This project is funded by the EU’s Horizon 2020 research and innovation programme under grant agreement N°784966, and lasts from April 2018 – September 2020.

This project receives co-funding from the German Federal Ministry of Economic Cooperation and Development.
KeepWarm Showroom

of

replicable and bankable DHS pilot projects
About the KeepWarm project

KeepWarm supports **forward-looking district heating systems** (DHS) in seven countries of Central and Eastern Europe to develop and implement pilot projects which **retrofit** their systems in a more **sustainable** manner. To **overcome barriers** to DH deployment across the region, KeepWarm facilitates DHS via a multi-stage approach:

- Increased capacities of specialists working in DHS companies by offering training workshops
- DHSs supported in the development of viable **business plans**
- DHSs advised on how to **mobilise funding** for bankable pilot projects
- Exhibit of replicable DHS **demo cases**
- Facilitating the multi-level integration of DHS retrofits into key **strategies and plans**
Following KeepWarm’s suggested action-hierarchy below, DHSs will have more efficient operations from such cost-effective investments, and which provide even more reliable services to their customers while still contributing greatly to climate-related goals. The following pages exhibit KeepWarm’s portfolio of leading DHS demo cases as a means to:

• **Inspire other DHS** to replicate their successes
• **Stimulate investment** in worthwhile opportunities
• **Attract customers** to the viability of DHS services
• **Showcase DHSs’ justifiable role within energy policies**

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 and/or commercial facilities

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

5th • Deploying smart heat distribution and control management systems
## Summary of DHS demo cases

<table>
<thead>
<tr>
<th>DHS</th>
<th>Page</th>
<th>Boiler retrofits</th>
<th>Grid retrofits</th>
<th>Efficiency/optimisation</th>
<th>Temperature downgrade</th>
<th>Expansion/connections</th>
<th>Significant phase-out of fossil fuels</th>
<th>Biomass integration</th>
<th>Solar thermal integration</th>
<th>Integration of other sources</th>
<th>Smarter controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>7</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Eibiswald</td>
<td>9</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Ligist</td>
<td>11</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Croatia</td>
<td>13</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Samobor</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Velika Gorica</td>
<td>17</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Zagreb</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Zaprešić</td>
<td>21</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>23</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Brno</td>
<td>25</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>České Budějovice</td>
<td>27</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Písek</td>
<td>29</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Latvia</td>
<td>31</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Bene</td>
<td>33</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Jekabpils</td>
<td>35</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Lielauce</td>
<td>37</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>
## Summary of DHS demo cases

<table>
<thead>
<tr>
<th>DHS</th>
<th>Page</th>
<th>Boiler retrofits</th>
<th>Grid retrofits</th>
<th>Efficiency/optimisation</th>
<th>Temperature downgrade</th>
<th>Expansion/connections</th>
<th>Significant phase-out of fossil fuels</th>
<th>Biomass integration</th>
<th>Solar thermal integration</th>
<th>Integration of other sources</th>
<th>Smarter controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serbia</td>
<td>39</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Bajina Bašta</td>
<td>41</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Nova Varoš</td>
<td>43</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Priboj</td>
<td>45</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Šabac</td>
<td>47</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Slovenia</td>
<td>49</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Ptuj</td>
<td>51</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Slovenj Gradec</td>
<td>53</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Velenje</td>
<td>55</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Ukraine</td>
<td>57</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Bila Tserkva</td>
<td>59</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Khmelnytskyi</td>
<td>61</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Ternopil</td>
<td>63</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Zhytomyr</td>
<td>65</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

You can also find further inspirations for your next steps forward and how KeepWarm can help you achieve your DH goals, on page 67.
DH in Austria covers 15% of total heat demand, being the 3rd-most dense DH network in Europe. DH is especially predominant in larger cities, but also in rural villages with more than 2400 DH networks all over the country. Networks are mainly operated by private utilities.

**Challenges**

- High **investment costs** for RES, emission regulations and competition
- **Low consumption** in new homes
- Lack of a national heating **strategy**
Framework & action

Investment subsidies covering:

<table>
<thead>
<tr>
<th>Investment Subsidies</th>
<th>✔️</th>
<th>✗</th>
</tr>
</thead>
<tbody>
<tr>
<td>New DHS /expansions of DHS</td>
<td>✔️</td>
<td>✗</td>
</tr>
<tr>
<td>DHS retrofits for EE / RES</td>
<td>✔️</td>
<td>✗</td>
</tr>
<tr>
<td>Consumers / connections</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Soft loans and other financing</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Tax incentives</td>
<td>✗</td>
<td></td>
</tr>
</tbody>
</table>

Trends

- Annual **5% growth** of DHSs
- Trend towards **switching DHSs to RES**, especially biomass

Policy stance

- Goal of **1% annual increase of RES** share in DHC
- Austria must **reduce GHG emissions at least 36%** until 2030
- Concerted effort to increase DH’s share of **biomass** and other RES

Recommended actions

- Build new RES-DHS in urban as well as rural areas
- Find synergies between electricity and DHS grids
- Investigate the potential of large-scale biomass, excess heat and ambient heat

https://keepwarmeurope.eu/countries-in-focus/austria/deutsch/
DHS Eibiswald

(Nahwärme Eibiswald eGen)

- Location: Eibiswald, Austria
- Operating since: 1993
- Ownership: farmers cooperative
- Grid: 10,6 km (owned by the DHS)
- Customers: 150
- Connected load: 5800 kW
- Boiler output: 4870 kW (5 boilers)
- Type of DHS: hot water
- Current fuel: wood chips, thermal solar, oil (peak load & back-up)
- Potential renewables nearby: waste wood, excess heat, solar

Investment plans: Optimisation to achieve more efficient operation of the boiler house and grid as well as grid extension, in 2019.

For more information:
- www.keepwarmeurope.eu/country-pages/austria
- http://nahwaerme-eibiswald.at/
New boiler house, grid extension & grid connection

Primary work-steps and investment drivers:
- Takeover of nearby DHS
- Connecting both Grids
- Building new boiler-house / heating central
- Grid extension in Eibiswald

Results:
- RES use increase: before 10.9 ⇒ after 19.5 GWh
- RES heat production ratio: 99.1% RES
- Primary energy savings: 320 MWh/a
- Emission reductions: ↓1764 tCO₂/a
- Increased heat sales: 80%
- Increased profitability

Strategic background documents:
- Environmental subsidies for optimising DHS
- Climate & Energy Strategy of Styria

Stakeholder involvement:
- Leading: Owner consortium, planner
- Other: municipality, financing partners

Required resources:
Financial investment: Approx. 7 Million EUR

Want to adapt our work to your DHS?
Want to invest in our progressive DHS?
Contact us using the information below!

• Franz Moser, Bioenergie Service
• Franz.moser@lk-stmk.at, +43 316/8050-1366
DHS Ligist
(Biomasse Heizgemeinschaft Ligist GesmbH)

- Location: Ligist, Austria
- Operating since: 1986
- Ownership: private/community
- Grid: 6000 m (owned by the DHS)
- Customers: 138
- Connected load: 2880 kW
- Boiler output: 2500 kW (2 boilers)
- Type of DHS: hot water
- Current fuel: wood chips
- Potential renewables nearby: waste wood from forestry and saw mills

**Investment plans:**

For more information:
- www.keepwarmeurope.eu/country-pages/austria
- www.ligist.at/startseite/wirtschaft/heizgemeinschaft
Boiler Replacement & new customers

Primary work-steps and investment drivers:
• Boiler Replacement during 2019
• Connecting new customers during 2020

Strategic background documents:
• Environmental subsidies for optimising DHS
• Climate & Energy Strategy of Styria

Stakeholder involvement:
• Leading: Owner consortium, planner
• Other: municipality, financing partners

Required resources:
Financial investment: Approx. 1.5 Million EUR

Results:
• RES use increase: before 4.7 GWh ⇒ after 5.5 GWh
• RES heat production ratio: 100% RES
• Total efficiency gain: 6%
• Emission reductions: ↓323 tCO₂/a
• Resources: 100% local biomass from a 30 km radius
• Increased profitability

Want to adapt our work to your DHS?
Want to invest in our progressive DHS?
Contact us using the information below!

