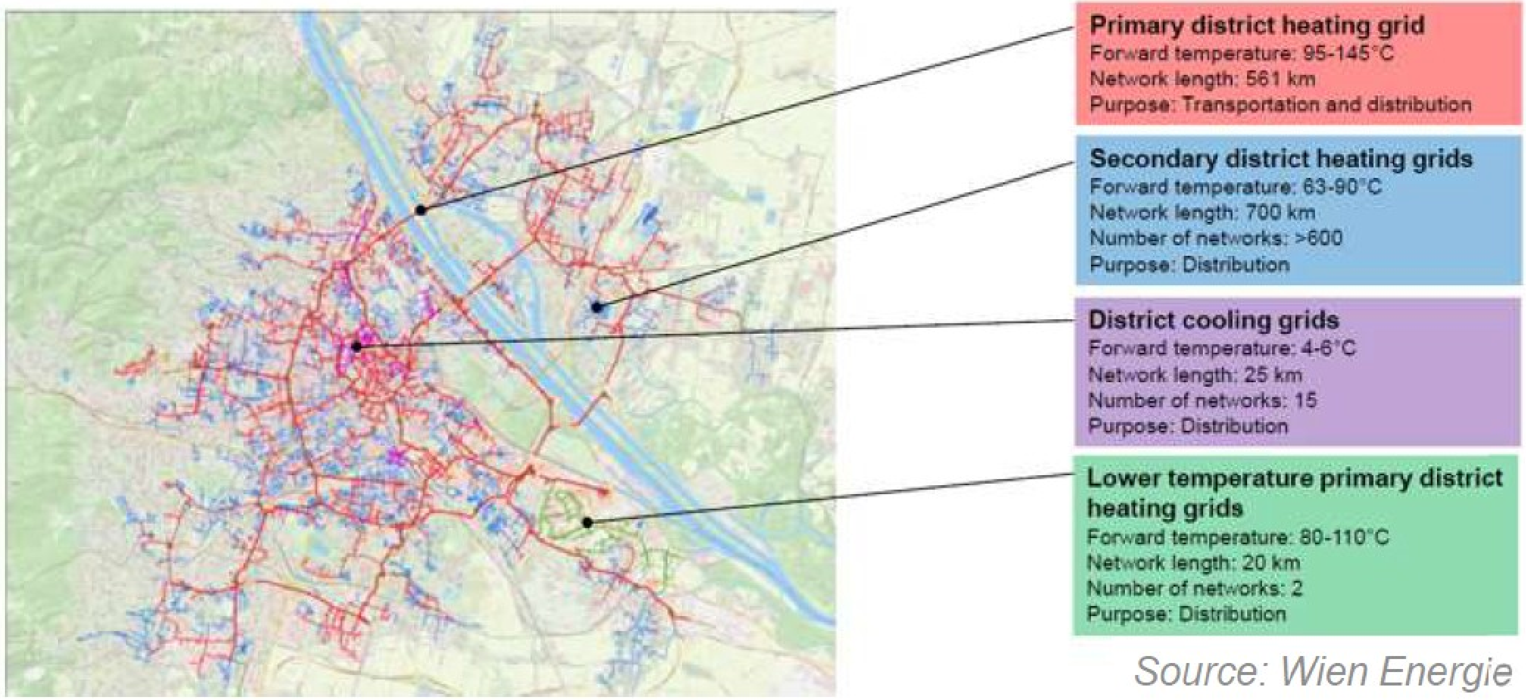
Scenario	Baseline	S1	S2	S3	S4	S5	S6
Heat from CHP [GWh]	20.9	19.2	19.8	22.4	23.3	21.7	22.4
Heat from Boilers [GWh]	17.0	7.9	9.0	15.5	14.6	6.3	5.3
Heat from RES [GWh]	-	10.8	9.1	-	-	9.9	10.2
RES Share (%)	0%	28%	24%	0%	0%	26%	27%
PBT (years)		11.0	21.5	1.3	2.2	7.3	7.1

ECONOMIC IMPACT	Electricity Price Sensitivity						
Gas cost Sensitivity	-50%	-20%	-10%	0	10%	20%	50%
-50%	305	81	7	-67	-142	-216	-439
-20%	559	336	262	187	113	39	-185
-10%	644	421	347	272	198	123	-100
0	729	506	431	**357**	283	208	-15
10%	814	591	516	442	368	293	70
20%	899	676	601	527	452	378	155
50%	1153	930	856	782	707	633	410

Wien (AT): key figures

- **Yearly heat supply**:
  6000 GWh/year
- **Network Length**:
  1300 km
- **Production mix**:
  - Gas-fired CHPs & Boilers
  - Waste Incineration & Industrial Waste Heat
  - Heat Pumps & Biomass units

- **Main investigation lines**:
  - Expansion of technology mix: geothermal, heat pumps, seasonal storage
  - Carbon capture & green gas power station



Source: Wien Energie

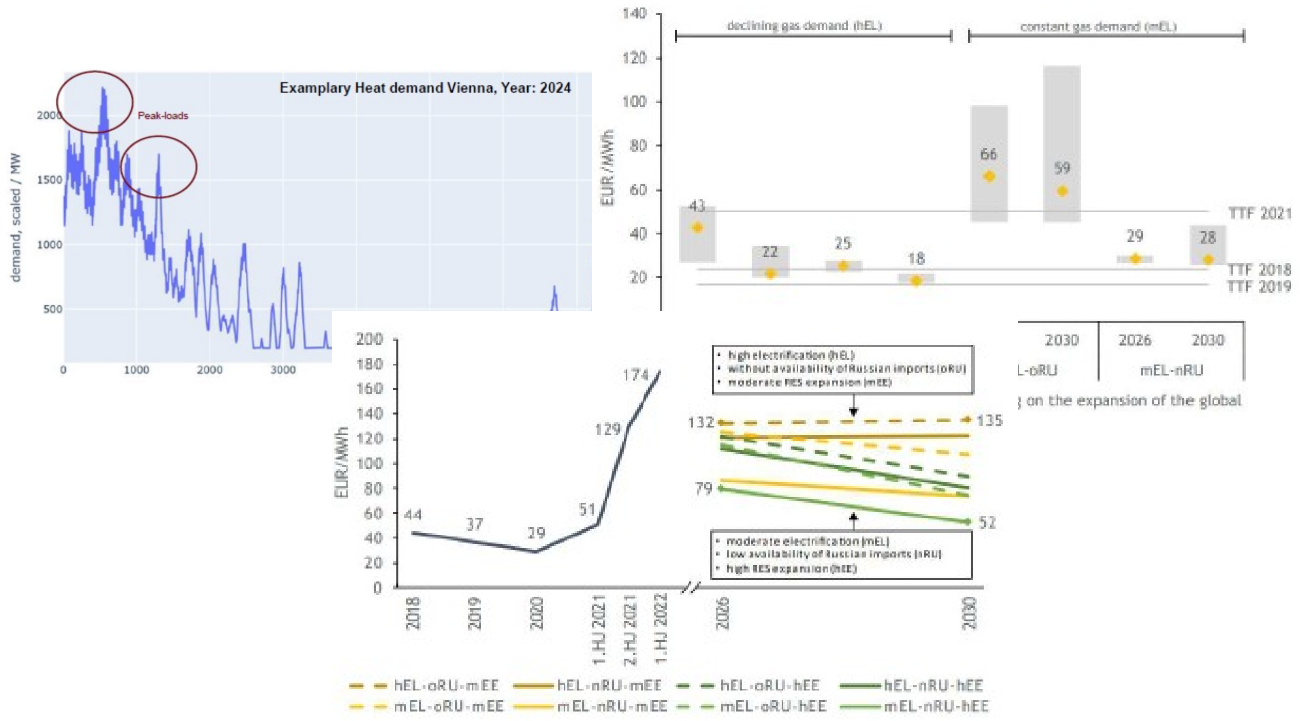
Wien (AT): navigating complex decarbonization pathways

