Potential of district heating systems in Eastern Europe

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Status of DH systems in Eastern Europe

- DH present in all larger urban areas in EEC
  - Russia - 91% of all buildings in large cities and 60% in smaller towns
  - Heat provided by utility companies via huge networks supplied by large centralized heat sources

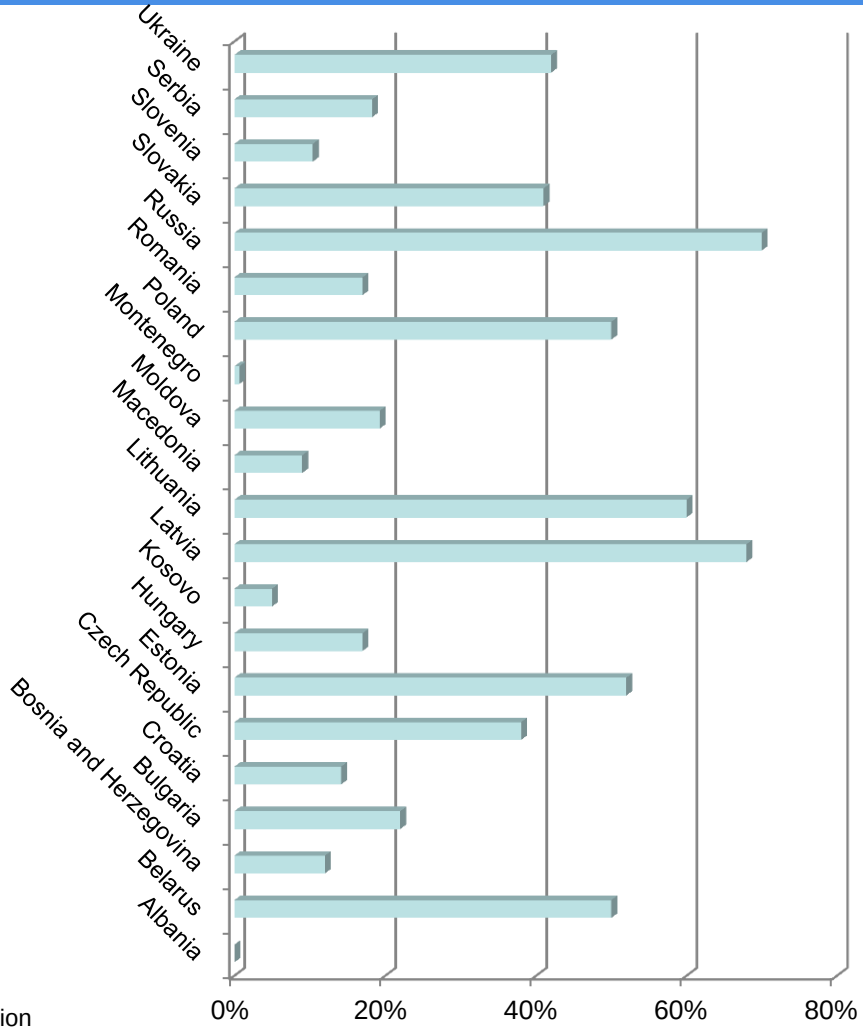


Figure: Share of district heating in final heat consumption

Status of DH systems in Eastern Europe

- Old and inefficient technology
  - High production and distribution losses
  - Poor maintenance
- Low environmental standards
- High operating and maintenance costs
  - Exceeds revenue → no economic interest to invest in DH system modernisation
  - Inadequate management and lack of investments
- Decrease in heat demand
  - Lack of customer satisfaction
  - Economical, political and social changes
- Lack of national regulations and policies
- Social problems
  - Difficulty in paying the bills

Source: Iacobescu, F., Badescu, V., Metamorphoses of cogeneration-based district heating in Romania: A case study, (2011)