• Franz Moser, Bioenergie Service
• Franz.moser@lk-stmk.at, +43 316/8050-1366
DH covers **15%** of total heat demand in Croatia, with DHS of many **different** sizes and type. Around 110 DHS are **regulated** by the national energy regulator HERA. Most of the DHS are owned by public companies.

**Challenges**

- Distribution networks tend to be old and **inefficient**
- DHSs require significant **investments to renovate** and modernise
- Lack of **proper energy planning** which would enable cooperation
- Lack of **legal framework** for systematic decarbonisation

Source: [WIKIPEDIA](https://keepwarmeurope.eu/countries-in-focus/croatia/english/)
Framework & action

Trends
• **CHP** remains the core of Croatia’s DH sector
• Heat consumption is **decreasing** due to increases of energy efficiency among newer/renovated buildings
• Slow integration of RES
• Increase of energy efficiency in production and distribution

Policy stance
• Goal of **1% annual increase of RES** in DHSs for 2021-2025
• Measures to stimulate increased **efficiency of DHSs**
• Support of highly efficient **cogeneration and RES**

Investment subsidies covering:

<table>
<thead>
<tr>
<th>Investment subsidies covering:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>New DHS /expansions of DHS</td>
<td>✓</td>
</tr>
<tr>
<td>DHS retrofits for EE / RES</td>
<td>✓</td>
</tr>
<tr>
<td>Consumers / connections</td>
<td>✓</td>
</tr>
<tr>
<td>Soft loans and other financing</td>
<td>✓</td>
</tr>
<tr>
<td>Tax incentives</td>
<td>✗</td>
</tr>
</tbody>
</table>

Recommended actions
• Introduction of solar energy in DHS
• Investigating the potential of excess heat, large scale solar and geothermal energy
• Connection of individual boiler rooms (smaller DHS) into a single distribution network
• Revitalisation of heat distribution network

https://keepwarmeurope.eu/countries-in-focus/croatia/hrvatska/
DHS Samobor
(HEP Toplinarstvo Ltd)

- Location: **Samobor, Croatia**
- Operating since: **1986**
- Ownership: **national company**
- Grid: **3 081 m** (owned by the DHS)
- Customers: **1 263**
- Connected load: **9 525 kW**
- Boiler output: **16 600 kW** (6 boilers)
- Type of DHS: **hot-water**
- Current fuel: **Natural gas**
- Potential renewables nearby: **solar thermal energy**

**Investment plans:**
- **Connection** into a single DHS and integration of solar thermal energy (optimisation included)

**Timeline:**
- End of 2020 - detailed feasibility study
- Mid 2021 - engineering study
- End of 2021 - investment

For more information:
- [https://keepwarmeurope.eu/countries-in-focus/croatia/english/](https://keepwarmeurope.eu/countries-in-focus/croatia/english/)
- [http://www.hep.hr/toplinarstvo/](http://www.hep.hr/toplinarstvo/)
Primary work-steps and investment drivers:
- First planning phase - Feasibility study
- Detailed planning (+external expertise)
- Negotiations with existing and prospective customers
- Obtaining permits & Tendering
- Construction – integration of solar energy

Strategic background documents:
- OP (Operative Programme Competitiveness and Cohesion)
- SECAP Samobor

Stakeholder involvement:
- Leading: HEP Toplinarstvo, REGEA, TVP Solar
- Other: City of Samobor, existing and prospective customers, financial institutions

Required resources:
Financial investment: 3 750 000 kn (500 000 EUR)
Additional staff: -
Other: External experts

Results:
- Collector area: 3 000 m²
- RES-share increase: 0% ⇒ 4%
- RES/fossil heat production ratio: 1:25
- Reduction of losses: 0%
- Primary energy factors: 1.69 ⇒ 1.45
- Emission reductions: ↓151 tCO₂ (-4.90%)
- Payback period: 12.25 years

Want to adapt our work to your DHS?
Contact us using the information below!
Marko Čavar (REGEA)
mcavar@regea.org
DHS Velika Gorica
(HEP Toplinarstvo Ltd)

- **Location:** Velika Gorica, Croatia
- **Operating since:** 1984
- **Ownership:** national company
- **Grid:** 9,836 m (owned by the DHS)
- **Customers:** 5,902
- **Connected load:** 46,275 kW
- **Boiler output:** 69,612 kW (33 boilers)
- **Type of DHS:** hot-water
- **Current fuel:** Natural gas and extra light fuel oil
- **Potential renewables nearby:** solar thermal energy

**Investment plans:**
*Connection* of boiler rooms into a single DHS network, optimisation of new system and integration of solar thermal energy.

**Timeline:**
- End of 2020 – detailed feasibility study
- Mid 2021 – engineering study
- End of 2021 - investment

For more information:
https://keepwarm.eu/countries-in-focus/croatia/english/
http://www.hep.hr/toplinarstvo/
Interconnection of boiler rooms & integration of solar thermal

Primary work-steps and investment drivers:
- Feasibility study & scenario evaluation
- Detailed planning (+external expertise)
- Negotiations with regional authorities and customers
- Obtaining permits & tendering
- Construction phase – solar plant & interconnection

Strategic background documents:
- OP (Operative Programme Competitiveness and Cohesion)
- SECAP Velika Gorica

Stakeholder involvement:
- Leading: HEP Toplinarstvo, REGEA, TVP Solar
- Other: City of Velika Gorica, existing and prospective customers, financial institutions, planning and construction companies, equipment producers

Results:
- Collector area: **500 m²**
- RES-share increase: **0% ⇒ 3%**
- RES/fossil heat production ratio: **1:32.3**
- Reduction of losses: **0%**
- Primary energy factors: **1.29 ⇒ 1.14**
- Emission reductions: **816 tCO₂ (-5%)**
- Payback period: **10,1 years**

Required resources:
Financial investment: **7 500 000 kn (1 000 000 EUR)**
Additional staff: -
Other: **External experts**

Want to adapt our work to your DHS?
Contact us using the information below!

Marko Čavar (REGEA)
mcavar@regea.org
DHS Zagreb
(HEP Toplinarstvo Ltd)

- **Location:** Zagreb, Croatia
- **Operating since:** 1954
- **Ownership:** national company
- **Grid:** 271 395 m (owned by the DHS)
- **Customers:** 99 004
- **Connected load:** 1 186 815 kW
- **Boiler output:** 1 378 000 kW
- **Type of DHS:** hot-water and steam
- **Current fuel:** Natural gas (cogeneration)
- **Potential renewables nearby:** geothermal, solar thermal energy

**Investment plans:**
**Optimisation** of current cogeneration plans, increase in energy efficiency in distribution network, reconstruction of direct heating stations

**Timeline:**
End 2019 - detailed feasibility study
April 2020 - securing external funds
2021-2023 - Investments

For more information:
https://keepwarmeurope.eu/countries-in-focus/croatia/english/
http://www.hep.hr/toplinarstvo/

Source: Andrej Majcen, Razvoj izvora CTS grada Zagreba
Distribution network revitalisation

Primary work-steps and investment drivers:
- Feasibility studies and scenario evaluation
- Obtaining necessary permits
- Securing funds
- Tendering; equipment, construction work, supervision, revision, project management and promotion
- Construction, supervision and revision

Strategic background documents:
- SECAP Zagreb, OPKK (Operational Programme Competitiveness and Cohesion)

Stakeholder involvement:
- Leading: HEP Group
- Other: Government bodies, Ministry of Finance, Ministry of Regional Development, Ministry of Environment, Croatian Energy Regulatory Agency, City of Zagreb, consulting, planning and construction companies...