1

Uncertainty analysis

- Outline the factors mainly driving uncertainty in evaluating investment returns

Assessing **heat demand, commodity prices and other techno-economics drivers** to define an **uncertainty framework**



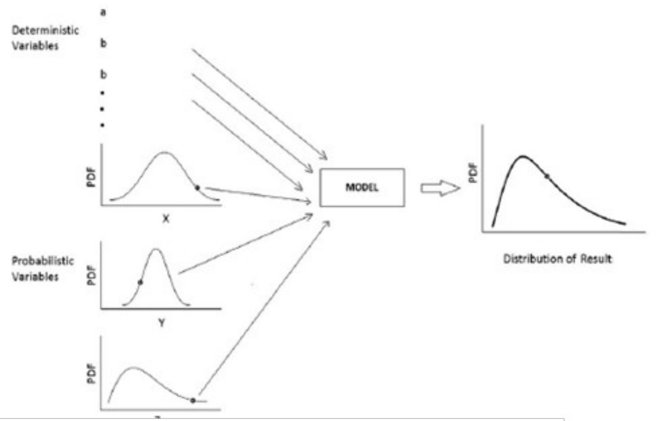
Wien (AT): navigating complex decarbonization pathways

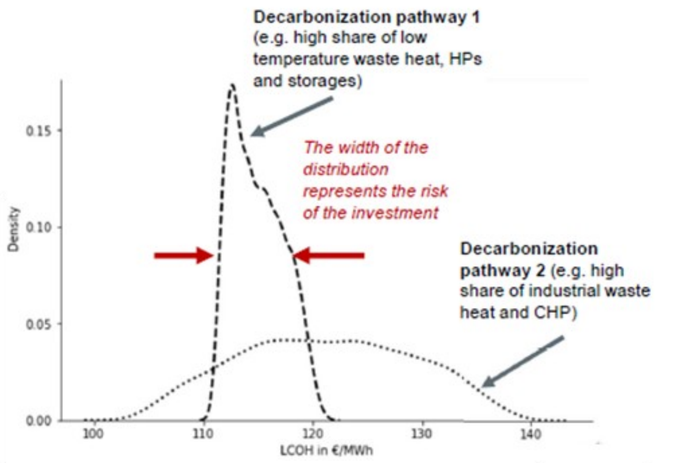
1 **Uncertainty analysis**

2 **Monte Carlo Simulations**

- Analyze decarbonization pathways, **leveraging MCS as "stress test"**

Decarbonization pathways are analyzed using ***AIT's tool (IESopt)***, to assess **feasibility and robustness of future scenarios**