Status of DH systems in Eastern Europe

- Fuels
  - Most common: natural gas, heavy oil and coal
  - Nuclear – Russia, Ukraine, Hungary, Bulgaria, Czech Republic and Slovakia
  - RES → slowly increasing their share

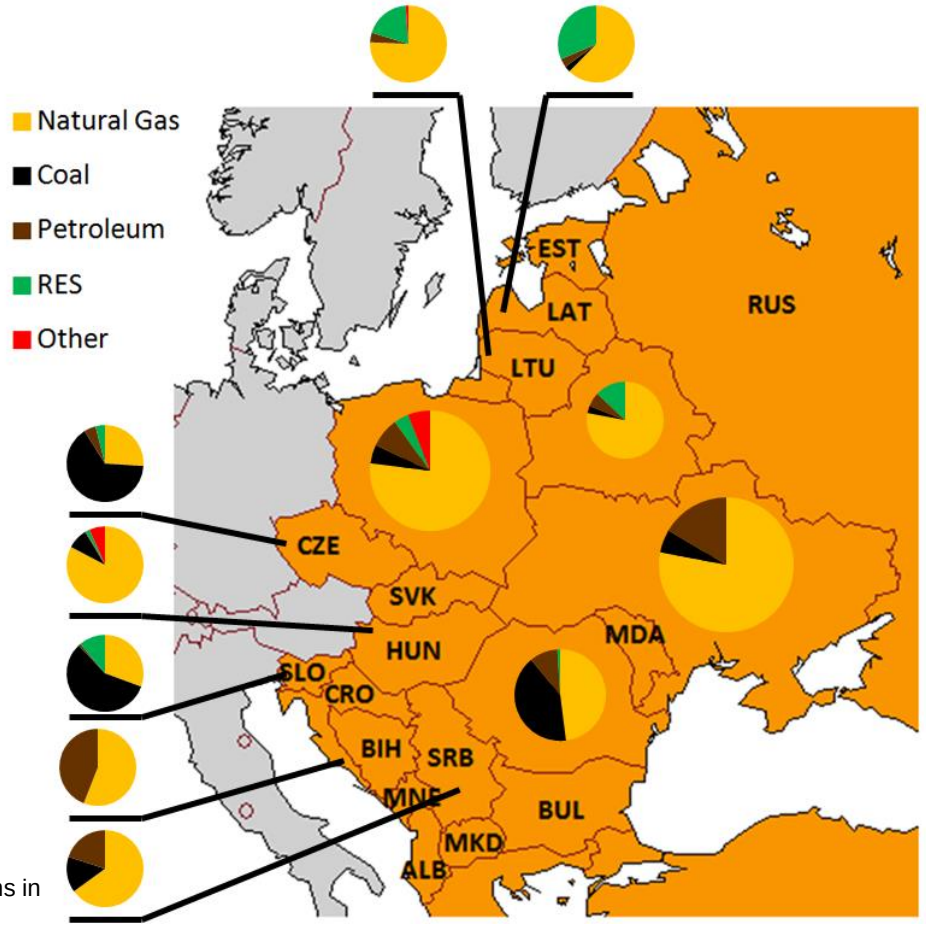


Figure: Share of different energy sources used in district heating systems in Eastern European countries

Status of RES in Eastern European DH systems

- Biomass DH systems
  - More than 20 biomass DH systems in operation (mostly EU members)
- Geothermal DH systems
  - More extensively used only in Hungary and Poland
- Solar DH systems
  - Solar potential is underused
- Municipal waste DH systems
  - Potential of municipal waste systems is underused
    - Installed in Czech Republic, Slovakia, Poland and Hungary

Source: Kurti, Armond: Geothermal District Heating in a Part of Elbasan City, Albania