Required resources:
Financial investment:
around 573 000 000 kn (76 500 000 EUR)
Additional staff: -
Other: External experts for revision, construction and promotion

Results:
- Length revitalised: 68 500 m
- Reduction of heat losses 28%
- Primary energy savings 5.31 GWh/year
- Emission reductions: ↓816 tCO₂
- Internal return rate: ca 15%

Want to find out more about this project?
Contact us using the information below!

Marko Čavar (REGEA)
mcavar@regea.org
DHS Zaprešić
(HEP Toplinarstvo Ltd)

- Location: Zaprešić, Croatia
- Operating since: 1984
- Ownership: national company
- Grid: 2 368 m (owned by the DHS)
- Customers: 2 372
- Connected load: 15 172 kW
- Boiler output: 20 360 kW (19 boilers)
- Type of DHS: hot-water
- Current fuel: Natural gas and extra light fuel oil
- Potential renewables nearby: solar thermal energy

Investment plans:
Connection into a single DHS system, optimisation of new system, connection of potential customers and integration of solar thermal energy

Timeline:
End of 2020 – detailed feasibility study
Mid 2021 – engineering study
End of 2021 – Investments

For more information:
https://keepwarmeurope.eu/countries-in-focus/croatia/english/
http://www.hep.hr/toplinarstvo/
Interconnection of boiler rooms & integration of solar thermal

Primary work-steps and investment drivers:
- Feasibility study & scenario evaluation
- Detailed planning (+ external expertise)
- Negotiations with regional authorities and customers
- Obtaining permits & Tendering
- Construction phase – solar plant & interconnection

Strategic background documents:
- OP (Operative Programme Competitiveness and Cohesion)
- ECAP Zaprešić

Stakeholder involvement:
- Leading: HEP Toplinarstvo, REGEA, TVP Solar
- Other: City of Zaprešić, existing and prospective customers, financial institutions, planning and construction companies, equipment producers

Required resources:
Financial investment: 26 250 000 kn (3 500 000 EUR)
Additional staff: -
Other: External experts

Results:
- Collector area: 50 000 m²
- RES-share increase: 0% ⇒ 17%
-RES/fossil heat production ratio: 1:4.8
- Reduction of losses: 0%
- Primary energy factors: before 1.20 ⇒ after 0.86
- Emission reductions: ↓1046 tCO₂ (-22.07%)
- Payback period: 21.4 years

Want to adapt our work to your DHS?
Contact us using the information below!

Marko Čavar (REGEA)
mcavar@regea.org
DH has a high 40.3% share of residential heating. Though the DH sector is highly developed, nearly 15% of heat networks are still steam technology. DHS are mostly owned by municipalities or in combination with the private sector.

Challenges

- Heat prices are regulated
- Economic discrimination of DH industry
- Vulnerability of DHSs
- Retrofits of (steam) DHSs needed
- Transition from coal to RES

Source: Wallpaper Flare

DH ENERGY MIX - CZECH REPUBLIC

- Coal: 57.7%
- Natural Gas: 25.4%
- RES: 8.1%
Framework & action

Trends
- Between 2017 and 2019 **3.5% decrease** in DH supplied
- Even so, the share of heat from **biomass** and **biogas** is growing
- Trend in **replacement of inefficient steam** systems with modern ones

Policy stance
- There are goals for the **increase of RES** in heating & cooling
- A **DH Modernisation Fund** is operational

**Investment subsidies covering:**
- New DHS /expansions of DHS
- DHS retrofits for EE / RES
- Consumers / connections
- Soft loans and other financing
- Tax incentives

**Recommended actions**
- Upgrade biogas plants and increase the efficiency of bio-methane (CHP, gas systems)
- Promotion of electricity from high-efficiency cogeneration
- Support of heat from RES
- Introduce a carbon tax, thus eliminating discrimination in the DH sector

https://keepwarmeurope.eu/countries-in-focus/czech-republic/cestina/
DHS Brno
(Teplárny Brno, a.s.)

- Location: **Brno, Czech Republic**
- Operating since: **1930**
- Ownership: **community**
- Grid: **291 011 m** (owned by the DHS)
- Customers: **4 000**
- Connected load: **1 078 000 kW**
- Boiler output: **762 840 kW** (13 boilers)
- Type of DHS: **steam, hot-water**
- Current fuel: **natural gas**
- Potential renewables nearby: **wood chips, Forests of Brno city**

**Investment plans:**
Reconstruction of obsolete steam pipelines for **modern economical hot water system** in the period 2020-2023, **expansion of WtE capacity** by 2024.

For more information:
Upgrade to hot-water system

Primary work-steps and investment drivers:
- Analysis of heat network condition, heat distribution losses and demand for technological steam
- OP Enterprise and Innovations for Competitiveness

Strategic background documents:
- Territorial Energy Concept of the City of Brno
- State Energy Policy supporting DH modernisation

Stakeholder involvement:
- Leading: DHS operator, municipality as an owner of DHS
- Other: Financial institutions, suppliers

Results:
- Reduction of losses: 18 % before ⇒ 6 % after
- Primary energy savings over the lifetime of the solution: 5 533 GWh
- Emission reductions: ↓1 106 670 tCO₂ (- 14 %)
- Fuel (natural gas) savings per year: 19 529 000 m³

Required resources:
Financial investment: 650 mil Kč (25 mil €) for a conversion of the steam network

Want to adapt our work to your DHS? Want to invest in our progressive DHS?
Contact us using the information below!

- Martin Sroubek, Head of Tech.Development
  - sroubek@teplarny.cz
DHS České Budějovice
(Teplárna České Budějovice, a.s.)

- Location: České Budějovice, Czech Republic
- Operating since: 1965
- Ownership: community
- Grid: 165,000 m (owned by the DHS)
- Customers: 1,181
- Connected load: 456,400 kW
- Boiler output: 453,700 kW (5 boilers)
- Type of DHS: steam, hot-water
- Current fuel: lignite, natural gas
- Other energy potential: excess heat from NPP Temelín

Investment plans:
Conversion of a reasonable part of the steam network to hot water by 2021. Construction of a hot-water feeder and start of excess heat supply from NPP Temelín in 2020/21.

For more information:
- [www.keepwarm.eu/country-pages/czech-republic](http://www.keepwarm.eu/country-pages/czech-republic)
Switch to heat from NPP

Primary work-steps and investment drivers:
• Technical and economic analysis of heat utilisation from nuclear power plant
• Plan of the feeder route and negotiations with the participating municipalities
• OP Enterprise and IC, OP Environment, loans

Strategic background documents:
• Long-term business concept of DHS České Budějovice in 2018–2045
• State Energy Policy supporting DH modernisation

Stakeholder involvement:
• Leading: DHS operator, municipality as an owner of DHS, NPP owner as heat supplier
• Other: Financial institutions

Results:
• RES-share increase: 0 before ⇒ 208 GWh after
• RES/fossil heat production ratio: 1/2
• Reduction of coal production: 30 %,
• Primary energy savings over the lifetime of the solution: 4 583 GWh
• Emission reductions: ↓1 650 000 tCO₂ (- 30%)

Required resources:
Financial investment: 1,5 mld Kč (58,3 mil €) for a construction of the hot-water pipeline

Want to adapt our work to your DHS?
Want to invest in our progressive DHS?
Contact us using the information below!