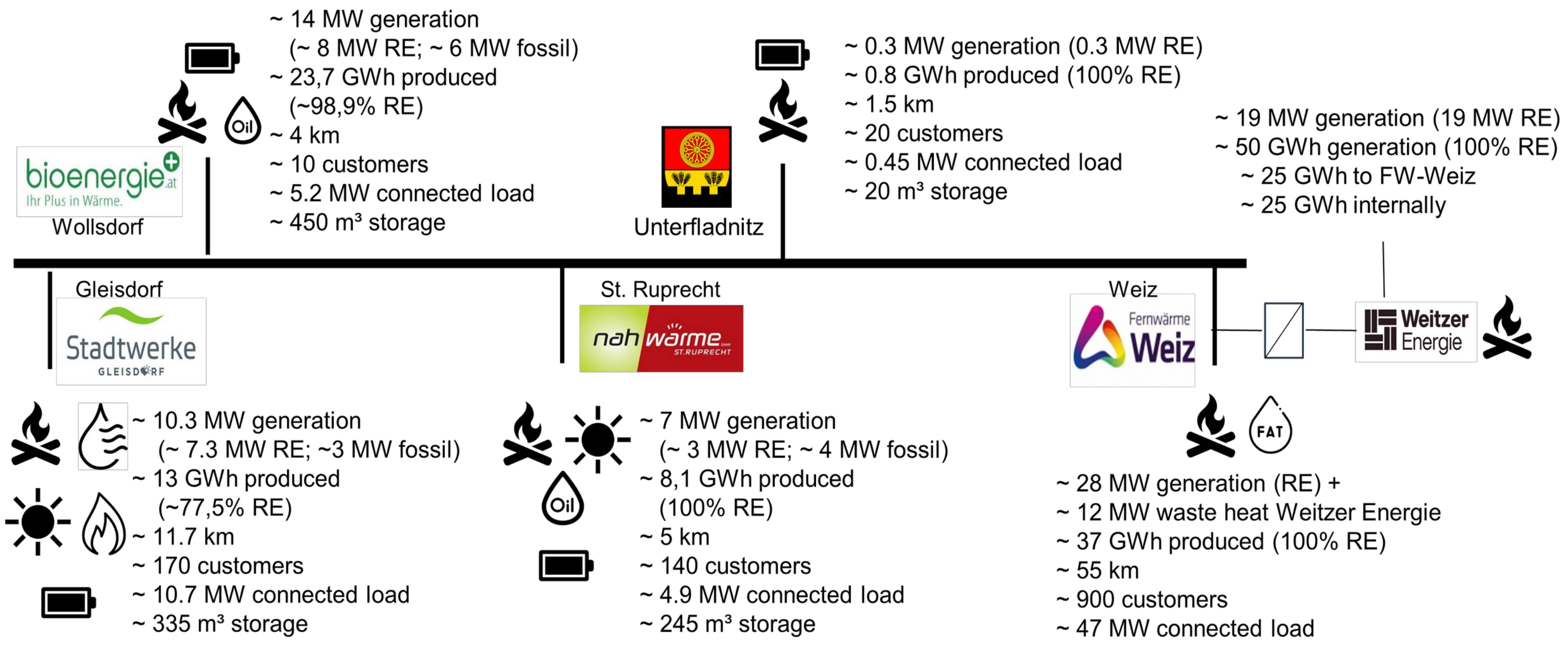


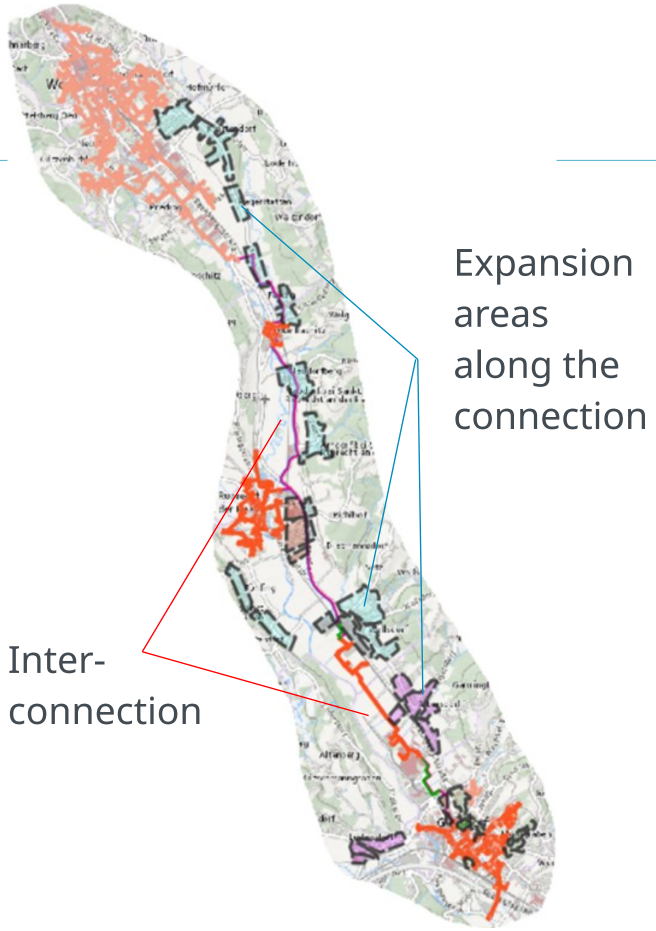


Weiz-Gleisdorf: interconnection for increased efficiency

The **interconnection of the currently 5 separated networks** will:

- Enhance the system **efficiency**, **flexibility** and **resiliency**
- Expand the **customer base** (from 93 to 200 GWh/y)





ENABLE DHC

THANK YOU

Stefano Morgione

stefano.morgione@optit.net

https://enabledhc.ambienteitalia.it/

GREENHEATLIFE

Optimisation and investment planning of District Heating systems for lower temperatures and decarbonisation

Federico Zucchi

SEI srl – Mantova, Italy

Co-funded by the European Union

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

Project details

LIFE Programme
For environment and climate action

Sub-programme
Clean Energy Transition

Duration:
36 months
October 2024 - September 2027

EC contribution
~€1,74M

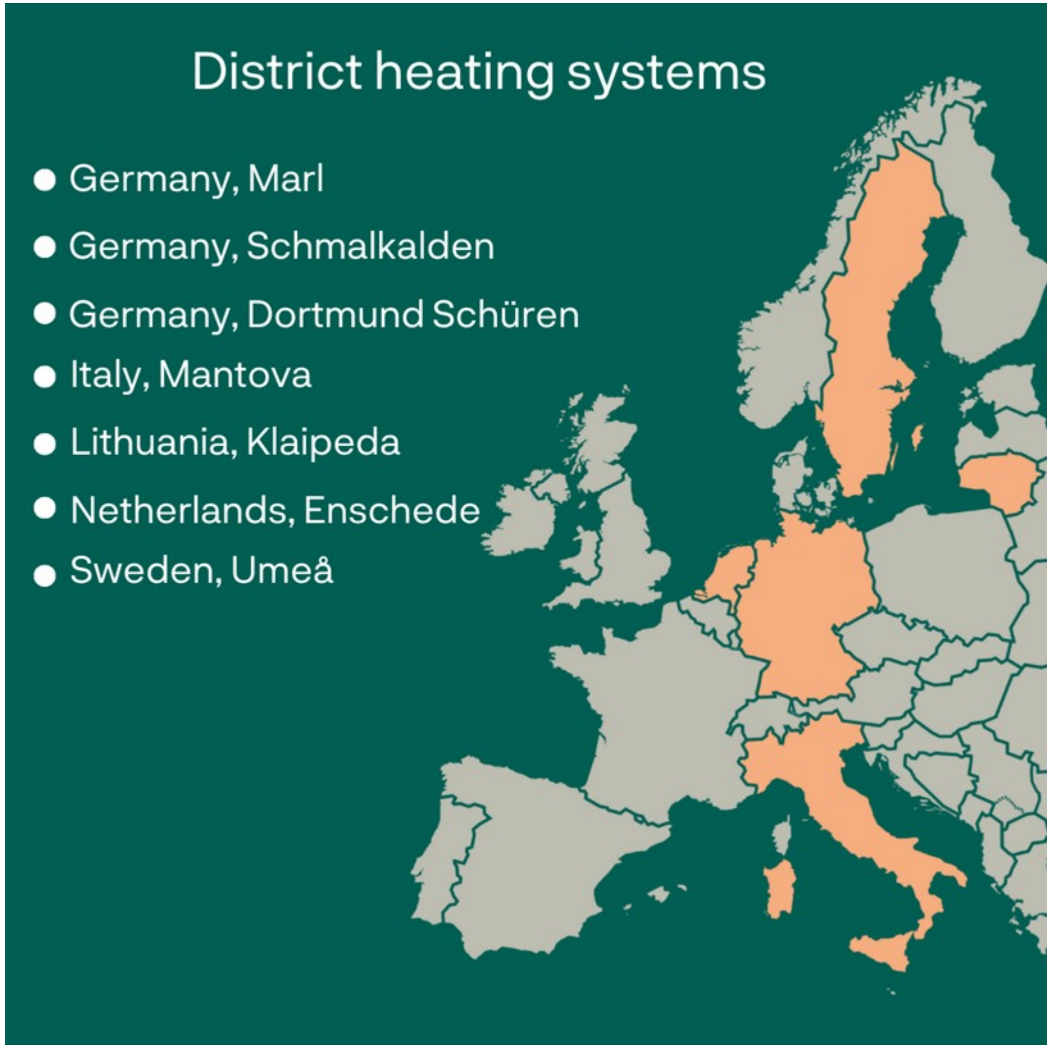
Partners:
7 from 6 countries

Consortium

Co-funded by the European Union

GREENHEATLIFE

Geographical Focus



Overview

Develop detailed and accurate **investment plans** for system modernisation

AI-driven technology (**Digital Twin**) for real-time monitoring, predictive analysis, and optimal decision-making

Key focus areas: temperature optimisation, reducing heat losses, lowering CO_2 emissions, accelerating renewable heating adoption

Specific Objectives

Analyse and validate district heating system data to **create a digital replica**, ensuring accuracy and providing insights for system improvements

Identify critical components for a smooth transition to decarbonisation and temperature reduction

Improve operational efficiency, **optimize** parameters, and **integrate** renewables to minimize GHG emissions

Develop and approve investment plans focused on GHG reduction, considering financial and technical factors

Sharing best practices and accelerating investment across the EU

Methodology

Digital Analysis & Market Trends Assessment

Standardize and validate data for Digital Twin creation.
Optimize decarbonisation by analysing CO_2 reduction and renewable energy options.

- Assess market trends, CO_2 pricing, and fuel availability.

Decarbonisation Modelling

Collaborate to identify CO_2 emitters and design renewable solutions.

- Test scenarios, assess feasibility, and calculate CO_2 savings.

Investment Planning & Funding

Develop tailored investment plans.

- Explore funding options and create an implementation roadmap.

Sustainability & Replication

Align with regulations and suggest policy changes.
Share knowledge through training and a replication kit.

- Replicate in 15 networks within 5 years to drive long-term impact.