Status of RES in Eastern European DH systems

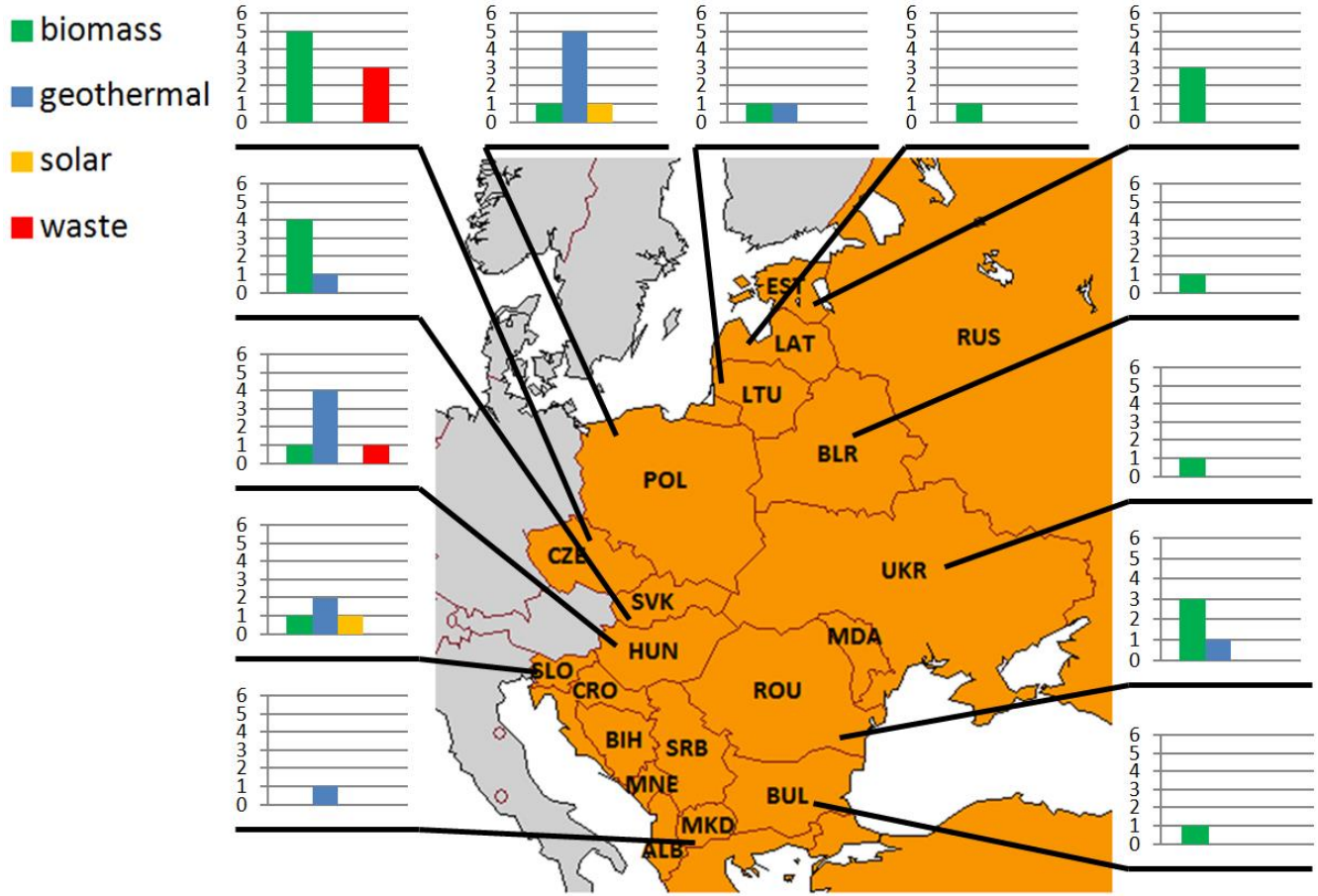
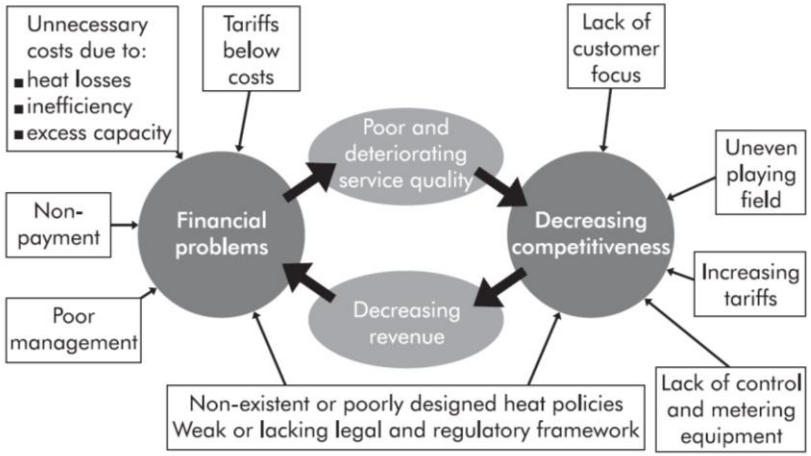