• Jan Vaclík, Head of Production Economics
• Jan.vaclik@teplarna-cb.cz
DHS Písek
(Teplárna Písek, a.s.)

- Location: Písek, Czech Republic
- Operating since: 1987
- Ownership: community + private
- Grid: 56 001 m (owned by the DHS)
- Customers: 446
- Connected load: 64 800 kW
- Boiler output: 66 350 kW (3 boilers)
- Type of DHS: steam/hot-water
- Current fuel: lignite, oil, gas, BM
- Potential renewables nearby: wood chips

Investment plans:
Conversion of steam network to hot water by the end of 2020, fuel optimisation - switch from coal to biomass in 2020.

For more information:
- www.keepwarmeurope.eu/country-pages/czech-republic

Switch to biomass

Primary work-steps and investment drivers:
- Definition of DHS strategic objectives: reduction of CO₂ emissions, replacement of fossil fuels, efficient heat production and distribution
- Integrated Regional OP, OP Enterprise and IC, OP Environment, investment loans

Strategic background documents:
- DHS Písek long-term strategy
- The thermal concept of town of Písek
- State Energy Policy supporting DH modernisation

Stakeholder involvement:
- Leading: DHS operator, municipality as an owner of DHS
- Other: Fuel suppliers, financial institutions

Required resources:
Financial investment: 170 mil Kč (6,5 mil €) for desulphurisation and biomass boiler

Results:
- RES-share increase: before 0 ⇒ after 63 GWh
- RES/fossil heat production ratio: 2/3
- Reduction of coal production: 40 %,
- Primary energy savings over the lifetime of the solution: 1 260 GWh
- Emission reductions: ↓453 320 tCO₂ (- 40%)

Want to adapt our work to your DHS?
Want to invest in our progressive DHS?
Contact us using the information below!

Andrea Zakova, DHS director
zakova@tpi.cz
Latvian DH context

DH covers 80% of Latvian buildings, mainly households. It is mainly owned by municipalities or private companies. A third of the total length of national heat networks is located in the capital Riga.

Challenges

- Some parts of the total network have high losses, up to 16%
- Consumer engagement and attraction issues
- Development of old DHS, heat network retrofitting
- Inefficient use of RES in DH
- Non-existing district cooling systems

Source: Wikimedia Commons

THERMAL ENERGY MIX - LATVIA

- Wood and Biomass; 39.4%
- Natural Gas; 55.3%
- Biogas; 5.0%
- Other Fossil Fuel; 0.3%

https://keepwarmeurope.eu/countries-in-focus/latvia/english/
Framework & action

Trends
• Share of natural gas is gradually being replaced with higher share of fuel wood
• The number of biomass heat sources has increased 2.5 times in recent years

Policy stance
• Goal of 0,55% annual increase of RES share in DH
• Latvia obliged to reduce GHG emissions outside ETS by 13% until 2030

Investment subsidies covering (2021-2027):

<table>
<thead>
<tr>
<th>Investment subsidies</th>
<th>✔️</th>
<th>✗</th>
</tr>
</thead>
<tbody>
<tr>
<td>New DHS /expansions of DHS (capacity till 1MW)</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>DHS retrofits for EE / RES (capacity till 1MW)</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Consumers / connections (capacity till 1MW)</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Soft loans and other financing</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Tax incentives</td>
<td>✗</td>
<td></td>
</tr>
</tbody>
</table>

Recommended actions
• Increase efficiency of DHS by using more RES technologies, especially non-emission technologies (solar collectors, heat pumps, etc.)
• Increase attractiveness of DH
• Reduce fuel consumption

https://keepwarmeurope.eu/countries-in-focus/latvia/latviesu-valoda/
DHS Bene
(Heat supply grid in Bene parish, «Auces komunalie pakalpojumi», Ltd.)

- Location: Bene parish, Auce county, Latvia
- Operating since: 1994
- Ownership: municipality
- Grid: 900 m (owned by the DHS)
- Customers: 299
- Connected load: 2310 kW (12 connections)
- Type of DHS: Heat energy is purchased according to meter from biological gas station and delivered to customers
- Current fuel: biogas
- Potential renewables nearby: woodchips / solar thermal energy

Investment plans:
To build own new boiler house (wood-chips), possible by the end of 2021.

Source: «Auces komunalie pakalpojumi», Ltd.

For more information:
- www.auceskp.lv/komunalie-pakalpojumi/siltumapgades-saimnieciba
Construction of new and automated boiler

Primary work-steps and investment drivers:
• Installation of new pellet boiler with an automated pellets delivery system (0.8-1MW)
• Availability of EU Funds and low cost loans

Strategic background documents:
• National energy and climate plan of Latvia for period 2021-2030;
• Energy Law
• Energy Action plan of Auce county, 2018-2025
• Medium-term operational strategy plan of «Auces komunālie pakalpojumi», Ltd. 2019-2021

Stakeholder involvement:
• Leading: DHS owner (municipality), state financial authorities, banks, technologies` suppliers
• Other: customers, government, fuel suppliers, state regulatory office

Required resources:
Financial investment: 165 000 EUR
New equipment: new pellet boiler with an automated pellets delivery system
Additional staff: external professionals for installation of new equipment

Results:
• RES-share: before 100% → after 100%
• RES/fossil heat production ratio: 100% RES
• Reduction of losses: remain the same 9%
• Planned energy input: 1760 MWh per year
• CO2 emissions: 0 t/year
• Internal Rate of Return (IRR): 44%
• Discounted repayment period: 2,5 years

Want to adapt our work to your DHS?
Want to invest in our progressive DHS?
Contact us using the information below!

• zrea@zrea.lv / www.zrea.lv
• www.auceskp.lv
DHS Jekabpils

(Boiler house at Celtnieku street 13A, Jekabpils, «Jekabpils Siltums», Ltd.)

• Location: Jekabpils city, Latvia
• Operating since: 2003
• Ownership: municipality
• Grid: 1362 m (owned by the DHS)
• Customers: 15 multi-residential buildings
• Connected load: 3649 kW
• Boiler output: 3360 kW (2 boilers)
• Type of DHS: production and distribution-hot water supply
• Current fuel: wood chips (93%) / gas (7%)
• Potential renewables nearby: woodchips, solar energy

For more information:
• www.keepwarmeurope.eu/country-pages/austria
• jekabpils-siltums.lv/lv-par-uznjeemumu-63321/inform%C4%81cija-par-kapit%C4%81lsabiedr%C4%ABbu

Investment plans:
Reconstruction and automatisation of boiler house, planned within the next 2-3 years.
Boiler house reconstruction and automatisation

Primary work-steps and investment drivers:
• Change of wood-chips boiler to new, automated wood-chips boiler (1MW);
• Automation of existing gas boiler;
• Installation of additional new automated 0.5 MW gas boiler (for summer load);
• Availability of EU Funds and low cost loans.

Strategic background documents:
• National energy and climate plan of Latvia for period 2021-2030;
• Energy Law;
• Sustainable Development Strategy of Jekabpils city by 2030,

Stakeholder involvement:
• Leading: DHS owner (municipality), state financial authorities, banks, technologies’ suppliers;
• Other: Customers, Government, fuel suppliers, state regulatory office.

Results:
• RES-share: before 93% ⇒ after 78%
• RES/fossil heat production ratio: 78%/22%
• Reduction of losses: remain same at 7% level
• Primary energy input: 6736 MWh/year ⇒ 4907 MWh per year
• CO2 emissions: 205,698 t/year
• Internal Rate of Return (IRR): 14%
• Discounted repayment period: 8 years

Required resources:
Financial investment: 510,000 EUR
New equipment: wood-chips boiler (1MW), gas boiler (0.5MW), equipment for automation of an existing gas boiler
Additional staff: external professionals for installation of new equipment.