Expected outcomes

- **10-15% heat loss reduction** on average across 7 networks
- **GHG emissions reduced by 5,578 t/year** for 7 networks
- Primary energy **savings of ~85,000 MWh**
- 1 **investment plan** for each network
- **5-10% OPEX reduction**, **10-20% efficiency increase** for renewables
- **€185M CAPEX** investments triggered by partners

Overall Ambition

- Establish a **new standard** for DH systems, optimising energy use and boosting sustainable energy
- **Digital Twin** setup for all 7 DH systems, improving operational efficiency and reducing emissions
- EU policy: Provide **recommendations** to drive change in EU energy policy

GREENHEATLIFE

Scan me!

Co-funded by
the European Union

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

Low2HighDH

Analysis of demand evolution in DH sites in Slovakia

David Pérez - CREARA

Sustainable places

Milan, 9th October 2025

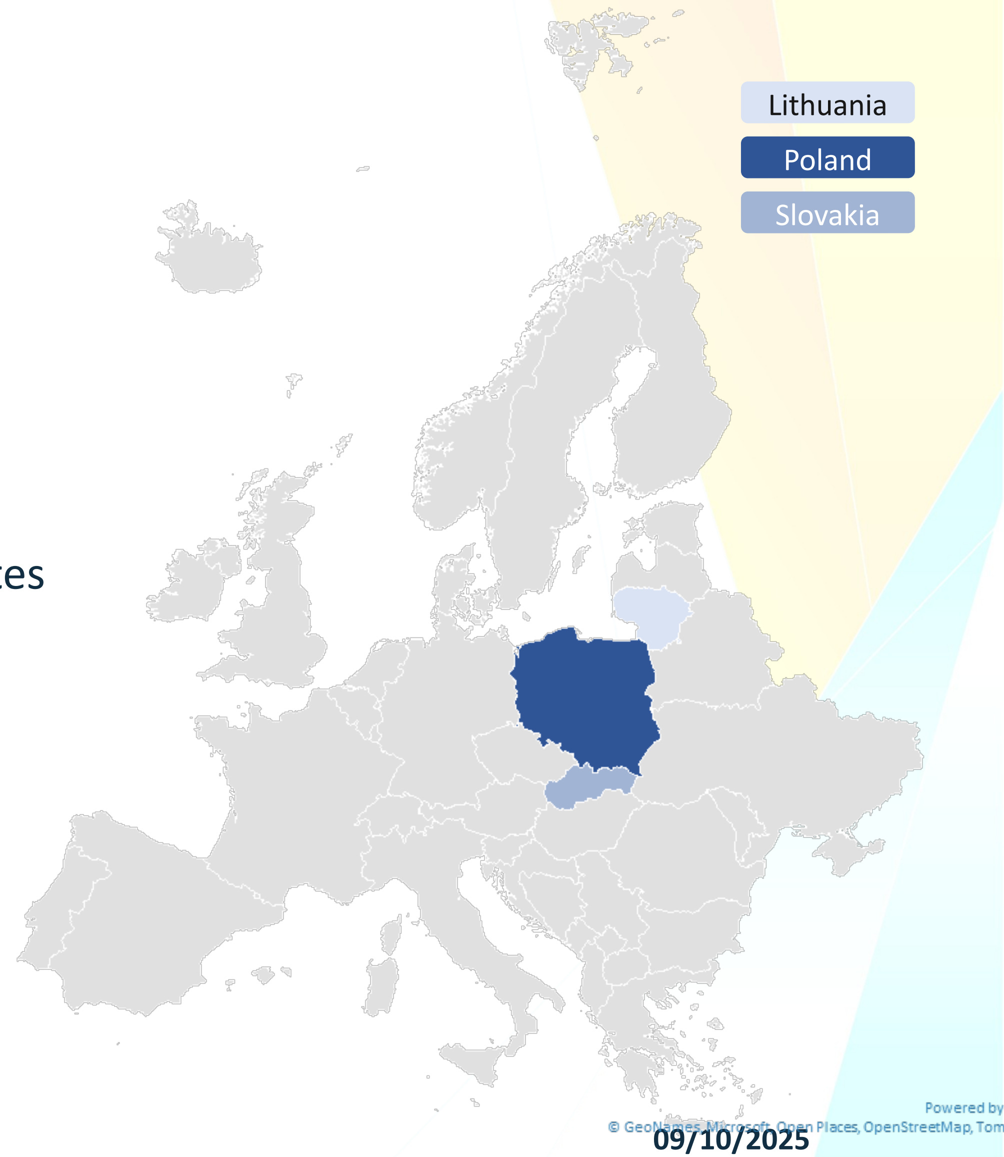
Co-funded by the European Union

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

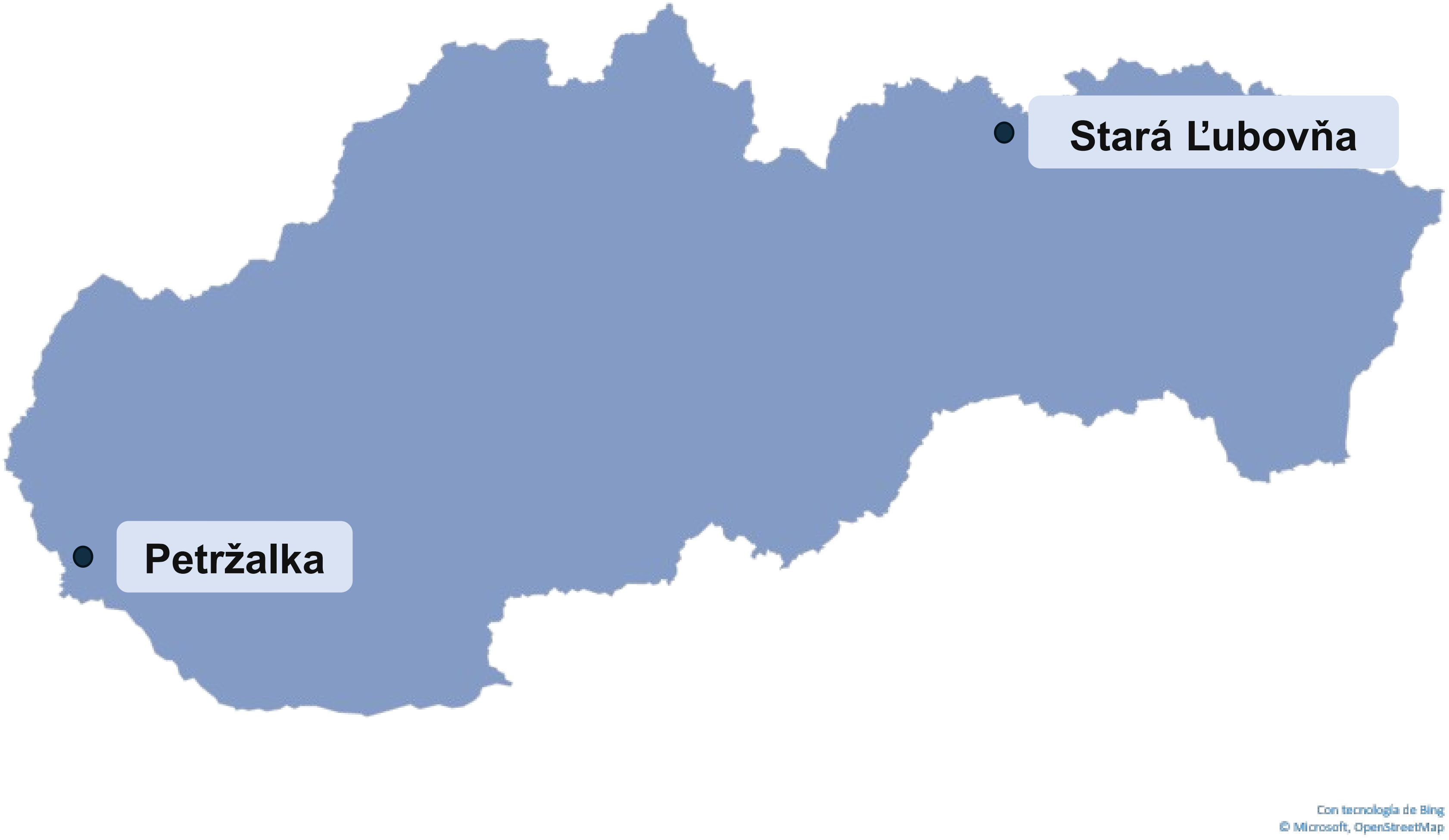
Low2HighDH project overview

- EU funded project
  - LIFE-CET program
  - 1,7 million Euros