Figure: Number of operational RES based DH systems in EEC

Key challenges

- Policy measures
  - Bureaucratic problems
  - Efforts to improve status of DH systems are being done without critical technical and economical research
- Future energy demands
  - Political, social and economic reform in EEC → heat load stagnation or decrease
- Competition and market saturation
  - In some EEC DH already has high share in fulfilling household needs for heat in large cities → market is becoming saturated
  - New buildings → high energy efficient → not attractive for DH system implementation



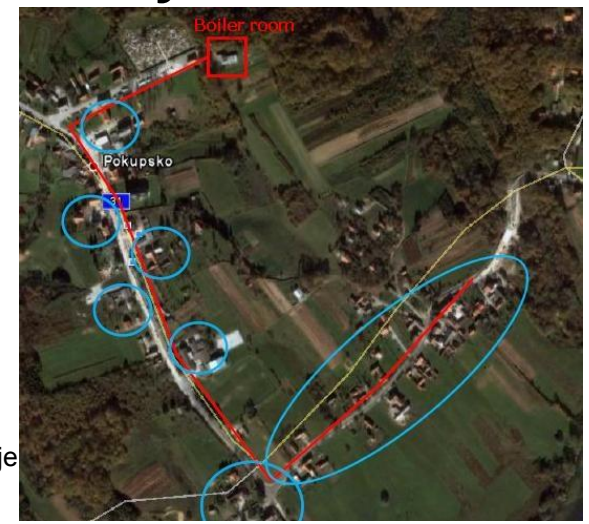
Source: IEA/OECD, 'Coming in from the Cold – Improving District Heating Policy in Transition Economies', (2004).

Key challenges

- Technical quality of DH systems
  - Technical characteristics of DH systems in EEC
    - Low heat production efficiency
    - High heat production costs
    - High transmission losses
    - Oversized network coverage
    - Lack of heat production and utilisation control (technical rigidity)
    - Irregular peak service
    - Non-designed operation parameters due to low heat demand

Potential of DHS in a small community in Croatia

- Topusko district heating system
  - Population – around 2500
  - Great biomass potential
  - DHS for heating and hot water purposes
  - No heavy industry
    - No requirements for high temperature water or steam
  - Maximum heat load – 1850 kW