Want to adapt our work to your DHS?
Want to invest in our progressive DHS?
Contact us using the information below!

• zrea@zrea.lv /www.zrea.lv
• https://www.jekabpils-siltums.lv/
DHS Lielauce

(Boiler house «Niedras», Lielauce parish, «Auces komunalie pakalpojumi», Ltd.)

- Location: Lielauce parish, Auce county, Latvia
- Operating since: 2004
- Ownership: municipality
- Grid: 300 m (owned by the DHS)
- Customers: 96
- Connected load: 540 kW
- Boiler output: 0,6 kW
- Type of DHS: production and distribution of hot water for heating
- Current fuel: wood chips
- Potential renewables nearby: wood-chips, solar thermal energy

Source: «Auces komunalie pakalpojumi», Ltd.

Investment plans:
Modernisation of the heat source without replacing the existing boiler, planned by the end of 2020.

For more information:
- www.auceskp.lv/komunalie-pakalpojumi/siltumapgades-saimnieciba
Boiler house and grid modernisation

Primary work-steps and investment drivers:
- Installation of frequency changer for network pumps;
- Change of grid: installation of industrially isolated single channel pipes with less diameter;
- Automation of fuel supply with a sliding floor and a fitted conveyor;
- Availability of EU Funds and low cost loans.

Strategic background documents:
- National energy and climate plan of Latvia for period 2021-2030;
- Energy Law;
- Energy Action plan of Auce county, 2018-2025;

Stakeholder involvement:
- Leading: DHS owner (municipality), state financial authorities, banks, technologies’ suppliers;
- Other: customers, government, fuel suppliers, state regulatory office.

Required resources:
Financial investment: 65 000 EUR;
New equipment: a sliding floor and a fitted conveyor, frequency changer for network pumps, industrially isolated single channel pipes with less diameter;
Additional staff: external professionals for installation of new equipment.

Results:
- RES-share : before 100% ⇒ after 100%
- RES/fossil heat production ratio: 100% RES
- Reduction of losses: 27% ⇒ 10%
Primary energy input:
1423 MWh/year ⇒ 1178 MWh per year
- CO2 emissions: 0 t/year
- Internal Rate of Return (IRR): 29%
- Discounted repayment period: 4 years

Want to adapt our work to your DHS?
Want to invest in our progressive DHS?
Contact us using the information below!

• zrea@zrea.lv / www.zrea.lv
• https://www.auceskp.lv/
Serbian DH context

DH covers 25.1% of households in Serbia, with 31% of the total length of networks in/near the capital Belgrade. DH heat is supplied to 48.3% of urban households. DHSs are typically owned by municipalities and operate as public enterprises.

Challenges

- High potential for solar and geothermal aren’t exploited enough
- Old and outdated DHS, with average heat losses of 12-14%.
- Most DHS operate with no profit, due to inefficiencies and energy-pricing policy

Source: Wikimedia Commons

https://keepwarmeurope.eu/countries-in-focus/serbia/english/
Trends
• Total national network has expanded by nearly **300 km annually** in recent years
• Number of plants using **wood chips** is increasing each year

Policy stance
• Plans for RES use in the heating/cooling sector include an increase with **biomass** in DHS
• Production of heat has the highest potential for the energy **efficiency** increase (> 50%) compared with any other energy activity

**Investment subsidies covering:**
<table>
<thead>
<tr>
<th>Investment subsidies covering:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>New DHS / expansions of DHS</td>
<td>❌</td>
</tr>
<tr>
<td>DHS retrofits for EE / RES</td>
<td>✓✓</td>
</tr>
<tr>
<td>Consumers / connections</td>
<td>❌</td>
</tr>
<tr>
<td>Soft loans and other financing</td>
<td>✓✓</td>
</tr>
<tr>
<td>Tax incentives</td>
<td>❌</td>
</tr>
</tbody>
</table>

**Recommended actions**
• Greater integration of RES into the DHS wherever feasible, especially biomass, but also solar, geothermal & excess heat
• Increasing DHS energy efficiency
• Find synergies between electricity and DHS grids
• Establishing parity of heating and electricity prices

https://keepwarmEurope.eu/countries-in-focus/serbia/srpski/
DHS Bajina Bašta

(JP “BB TERM”)

• Location: Bajina Bašta, Serbia
• Operating since: 1973
• Ownership: Municipality of B. Bašta
• Grid: 2900 m (owned by municipality)
• Customers: 1200
• Connected load: 10800 kW
• Boiler output: 12300 kW (6 boilers)
• Type of DHS: warm-water, hot-water
• Current fuel: Oil, coal
• Potential renewables nearby: wood chips

Investment plans:
Build a new biomass plant (wood chips) of 2 x 3 MW, replacing the substations and replacing the part of the main hot water pipes net., planned in the next 2 years.

For more information:
• www.keepwarmeurope.eu/country-pages/serbia
• http://www.bbterm.rs/
Total replacement of fossil fuels (mazut & coal) by 2x3.0 MW boilers on wood chips, integration of presently segmented grid into one unified system, enabling increase in heat consumption

<table>
<thead>
<tr>
<th>Results:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• RES-share increase: 0% ⇒ 100%</td>
</tr>
<tr>
<td>• RES/fossil heat production ratio: 1/0</td>
</tr>
<tr>
<td>• Reduction of losses: overall efficiency remains the same</td>
</tr>
<tr>
<td>• Primary energy factors: remains the same</td>
</tr>
<tr>
<td>• Emission reductions: ↓ 4835 tCO₂</td>
</tr>
<tr>
<td>• Return on investment (ROI): 81% (for a period of 25 years)</td>
</tr>
<tr>
<td>• Annualised ROI: 2.40%</td>
</tr>
</tbody>
</table>

Primary work-steps and investment drivers:
- planning and selection of location finished 03/2020
- contract with investors 2020
- public procurement and selection of bidder in progress
- tech.documentation elaboration & permits obtaining 09/2020
- Boiler & boiler house construction, grid segments connection
- operation of plant 05/2022

Strategic background documents:
- Energy Sector Development Strategy of the Republic of Serbia for the period by 2025 with projections by 2030
- The National Sustainable Development Strategy

Stakeholder involvement:
- Leading: Municipality of Bajina Bašta, PIMO
- Other: Planning and construction companies

Required resources:
- Financial investment: 2'130'000 €
- Additional staff: operators, maintenance & wood chips manipulation personnel,
- Other: fuel, maintenance, electricity...

Want to adapt our work to your DHS?
Want to invest in our progressive DHS?
Contact us using the information below!
- Velimir Radovanović, executive director of the heating plant
- jp.bbterm@gmail.com
DHS Nova Varoš
(“Energija Zlatar NV”)

- Location: **Nova Varoš, Serbia**
- Operating since: **1981**
- Ownership: **Municipality of N.Varoš**
- Grid: **4638 m** (owned by municipality)
- Customers: **765**
- Connected load: **9538 kW**
- Boiler output: **15520 kW** (12 boilers)
- Type of DHS: **hot-water**
- Current fuel: **oil, pellets**
- Potential renewables nearby: **wood chips**

**Investment plans:**
**Reconstruction and modernisation** of all boiler rooms and distribution network, **transition** from fossil fuels/oil to **biomass** in existing boiler houses, planned in the next 2 years.

