DISTRICT HEATING AND 4DH IN CENTRAL AND EASTERN EUROPE

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Introduction

- DH is legacy of centralized economic planning
- Traditionally most important source of heat for space heating in highly populated urban areas
- Necessary modernisation of district heating systems
- Main problems:
  - inefficient heat production, often boilers, not CHP
  - declining sales due to competition
  - heat losses in production, distribution and end-use which are higher compared to Western Europe
Introduction

- Other problems:
  - high thermal and combined power plant O&M costs
  - Revenues (cost of heat for consumer) are under national tariff regulations which often give incentives to high-carbon heating methods instead of district heating
  - social problems and “energy poverty” (difficulty in paying the bills)
  - future existing district heating networks in CEE could be expanded and changed gradually towards more efficient systems such as 3\textsuperscript{rd} or even 4\textsuperscript{th} generation district heating systems
Status of district heating in Eastern Europe

- District heating services are provided by utility companies via large networks supplied by large centralized heat sources.
- They were used during past decades to distribute heat to urban population using relatively cheap fuels.
- Largest district heating systems in Russia (about 1700 TWh), Poland (just under 100 TWh) and Ukraine (just under 200 TWh).

![Number of DH users graph]

- Albania: 7.37 mil
- Bosnia and Herzegovina: no data
- Bulgaria: 200000
- Croatia: 400000
- Czech Republic: 600000
- Estonia: no data
- Greece: no data
- Hungary: no data
- Kosovo: no data
- Latvia: no data
- Lithuania: no data
- Macedonia: no data
- Moldova: no data
- Montenegro: no data
- Poland: 5.3 mil
- Romania: no data
- Russia: no data
- Slovakia: no data
- Slovenia: no data
- Serbia: no data
- Ukraine: no data
Status of district heating in Eastern Europe

DH network length (km)

- Ukraine: 35830 km
- Poland: 176512 km
- Croatia: 0 km
- Czech Republic: 0 km
- Estonia: no data
- Greece: no data

Number of DH systems

- Ukraine: 8250 systems
- Poland: 50000 systems
- Croatia: no data
- Czech Republic: no data
- Estonia: no data
- Greece: no data

Other countries have either no data or are not listed in the diagram.
Status of district heating in Eastern Europe

Share of different fuels in the DH

- Natural gas
- Coal
- Petroleum and petroleum products
- Renewable energy sources
- Others
Status of district heating in Eastern Europe

Share of natural gas in DH

Belarus 100%
Ukraine 90%
Romania 80%
Bulgaria 70%
Macedonia
Bosnia Herzegovina
Croatia
Czech Republic 60%
Estonia 50%
Greece 40%
Hungary
Latvia 30%
Lithuania
Moldova 20%
Poland
Russia
Slovakia 10%
Slovenia
Serbia
Status of district heating in Eastern Europe

Share of DH in household and commercial heating demand

Source: IEA, statistics
http://www.iea.org/statistics
Status of district heating in Eastern Europe

https://www.euroheat.org/
Residential heat supplied by DH

- Falling due to increase in energy efficiency, but also due to competition from natural gas
- Romania lost most of DH
Residential DH share

- Falling due to competition from natural gas
- Romania lost most of DH to gas
How Romania lost DH?

- DH was municipal ownership
- -> Clientilistic employment in DH
- -> Cost balloons
- National gas monopoly steps in and offers to finance conversion to gas
- Nearly 90% of DH network was lost
Gas prices for household consumers (taxes included), second half 2017

Source: Eurostat (online data codes: nrg_pc_202)
Status of district heating in Eastern Europe – Belarus example

- 70% of the population is served by district heating where the network capacity is high enough to provide thermal energy to almost all the inhabitants of cities.

- Problems:
  - High share of thermal energy generated by using natural gas imported from Russia, 80%.
  - State monopoly for the production and distribution of thermal energy.
  - The Ministry of Economics establishes the same tariffs for heating, cold and hot water for all regions, independent of the kind of equipment and fuel used for the generation of thermal energy.

- The CHP development in Belarus between 2010 and 2015 had a significant impact on the increase of electricity and thermal energy generation.

- In Belarus 89.8% of the urban housing stock are covered by DH system and 38.3% of rural housing stock are covered by DH system.
# Main characteristics of DH systems in Eastern Europe

- inefficient heat production
- high emissions
- fossil fuel dependence
- declining sales
- old technology
- poor maintenance
- worn out equipment
- over dimensioned systems
- lack of controls
- insufficient insulation on heat pipelines

## COMPARISON OF PERFORMANCE INDICATORS FOR DISTRICT HEATING DISTRIBUTION SYSTEMS

<table>
<thead>
<tr>
<th></th>
<th>Unit</th>
<th>CEE and former Soviet Union</th>
<th>Western Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer heat consumption (annual energy use/space heated)</td>
<td>kWh/m³</td>
<td>70-90</td>
<td>45-50</td>
</tr>
<tr>
<td>Distribution losses</td>
<td>% of heat supply</td>
<td>15-25</td>
<td>5-10</td>
</tr>
<tr>
<td>Change of circulation water (annual make-up/water volume/network water volume)</td>
<td>Refills per year</td>
<td>10-30</td>
<td>1-5</td>
</tr>
<tr>
<td>Production losses</td>
<td>% of fuel energy</td>
<td>15-40</td>
<td>5-15</td>
</tr>
</tbody>
</table>
Key challenges of DH systems in Eastern Europe