Source: Source: Šegon, Velimir; Područno grijanje na biomasu

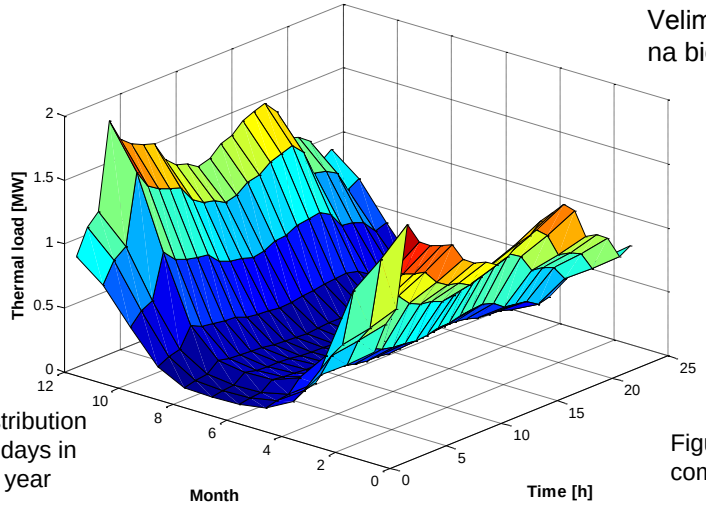


Figure: Heat load distribution during characteristic days in different months of a year

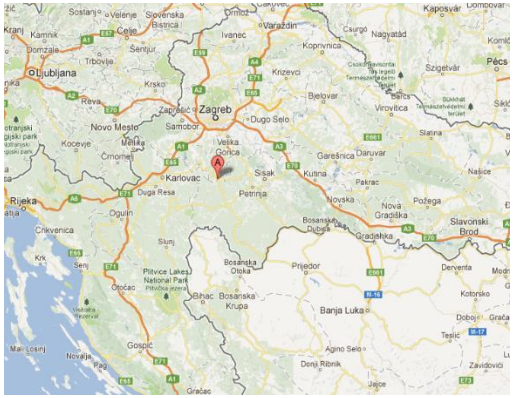


Figure: Location of Topusko community

Potential of DHS in a small community in Croatia

- Different DH technologies have been analysed
- Optimisation algorithms have been developed in order to find optimal system configuration