For more information:
- [www.keepwarmeurope.eu/country-pages/serbia](http://www.keepwarmeurope.eu/country-pages/serbia)
- [energijazlatarnv@gmail.com](mailto:energijazlatarnv@gmail.com)

Construction of a new 3.0 MW boiler on wood chips with, extended operation including night shift, integration of grid

Primary work-steps and investment drivers:
- First planning, coordination of project
- Contract with PIMO or KfW, producing documentation, selection of bidder,
- Construction phase, obtaining new customers,
- Test phase, training of staff

Strategic background documents:
- Energy Sector Development Strategy of the Republic of Serbia for the period by 2025 with projections by 2030
- The National Sustainable Development Strategy

Stakeholder involvement:
- Leading: Nova Varoš municipality & DHS operators, KfW, PIMO, Regulatory and energy agencies
- Other: Wood chips producers (Holz Tim, Jela Star, Zlatar Šped)

Required resources:
Financial investment: 1640000€
Additional staff: -
Other: fuel, maintenance, electricity...

Results:
- RES-share increase: before 10% ⇒ after 93%
- RES/fossil heat production ratio: 0,95
- Reduction of losses: via primary energy savings: 5%
- Primary energy factors: 0,629 ⇒ 0,663
- Emission reductions: ↓2542 tCO₂
- Return on investment (ROI): 93% (for period of 25 years)
- Annualised ROI: 2,66

Want to adapt our work to your DHS?
Want to invest in our progressive DHS?
Contact us using the information below!

• Nenad Todorović, technical director of the heating plant
• nedtod@gmail.com
DHS Priboj

(JP "Toplana Priboj")

- Location: Priboj, Serbia
- Operating since: 2012
- Ownership: Municipality of Priboj
- Grid: 4750 m (not owned by DHS)
- Customers: 1390 households, 100 office buildings & school
- Connected load: 16338 kW
- Boiler output: 51000 kW (2 boilers)
- Type of DHS: hot-water
- Current fuel: Oil
- Potential renewables nearby: wood chips

Investment plans:
Construction of a brand new biomass heating plant of 8MW on wood chips, planned in the next 2 years/test work of the plant is scheduled for April 2022.


For more information:
- www.keepwarmeurope.eu/country-pages/serbia
- toplana.priboj@gmail.com
Total replacement of fossil fuels (mazut) by introducing 8.0 MW boiler on wood chips, extended operation including night shift, integration of presently segmented grid into one unified system, enabling increase in heat consumption

**Primary work-steps and investment drivers:**
- Planning and selection of location finished 02/2020
- Contract with investors 03/2020
- Public procurement and selection of bidder in progress
- Tech. documentation elaboration & permits obtaining 09/2020
- Boiler & boiler house construction, grid segments connection
- Operation of plant 05/2022

**Strategic background documents:**
- Energy Sector Development Strategy of the Republic of Serbia for the period by 2025 with projections by 2030
- The National Sustainable Development Strategy
- Priboj has signed the "Covenant of Mayors"

**Stakeholder involvement:**
- Leading: Priboj municipality and DHS operators, KfW, PIMO, Regulatory and energy agencies
- Other: Wood chips producers (Srbijašume, Jela Star)

**Results:**
- RES-share increase: 0% ⇒ 100%
- RES/fossil heat production ratio: 1/0
- Reduction of losses: overall efficiency remains the same
- Primary energy factors: remains the same
- Emission reductions: ↓7305 tCO₂ (-100%)
- Return on investment (ROI): 50% (for period of 25 years)
- Annualized ROI: 1.64%

**Required resources:**
- Financial investment: 3830000 EUR
- Additional staff: operators, maintenance & wood chips manipulation personnel,...
- Other: fuel, maintenance, electricity... 968,570 EUR

Want to adapt our work to your DHS? Want to invest in our progressive DHS? Contact us using the information below!

- Marko Janjušević, energy manager of Priboj municipality
- marko@priboj.rs, M: +381 64 20 66 826
DHS Šabac
(JKP TOPLANA-ŠABAC)

- Location: Šabac, Serbia
- Operating since: 1986
- Ownership: Municipality of Šabac
- Grid: 22400 m (owned by municipality)
- Customers: 8135
- Connected load: 75005 kW
- Boiler output: 68300 kW (9 boilers)
- Type of DHS: warm- & hot-water
- Current fuel: natural gas, wood chips
- Potential renewables nearby: wood chips, straw bales, waste water & underground water, geothermal energy

Investment plans:
Modernisation of DHS to 4G district heating with the participation of Heating plant and Civilian Initiatives, planned in the next 2 years.

Source: https://toplanasabac.rs/o-nama/

For more information:
- www.keepwarmeurope.eu/country-pages/serbia
- https://toplanasabac.rs/
Significant (63%) replacement of fossil fuel (gas) by new 10 MW boiler on wood chips, extended operation to include night shift.

**Primary work-steps and investment drivers:**
- Company first planning phase **07/2020**
- Municipal Energy policy
- Contract with PIMO or/and KfW **08/2020**
- Public procurement and selection of bidder **12/2020**
- Construction phase, obtaining new customers, involvement of personnel, Test phase, training of staff **10/2023**

**Strategic background documents:**
- Energy Sector Development Strategy of the Republic of Serbia for the period by 2025 with projections by 2030
- The National Sustainable Development Strategy
- Energy policy of the city of Šabac

**Stakeholder involvement:**
- Leading: Municipality of Šabac, PIMO, Planning and construction companies
- Other: Technical suppliers

**Results:**
- RES-share increase: **0,7% ⇒ 63%**
- RES/fossil heat production ratio: **63/37**
- Reduction of losses: energy efficiency decreases slightly due to the replacement of gas boilers with biomass
- Primary energy factors: **0,801 ⇒ 0,753**
- Emission reductions: **8885 tCO₂**
- Return on investment (ROI): **91% (for period of 25 years)**
- Annualised ROI: **2,62%**

**Required resources:**
- Financial investment: **3.250.000 €**
- Additional staff: operators, maintenance & wood chips manipulation personnel,...
- Other: fuel, maintenance, electricity...
  - **1.460.774€**

Want to adapt our work to your DHS?
Want to invest in our progressive DHS?
Contact us using the information below!

- Slobodan Jerotić, director of DHS Sabac
- [slobodan.jerotic@sabac.org](mailto:slobodan.jerotic@sabac.org), +381(65) 341 7000
DH covers about 10% of total heat supply in Slovenia and is the prevailing type of space heating particularly in densely populated urban areas. The DH is mainly carried out as an optional local service of general economic interest (supply to 89% of all DH consumers), as commercial distribution or as the supply from a private DHS.

Challenges

- Average annual losses are estimated to be around 15%
- DHS temperatures often still too high to enable more RES to be integrated
- Need to ensure cost competitiveness despite decreasing heat demand
- Lack of strategic framework and supportive activities/funds for systematic decarbonisation of DHSs

Source: Piqsels

https://keepwarmeurope.eu/countries-in-focus/slovenia/english/
Framework & action

Investment subsidies covering:

<table>
<thead>
<tr>
<th>Investment Area</th>
<th>Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>New DHS / expansions of DHS</td>
<td>✔️</td>
</tr>
<tr>
<td>DHS retrofits for EE / RES</td>
<td>✗</td>
</tr>
<tr>
<td>Consumers / connections</td>
<td>✔️</td>
</tr>
<tr>
<td>Soft loans and other financing</td>
<td>✔️</td>
</tr>
<tr>
<td>Tax incentives</td>
<td>✗</td>
</tr>
</tbody>
</table>

Trends

- Compared to 2016, DH consumers connections increased by 5% in 2017 and additional 1% in 2018.
- In the last few years, the share of RES and excess heat is around 17%.
- Carbon intensity is planned to noticeably decrease by 2021 due to coal phase-out in the largest DHS.