  - From October 2023 to October 2026

- Low2HighDH Project Objective: Reach 50% decarbonization of 30 DH sites in **Lithuania, Poland, Slovakia:**
  - Trigger 454 Million euros in investments in sustainable energy
  - Replace 1 TWh/year of fossil fuels
  - Abate 291,000 tons of CO_2 emissions

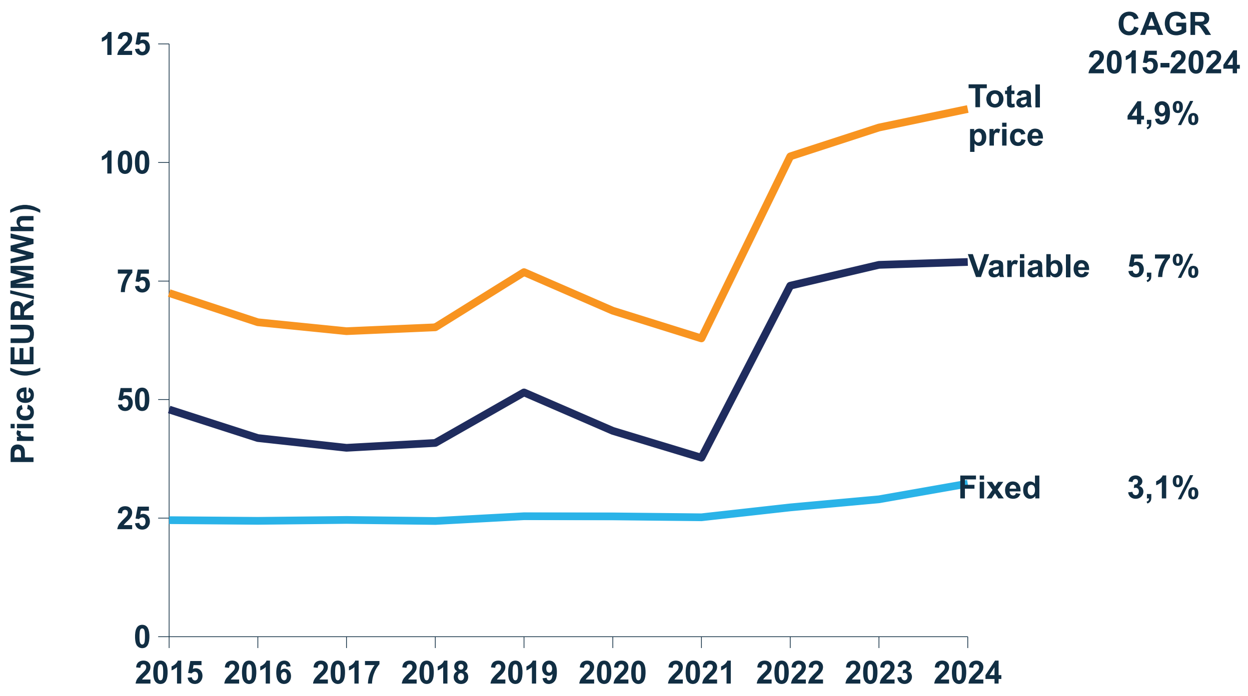


Slovakian pilots location



In Slovakia the profit of DH companies is regulated and linked to heat volumes (and so it is in Poland and Lithuania)

Total heat price and its components evolution for a DH site in Stará Ľubovňa

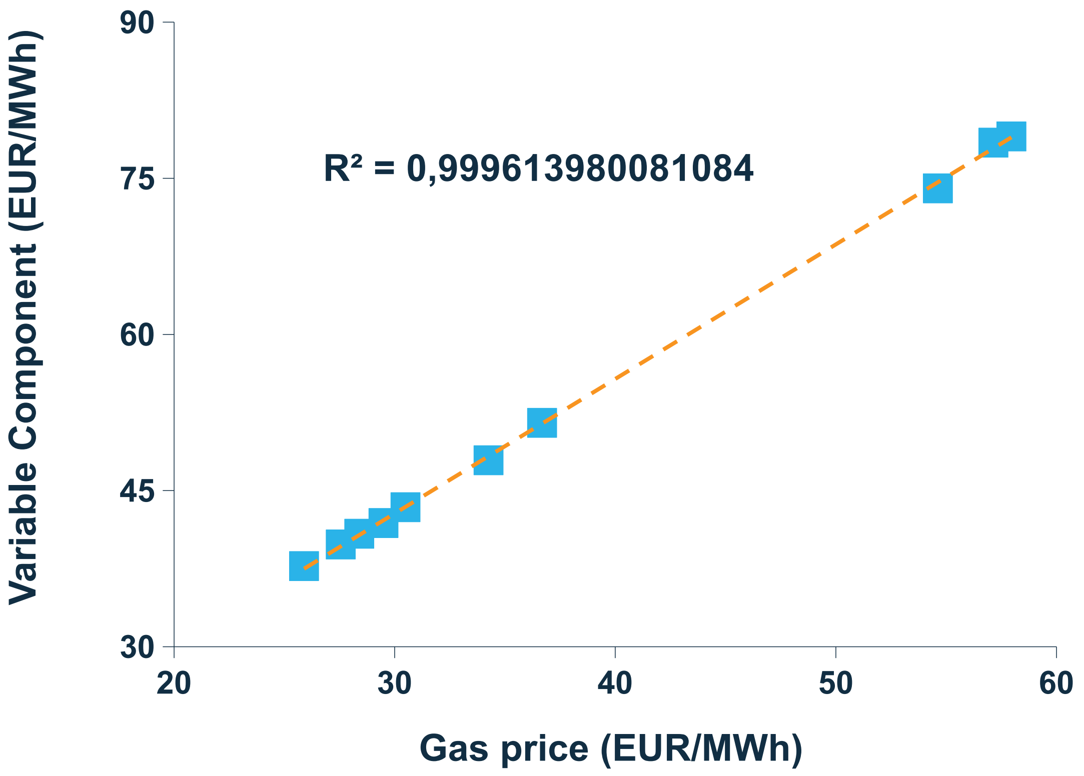


- **Variable Component includes consumption-dependent costs, including fuel/energy used in heat generation**
- **Fixed Component includes:**
  - Costs associated with heat generation and distribution (equipment maintenance, infrastructure depreciation, personnel salaries, and other overheads)
  - Regulated profit is also included in this component
- **Regulated profit depends on heat demand:**
  - Base profit: €18/kW of heat capacity
  - Additional profit: €0-4/kW depending on assets value
  - There is an incentive if RES account for 20% at least