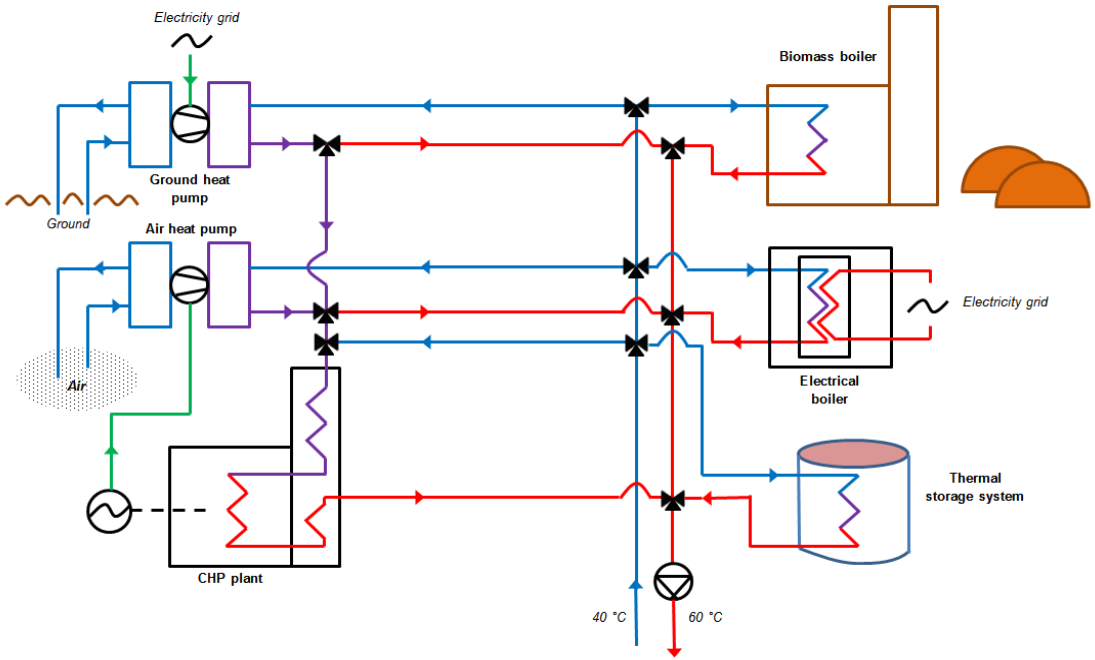


Figure: Proposed DHS for Topusko

Optimal DHS configuration

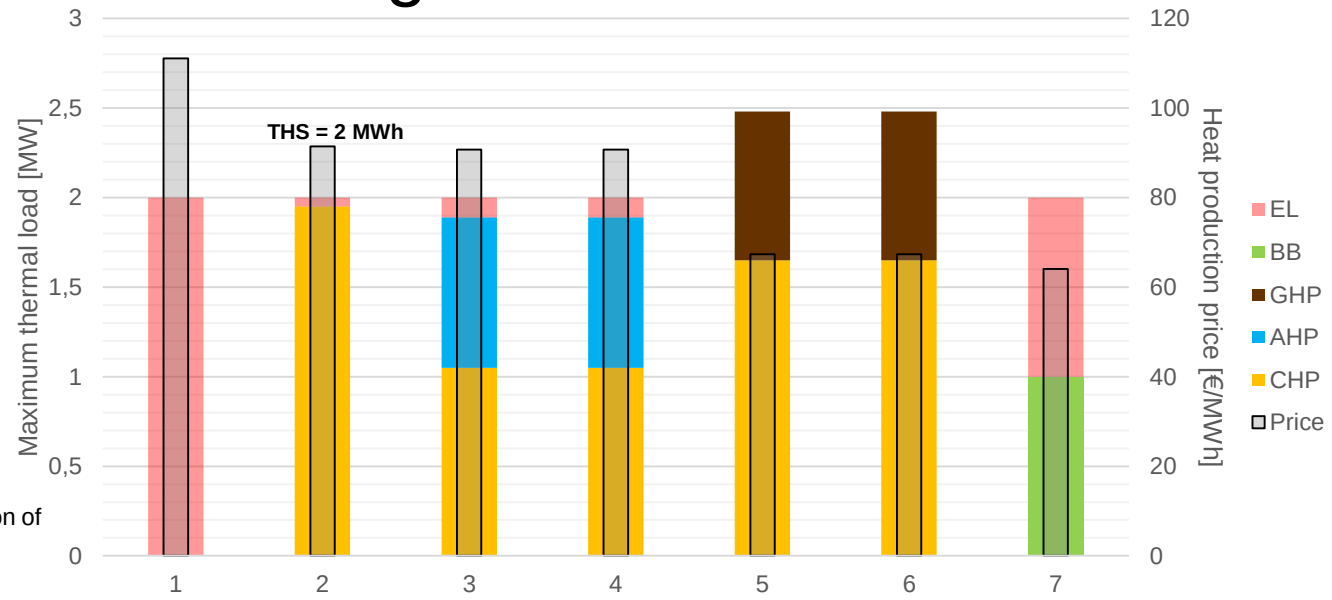


Figure: Optimal configuration of DHS and related heat production prices

Available technologies	Cogeneration plant (CHP)	Air heat pump (AHP)	Ground heat pump (GHP)	Biomass boiler (BB)	Electrical boiler (EL)	Thermal heat storage (THS)
Case 1	-	-	-	-	√	-
Case 2	√	-	-	-	√	√
Case 3	√	√	-	-	√	-
Case 4	√	√	-	-	√	√
Case 5	√	-	√	-	√	-
Case 6	√	-	√	-	√	√
Case 7	√	√	√	√	√	√

Conclusion

- DH in EEC
  - Ageing of energy system infrastructure
  - Requires large investments in rehabilitation of existing district heating systems
  - High potential in locally available renewable energy sources (biomass, geothermal energy and municipal solid waste DH systems)
    - Decreased heat production costs
    - Decreased dependence on imported fossil fuels
    - Job creation in local communities
  - Potential of new technologies in DH systems
    - Thermal storage, low-temperature DH systems, hybrid DH systems and gasification processes

Thank you for your attention!

Any questions?