Policy stance

- Goal of 1% annual increase of RES share in DHC (by 2030)
- All black and brown coal should be replaced by 2023 (via gas or other)
- GHG emissions reductions expected as a result of building renovations and DH retrofitting

Recommended actions

- Investments in renewable heat generation facilities, the use of excess heat and reduction of temperature levels
- Integration of large HPs and heat storages
- Intensified electricity and heat sector coupling
- DH network planning supported by “heat mapping“ tools

https://keepwarmeurope.eu/countries-in-focus/slovenia/slovensko/
DHS Ptuj

- Location: Ptuj, Slovenia
- Operating since: 1975
- Ownership: community
- Grid: 5,990 m (owned by the DHS)
- Customers: 42
- Connected load: 24,8 MW
- Boiler output: 27 MW
- Type of DHS: hot water
- Current fuel: natural gas
- Potential renewables nearby: biomass, solar

For more information:
- www.keepwarmeurope.eu/country-pages/austria
- www.ligist.at/startseite/wirtschaft/heizgemeinschaft

Investment plans:
Optimisation of the biomass boiler and boiler house installation within next two years. In second phase is also planned to increase the grid and optimise it.

Source: Javne službe Ptuj, d.o.o.
Switch to biomass and optimisation of boiler and grid

Primary work-steps and investment drivers:
- Company (internal) development plan Municipal Local energy concept (LEK)
- Available incentives – Ministry of Infrastructure Co-financing of renewables for DHSs

Strategic background documents:
- NATIONAL ENERGY EFFICIENCY ACTION PLAN 2014–2020

Stakeholder involvement:
- Leading: Local decision makers, biomass suppliers
- Other: Costumers, Technology suppliers

Results:
- RES-share increase: before 0 % ⇒ after 80 %
- RES/fossil heat production ratio: 5/1
- Grid efficiency: increase of 3 %
- New connections: 2,500 MWh/Year
- Emissions: 1,515 tCO₂
- Payback period: 8-10 years

Required resources:
Financial investment: 1,538,824,88 EUR + 525,500 EUR
Additional staff: none – outsource
Other: outsourcing of services for documentation, design, etc

Want to adapt our work to your DHS? Want to invest in our progressive DHS? Contact us using the information below!

Franci Voglar/ Project manager
Franci.Voglar@jsp.si
DHS Slovenj Gradec

- Location: **Slovenj Gradec, Slovenia**
- Operating since: **1980**
- Ownership: **community**
- Grid: **7.958 m** (owned by the DHS)
- Customers: **170**
- Connected load: **21,2 MW**
- Boiler output: **17,4 MW** (2 boilers + CHP)
- Type of DHS: **hot water**
- Current fuel: **natural gas**
- Potential renewables nearby: **biomass**

**Investment plans:**
For the next year of operation, DHS SG plans to install a **new boiler system on biomass**, buffer tank system and logistic facilities;

For more information:
- [www.keepwarmeurope.eu/country-pages/austria](http://www.keepwarmeurope.eu/country-pages/austria)
- [www.ligist.at/startseite/wirtschaft/heizgemeinschaft](http://www.ligist.at/startseite/wirtschaft/heizgemeinschaft)
Modernisation and switch to biomass

Primary work-steps and investment drivers:
• Company (internal) development plan Municipal Local energy concept (LEK)
• Available incentives – Ministry of Infrastructure Co-financing of renewables for DHSs

Strategic background documents:
• NATIONAL ENERGY EFFICIENCY ACTION PLAN 2014–2020

Stakeholder involvement:
• Leading: Local decision makers, biomass suppliers
• Other: Costumers, Technology suppliers

Results:
• RES-share increase: before 0 % ⇒ after 75 %
• RES/fossil heat production ratio: 4/1
• Reduction of losses: 4-5 %
• Primary energy savings: 5 %
• Emissions: 3.000 tCO₂ p.a
• Payback period: 10-12 years

Required resources:
Financial investment: 2.500.000 EUR
Additional staff: one and outsourcing
Other: outsourcing of services for documentation, design, etc

Want to adapt our work to your DHS? Want to invest in our progressive DHS?
Contact us using the information below!

Sašo Mozgan/ consultant
Saso.mozgan@kssena.velenje.eu
DHS Velenje

- Location: Velenje, Slovenia
- Operating since: 1959
- Ownership: community
- Grid: 173 km (owned by the DHS)
- Customers: 11,776
- Connected load: 224 MW
- Boiler output: 600 MW (4 boilers)
- Type of DHS: steam
- Current fuel: coal - lignite
- Potential renewables nearby: solar energy, biomass, lakes

Investment plans: grid renovation and optimisation, digitalisation.

For more information:
- www.keepwarm europe.eu/country-pages/austria
- www.ligist.at/startseite/wirtschaft/heimgemeinschaft
Grid renovation and digitalisation

Primary work-steps and investment drivers:
- Company (internal) development plan
- Municipal Local energy concept (LEK)
- SEAP Velenje

Strategic background documents:
- NATIONAL ENERGY EFFICIENCY ACTION PLAN 2014–2020

Stakeholder involvement:
- Leading: Local decision makers,
- Other: Costumers, Technology suppliers

Results:
- Costumers: lowering connected power
- Reduction of losses: 0.3%
- Primary energy savings: 1,600 MWh p.a.
- Emissions: 784 tCO₂ p.a
- Payback period: 25 years

Required resources:
- Financial investment: 834,500 EUR
- Additional staff: not needed
- Other: outsourcing of services

Want to adapt our work to your DHS?
Want to invest in our progressive DHS?
Contact us using the information below!

Ervin Miklavžina / Head of department
Ervin.miklavzina@kpv.si
40% of Ukrainian citizens are served by DH, particularly in densely populated urban areas. DHSs are typically owned by municipalities and operated by municipal enterprises.

Challenges

• **Smart modernisation** of DHS is needed to increase efficiency
• Heat energy **demand decreasing**
• Significant **debt** levels and lack of **financial resources**
• **Third-party access** to DH networks
• Human resources **deficit**

Source: Pixabay

https://keepwarmeurope.eu/countries-in-focus/ukraine/english/
Framework & action

Trends
• The use of biomass for heating is growing
• Energy efficiency investment is increasing but needs to be accelerated

Policy stance
• Goal of 40% share of RES share in DH by 2030
• Measures to minimise natural gas usage and increase efficiency in DH and buildings
• Reducing GHGs emissions according to NDC

Investment subsidies covering:

<table>
<thead>
<tr>
<th>Item</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>New DHS / expansions of DHS</td>
<td>✗</td>
</tr>
<tr>
<td>DHS retrofits for EE / RES</td>
<td>✔ ✔</td>
</tr>
<tr>
<td>Consumers / connections</td>
<td>✔ ✔</td>
</tr>
<tr>
<td>Soft loans and other financing</td>
<td>✔</td>
</tr>
<tr>
<td>Tax incentives</td>
<td>✗</td>
</tr>
</tbody>
</table>

Recommended actions
• Approve a sector strategy on efficient DH and decarbonisation goals
• Develop a debt management plan
• Increase public investment in DH modernisation
• Support new business models

https://keepwarmeurope.eu/countries-in-focus/ukraine/ukrajinska/
DHS Bila Tserkva
(Municipal enterprise Bilotserkivteplomerezha)

- Location: Bila Tserkva, Ukraine
- Ownership: municipal
- Grid: 163 km (owned by the municipality)
- Customers: 1,370 buildings
- Connected load: 327 MW
- Boiler output: 419 MW (407 boilers)
- Type of DHS: hot water
- Current fuel: natural gas
- Potential renewables nearby: biomass

Investment plans (2020-2025):
Installation of new efficient natural gas boilers and 1 MW biomass boiler, replacement of pipelines, including 800 mm pipeline connecting DHS with the nearby CHP plant

For more information:
http://www.keepwarmeurope.eu/country-pages/ukraine/
Increased efficiency and security of heat supply

Primary investment drivers:
• network and equipment conditions
• energy security risks
• available financing sources

Strategic background documents:
• Sustainable Energy and Climate Action Plan of Bila Tserkva city up to 2030
• National energy efficiency, renewable energy and climate policy

Stakeholder involvement:
• Leading: Bila Tserkva city council
• Other: Bilotserkivska CHP, international financial organisations.