Source: Creara Analysis, Low2High, ÚRSO

The value of the variable component is closely linked to the price of fuel (which is passed through to the consumer)

Variable price component vs natural gas price for a DH site in Stará Ľubovňa

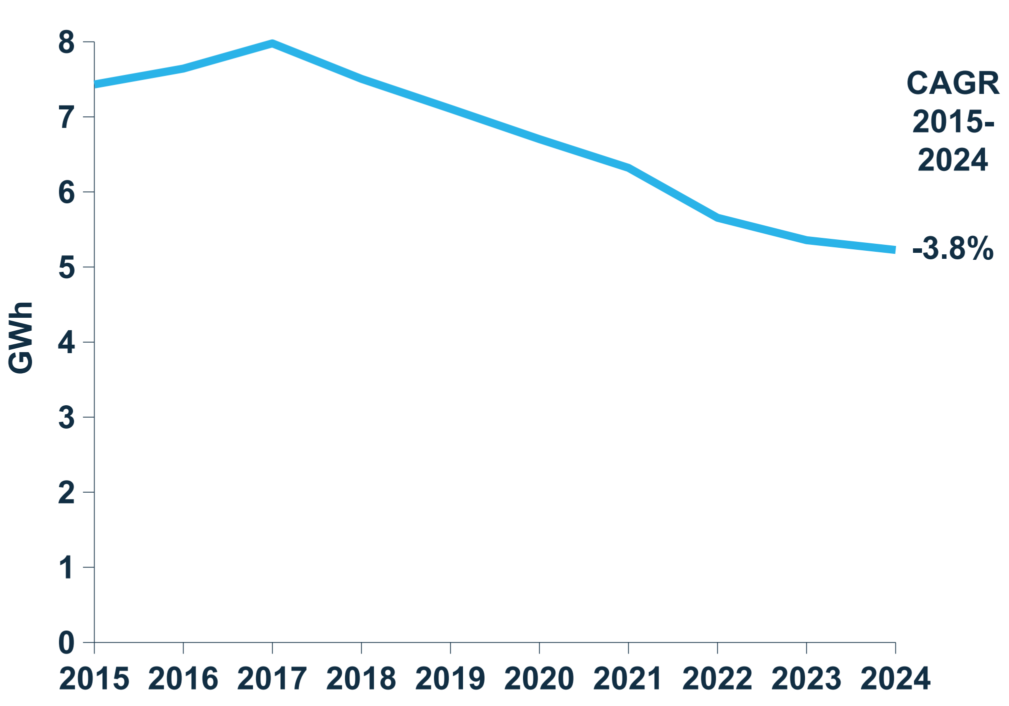


- **As the variable costs of operation, mainly fuel prices, are transferred directly to the consumer, the DH sites are not vulnerable to volatile markets**
  - A traditional business is incentivized to reduce their variable costs to increase the marginal profit, however this is not the case for DH sites
  - Therefore, there may be less incentives for reduction of variable costs through, among others, decarbonisation

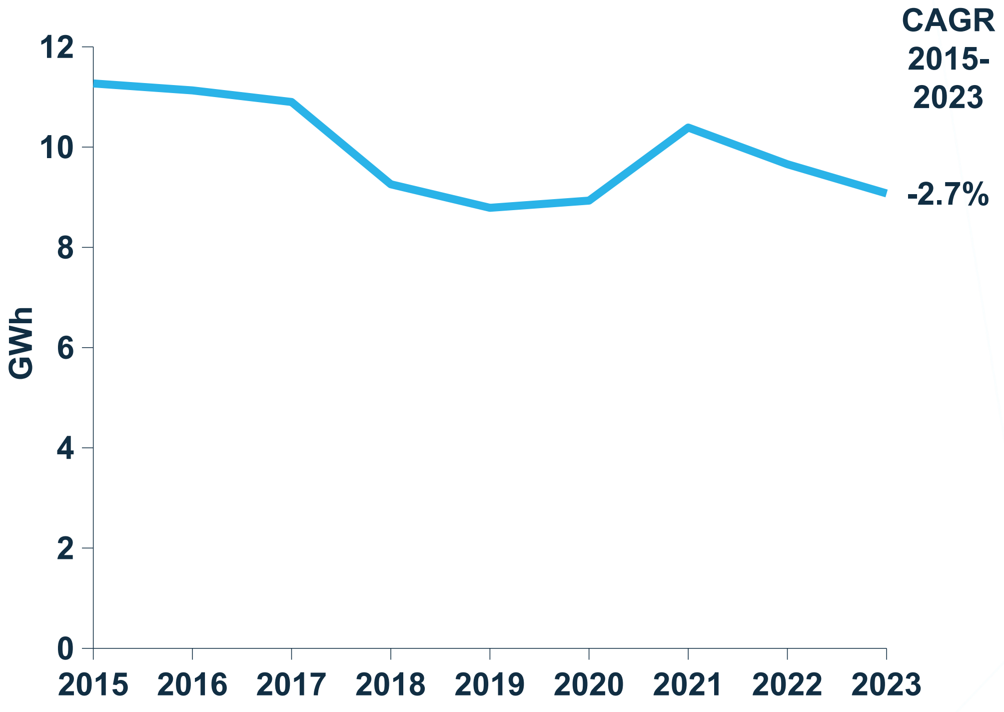
Source: Creara Analysis, Low2High, ÚRSO

Heat volumes are decreasing in the two cases studied in Slovakia

Heat demand evolution for a DH site in <u>Stará Ľubovňa</u>



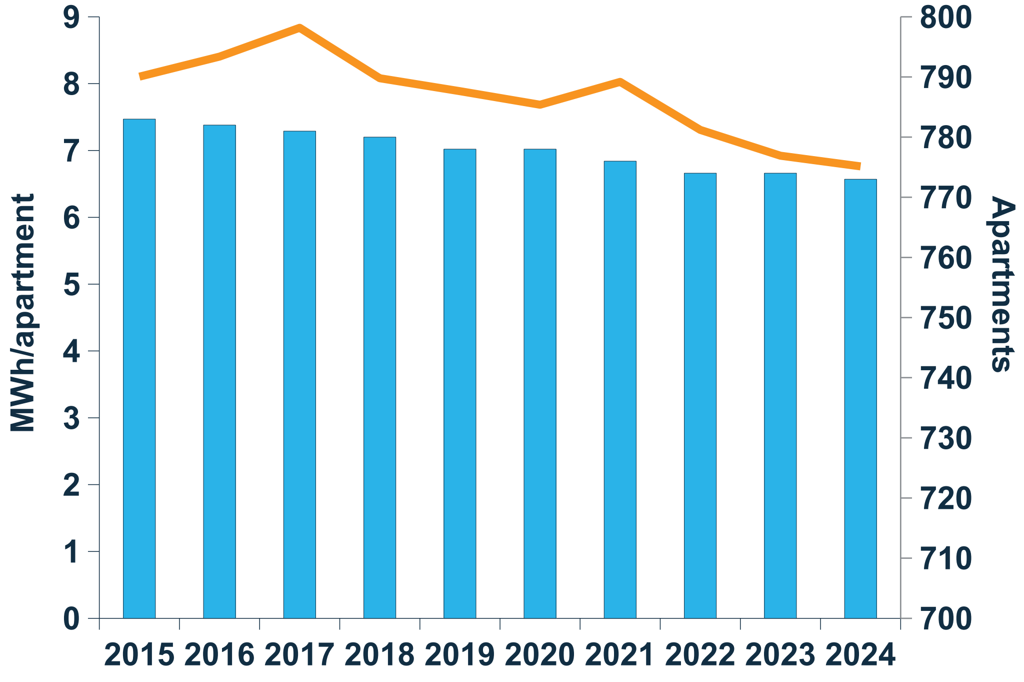
Heat demand evolution for a DH site in <u>Petržalka</u>