Unnecessary costs due to:
- heat losses
- inefficiency
- excess capacity

Tariffs below costs

Lack of customer focus

Financial problems

Poor and deteriorating service quality

Decreasing competitiveness

Decreasing revenue

Uneven playing field

Increasing tariffs

Lack of control and metering equipment

Non-existent or poorly designed heat policies
Weak or lacking legal and regulatory framework

Non-payment

Poor management
Use of locally available fuels in DH systems

Heat capacity of RES in DH systems [MW]

- Ukraine
- Serbia
- Slovenia
- Slovakia
- Russia
- Romania
- Poland
- Montenegro
- Macedonia
- Lithuania
- Latvia
- Hungary
- Greece
- Estonia
- Czech Republic
- Croatia
- Bulgaria
- Bosnia and Herzegovina
- Belarus

- Installed biomass
- Planned biomass
- Installed geothermal
- Planned geothermal
- Installed solar
- Installed waste
- Planned waste
Geothermal heating potential
## Solar DH in CEE

<table>
<thead>
<tr>
<th>Plant</th>
<th>Operation start</th>
<th>Owner</th>
<th>Country</th>
<th>City</th>
<th>Apert. area in m²</th>
<th>Capacity in kWth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incel</td>
<td>2009</td>
<td>Municipality Banja Luka</td>
<td>Bosnia and Herzegovina</td>
<td>Banja Luka</td>
<td>1030</td>
<td>721</td>
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<tr>
<td>Aldemar (Cretan Village)</td>
<td>2000</td>
<td>Sarantis S.A.</td>
<td>Greece</td>
<td>Aldemar</td>
<td>2785</td>
<td>1950</td>
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<tr>
<td>Sarantis</td>
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<td>Greece</td>
<td>Sarantis</td>
<td>2700</td>
<td>1890</td>
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<td>Greta Candia Maris</td>
<td>2002</td>
<td>Sarantis S.A.</td>
<td>Greece</td>
<td>Greta Candia Maris</td>
<td>2538</td>
<td>1777</td>
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<tr>
<td>Rodos Place</td>
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<td>Rodos Place</td>
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<td>781</td>
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<tr>
<td>Gomfoi</td>
<td>1999</td>
<td>Tyras S.A.</td>
<td>Greece</td>
<td>Gomfoi</td>
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<td>728</td>
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<tr>
<td>Budva</td>
<td>2014</td>
<td>Budvanska Riviera</td>
<td>Montenegro</td>
<td>Budva</td>
<td>1770</td>
<td>1200</td>
</tr>
<tr>
<td>Łódź</td>
<td>2008</td>
<td>SM Radogoszcz</td>
<td>Poland</td>
<td>Łódź</td>
<td>7368</td>
<td>5100</td>
</tr>
<tr>
<td>Zamość</td>
<td>2012</td>
<td>SM im. Jana Zamoyskiego</td>
<td>Poland</td>
<td>Zamość</td>
<td>2500</td>
<td>1750</td>
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<tr>
<td>Goldap</td>
<td>2011</td>
<td>Sarantis S.A.</td>
<td>Poland</td>
<td>Goldap</td>
<td>2140</td>
<td>1500</td>
</tr>
<tr>
<td>Częstochowa</td>
<td>2006</td>
<td>WSzS w Częstochowice</td>
<td>Poland</td>
<td>Częstochowa</td>
<td>1500</td>
<td>1050</td>
</tr>
<tr>
<td>Poddębice</td>
<td>2004</td>
<td>Gmina Poddębice</td>
<td>Poland</td>
<td>Poddębice</td>
<td>1287</td>
<td>901</td>
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<tr>
<td>Bartoszyce</td>
<td>2012</td>
<td>Szpital Powiatowy</td>
<td>Poland</td>
<td>Bartoszyce</td>
<td>1100</td>
<td>770</td>
</tr>
</tbody>
</table>
Use of heat storage and waste

- MSW heating plants are not so common in Eastern Europe, with few examples in:
  - Czechia (Prague, Brno, Liberec)
  - Estonia
  - Hungary
  - Lithuania
  - Slovenia

- Lock-in effect?

- Heat storage is not commonly used in the district heating systems in EE, but arriving – barriers to implementation
Wind share in electricity demand 2017

Romania – 13%
EU – 12%
Lithuania – 11%
Estonia, Poland – 9%
Greece – 8%
Croatia – 7%
Bulgaria – 4%
Hungary, Latvia, Macedonia, Norway – 2%
Czechia, Ukraine – 1%
National perspectives for DH systems in Central and Eastern Europe

- DH systems are supported in national energy plans, strategies and recommendations, but ...
- Decarbonisation of heating – EU top down legislation probably needed
- Why not RES-gas targets?
- Why not taxing unused excess heat
- Proper gas pricing, too high wholesale, too low retail
- Why not go Dutch and ban gas?
Conclusion

- Ageing of energy generation infrastructure requires large investments in rehabilitation of existing district heating systems
- Low DH efficiency and high emissions
- Negative media coverage
- Customer dissatisfaction with heat distribution systems which reduces total heat demand from DH systems and revenue
- Biomass is the most ready for district heating, while readiness of geothermal and solar energy is limited
- Natural gas better organised competitor using hidden subsidies
- Orientation to local resources leads to job creation in local communities
Thank you for your attention!

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