Results:
• RES heat increase: **20,624 GJ per year**
• Primary energy savings: **92,152 GJ per year**
• Emissions: **6,895 tonnes CO$_2$e per year or 6%**
• Internal rate of return: **5-18%** depending on the intervention and assumed natural gas prices

Required resources:
Financial investment:
**10.8 million EUR**
Other: equipment and materials, energy resources, incl. biomass

Want to support our modernisation projects?
Contact us using the information below!

• Mr. Vladyslav Bezukladnikov, Director
• bctm@magnus.kiev.ua
DHS Khmelnytskyi
(Municipal enterprise Pivdenno-zahidni teplomerezhi)

- Location: Khmelnytskyi, Ukraine
- Ownership: municipal
- Grid: 138 km (owned by the municipality)
- Customers: about 20,000
- Connected load: 96.75 MW
- Boiler output: 293.8 MW (43 boilers)
- Type of DHS: hot water
- Current fuel: natural gas
- Potential renewables nearby: biomass

Investment plans (2020-2025):
Construction of 5 MW biomass boiler, modernisation of boiler houses with new burners installation, replacement of pipelines and installation of individual heating units.

Source: DHS Khmelnytskyi web-site, pivzahteplo.com

For more information:
http://www.keepwarmeurope.eu/country-pages/ukraine/
Increasing biomass share and efficiency

Primary investment drivers:
• network and equipment conditions
• available financing sources

Strategic background documents:
• Sustainable Energy Action Plan of Khmelnytskyi city for 2016-2025
• National energy efficiency, renewable energy and climate policy

Stakeholder involvement:
• Leading: Khmelnytskyi city council
• Other: international financial organizations, customers, contractors

Results:
• RES heat increase: 44,823 GJ per year
• Primary energy savings: 24,188 GJ per year
• Emissions: $4,557$ tonnes $\text{CO}_2\text{e}$ per year or 10%
• Internal rate of return: 3-43% depending on intervention and assumed natural gas prices

Required resources:
Financial investment: 4.6 million EUR
Other: equipment and materials, energy resources, incl. biomass

Want to support our modernisation projects?
Contact us using the information below!

• Mr. Pavlo Vozborskyi, Director
• p.z.teplomerega@gmail.com
DHS Ternopil

(Municipal utility district heating company “Ternopilmiskteplokomunenergo” of Ternopil City Council)

- **Location:** Ternopil, Ukraine
- **Ownership:** municipal
- **Grid:** 152 km (owned by the municipality)
- **Customers:** over 42,000
- **Production:** 471,597 MWh (2018)
- **Boiler output:** 709 MW (137 boilers)
- **Type of DHS:** hot water
- **Current fuel:** natural gas
- **Potential renewables nearby:** biomass

**Investment plans** (2020-2025):
10 MW and 4 MW biomass boilers, modernisation of boiler houses, replacement of pipelines, and installation of individual heating units.

For more information:
http://www.keepwarmeurope.eu/country-pages/ukraine/
Increasing biomass share in heat supply

Primary investment drivers:
• Modernisation Program for the District Heating and Hot Water Supply System of Ternopil city for the period 2016-2020
• available financing sources

Strategic background documents:
• Sustainable Energy Action Plan of Ternopil city up to 2020
• National energy efficiency, renewable energy and climate policy

Stakeholder involvement:
• Leading: Ternopil city council
• Other: international financial organisations, customers, contractors

Required resources:
Financial investment: **4.9-6.9 million EUR**
Other: **equipment and materials, energy resources, incl. biomass**

Results:
• RES heat increase: **271,256 GJ per year**
• Emissions: **14,820 tonnes CO₂e per year or 12%**
• Internal rate of return: **13-54%** depending on the intervention and assumed natural gas prices

Want to support our modernisation projects?
Contact us using the information below!

• Mr. Andriy Chumak
• zvern.kptmtke@ukr.net
DHS Zhytomyr

Location: Zhytomyr, Ukraine
Ownership: municipal
Grid: 207 km (owned by the municipality)
Customers: 1,952 buildings
Production: 563,299 MWh (2017)
Boiler output: 789 MW (204 boilers)
Type of DHS: hot water
Current fuel: natural gas
Potential renewables nearby: biomass

Investment plans (2020-2025):
Biomass CHP unit with ORC technology, complex modernisation of network subsection, installation of new natural gas boilers, replacement of pipelines, and installation of individual heating units.

For more information:
http://www.keepwarm europe.eu/country-pages/ukraine/

Source: DHS Zhytomyr web-site, tke.org.ua
Complex modernization and switching to biomass

Primary investment drivers:
- Internal development plans
- Network and equipment conditions
- Available financing sources

Strategic background documents:
- Sustainable Energy Action Plan of Zhytomyr city for 2015-2024
- National energy efficiency, renewable energy and climate policy

Stakeholder involvement:
- Leading: Zhytomyr city council
- Other: international financial organisations, customers, contractors

Required resources:
Financial investment: 9.8 million EUR
Other: equipment and materials, energy resources, incl. biomass

Results:
- RES heat increase: 158,909 GJ per year
- Primary energy savings: 101,322 GJ per year
- Emissions: 17,472 tonnes CO$_2$e per year or 13%
- Internal rate of return: 7-32% depending on intervention and assumed natural gas prices

Want to support our modernisation projects?
Contact us using the information below!

- Mr. Dmytro Rogozhyn, Director
- teplo@teplo.net.zt.ua
Now that you have discovered our front-running DHSs all across the CEE region, we hope that they have inspired you to replicate their successes for your own DHSs, as well as set up effective policy frameworks to support them further and inject investments into their bankable DH projects.

To facilitate your next steps, please keep reading the remaining few pages to see how we can help you to KeepWarm.
Keep learning with KeepWarm

In order to help you on your way, you are highly recommended to explore further the KeepWarm website, including its Learning Centre with numerous resources from KeepWarm and many other related projects and EU-led initiatives, not to mention our latest news. In particular, you can discover numerous guidebooks, tools and other useful materials to help you on your way to modernising DHSs:

– case studies of DH retrofits and sustainable-energy upgrades
– spatial mapping about heat supply and demand across Europe
– free-to use thermal planning software
– policy recommendations
– insights into finance and technical assistance
– Inspire Events, many of which are now being done online...

... and much more!
Keep going with KeepWarm

Finally, it is worth highlighting that the KeepWarm consortium is especially well-suited to use its competence to help you achieve your DH goals! Our diverse group of experts can apply our great experience all across Europe, especially in countries of the CEE region.

Contact us (centrally or via links on the next pages) so we can know how our expertise can benefit your work towards making your DH more efficient and sustainable:

- Technical consultancy
- Feasibility studies
- Financial guidance
- Strategic action-planning
- Policy/market integration
- Staff/stakeholder trainings
- General advice

... and much more!
International project partners

Czech Republic

Austria

Slovenia

Croatia

Latvia

Ukraine

Serbia

Croatia

Slovenia

Austria

Latvia

Ukraine

Serbia
For more information:

visit our website
www.KeepWarmEurope.eu
contact us at:
info@keepwarmeurope.eu
or at:
keepwarmeurope.eu/contact
follow us on Twitter:
@KeepWarm_EU