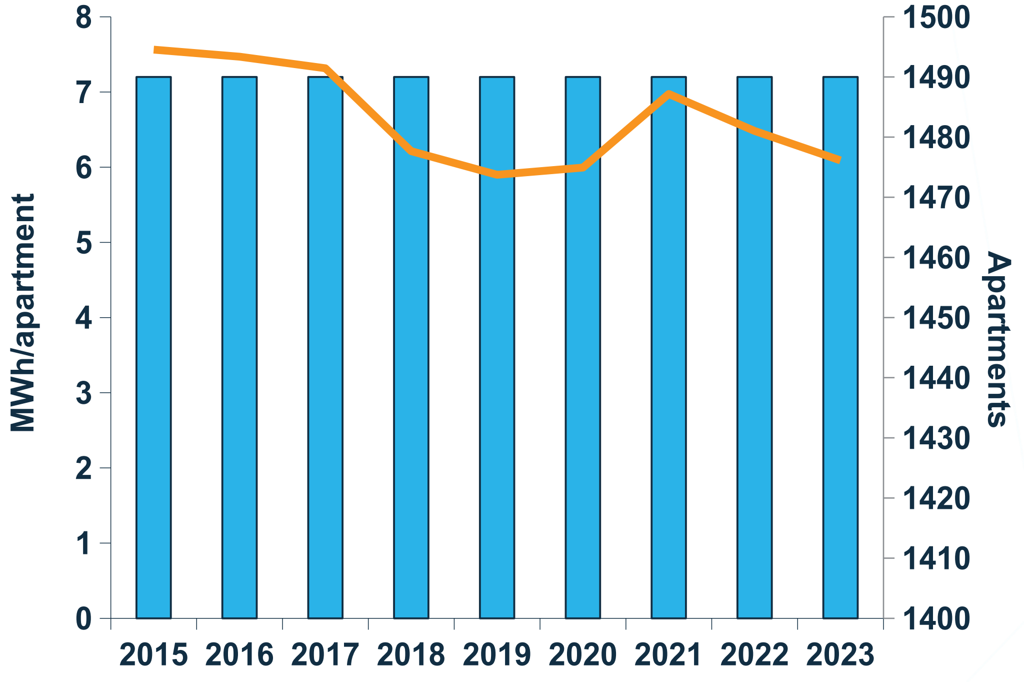
Source: Creara Analysis, Low2High

Heat volumes decrease due to lower unitary consumption and (in one of the cases) due to disconnections

Unitary consumption and connected apartments evolution for a DH site in Stará Ľubovňa



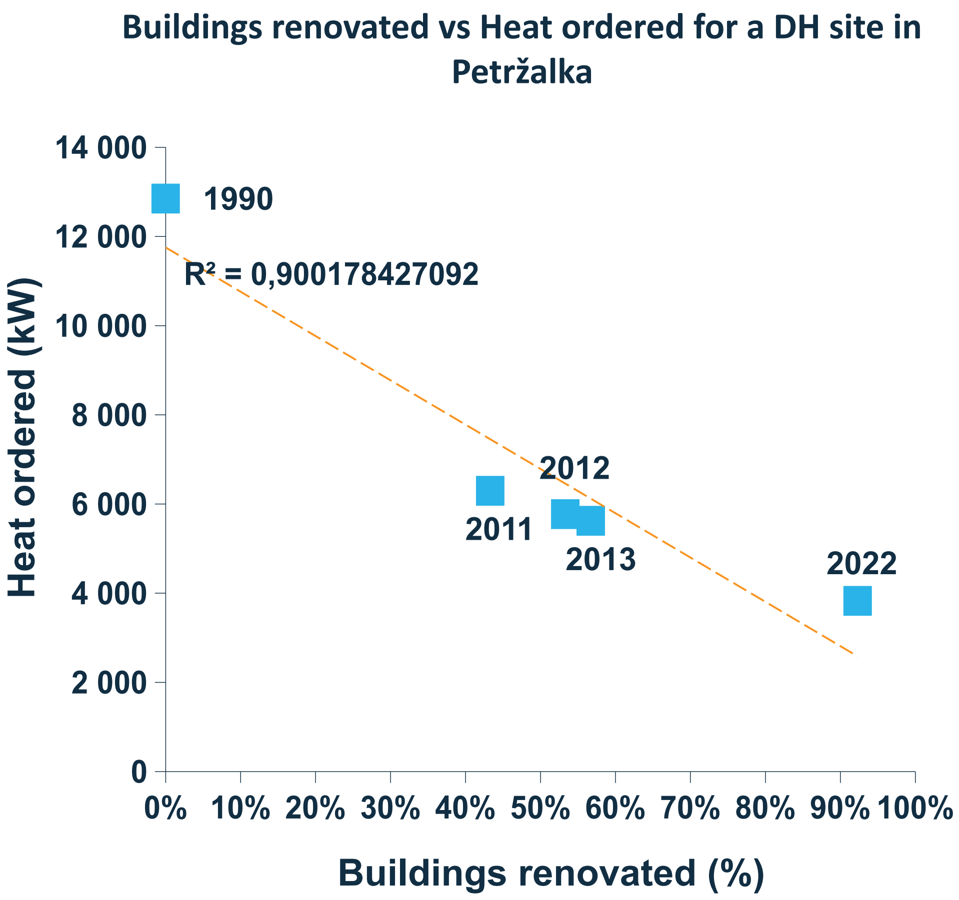
Unitary consumption and connected apartments evolution for a DH site in Petržalka

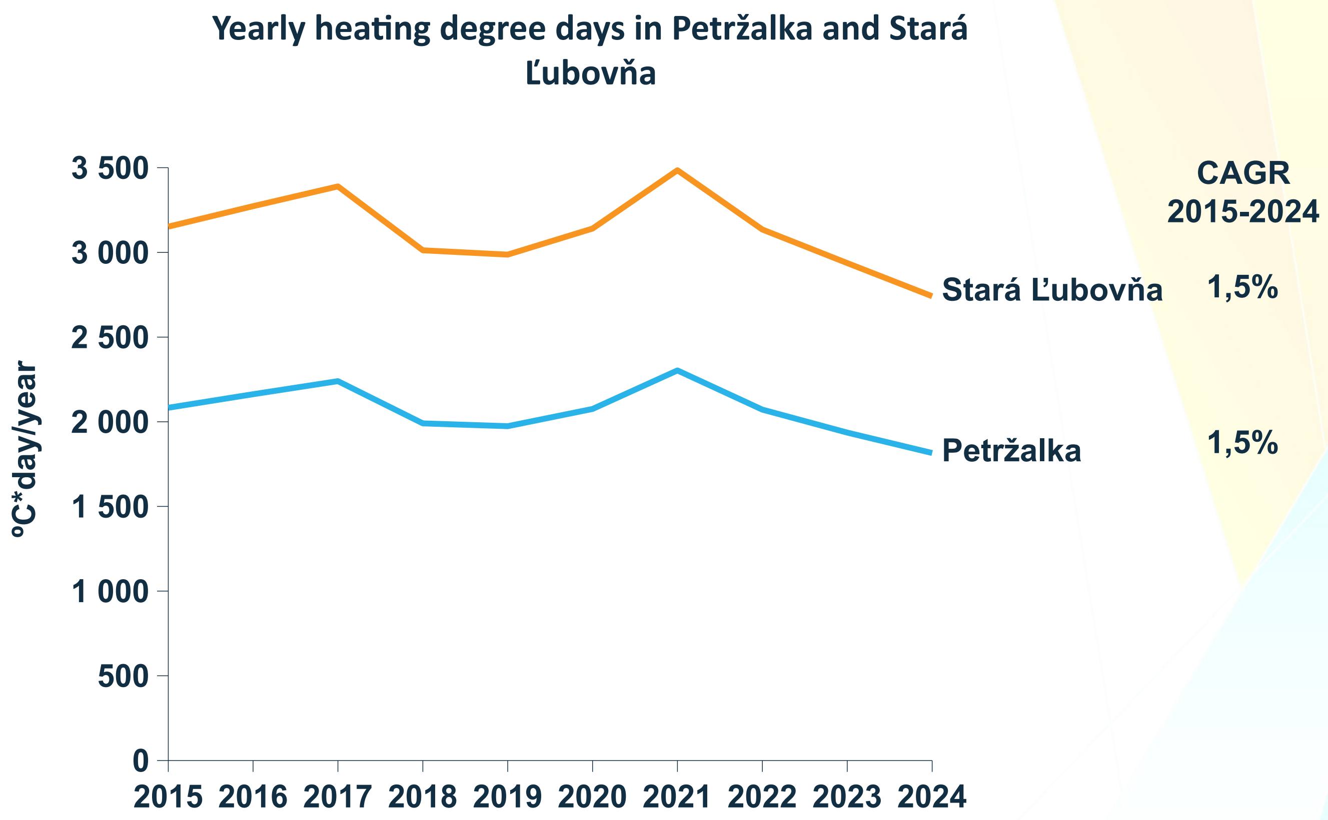


Unitary consumption   Nº of connected apartments

Source: Creara Analysis, Low2High

The main reason for the reduction of unitary consumption is building retrofits and a milder weather (changes in consumer attitude also affect)

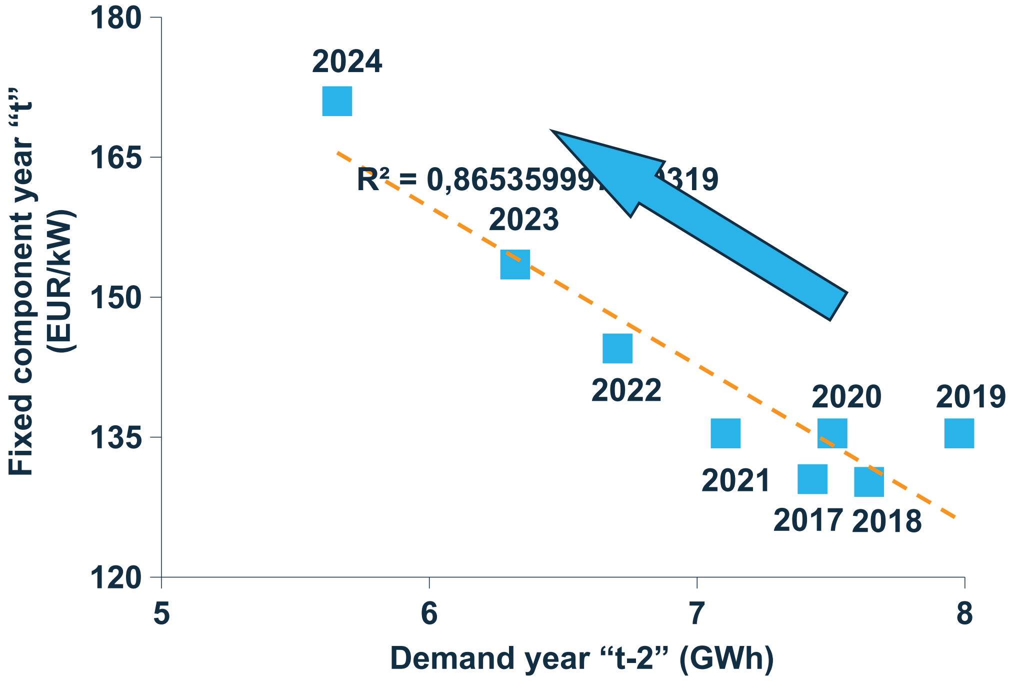




Source: Creara Analysis, Low2High

The main reason for disconnections is price, which in old outdated networks is too high compared with the individual gas boiler (the main DH competitor)

Fixed price component for year "t" vs Demand for year "t-2" of a DH site in Stará Ľubovňa



- **Individual gas boilers are the main competing technology to DH supply**
- **According to local experts, the pursue of a lower heat price is the main reason to choose gas boilers and therefore disconnect from the DH network**
  - District heating (DH) networks operate on economies of scale: when demand decreases the fixed cost per unit increases, as there is less energy to distribute
  - This provokes a loop that feeds itself, more disconnections lead to lower heat demand that leads to a higher price that provokes more disconnections

Source: Creara Analysis, Low2High, ÚRSO

Conclusions

- **Heat volumes are expected to decrease in the two Slovak cases analysed**
  - Heat consumption is expected to follow a decreasing path across the board due to a milder weather and to energy renovations in buildings
  - Besides this, for DHs facing disconnections (due to competition from individual gas boilers) an accelerated path for heat demand is also expected, as lower volumes translate to higher prices

- **The current regulation links DH profit to demand volumes, which builds a difficult case to make investments in an environment of decreasing volumes**
  - However, the current regulation incentivizes DH companies to expand their network, as profit depends on heat demand volumes
  - Also, it provides no incentive to be energy efficient, as losses are paid by the system

- **The current regulation incentivizes to introduce RES in DH, but may not be effective (still under study)**

Thank you

David Pérez
dpn@creara.es

Tou can follow our progress and results through our newsletter – https://low2highdh.eu/newsletter/

Co-funded by
the European Union

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

DH SYNERGY HUB

Thank you

SET HEAT
SUPPORT DHC
Low2HighDH
ENABLE DHC
HeatMineDH
DHC SwEEtch
GREENHEATLIFE

Co-funded by
the European Union