Investing in energy efficiency in buildings with district heating

Cohesion Policy – Investing in energy efficiency in buildings

SERGIO TIRADO HERRERO
DIANA URGE-VORSATZ

Central European University (CEU)
Department of Environmental Sciences and Policy
Center for Climate Change and Sustainable Energy Policy
Diverging perspectives in an evolving EU

A CLEAN, EFFICIENT, CHEAP TECHNOLOGY

- **Up-to-date** heat production plants and distribution systems
- **Cogeneration** and renewables (e.g., biomass)
- **Lower costs** per kWh
- **Lower GHG emissions**
- **Low-carbon solution** promoted in Member States with potential (e.g., UK)

Spittelauer DH plant (Vienna) / Source: [www.hundertwasser.at](http://www.hundertwasser.at)
Diverging perspectives in an evolving EU

AN UNDESIRABLE LEGACY

- Less cogeneration, sometimes heat-only plants based on polluting fuels (e.g., coal, Poland)
- Obsolete distribution systems inefficient and building stock
- Inadequate metering
- Inflexible flat rates
- Cost burden

Diverging perspectives in an evolving EU

AN INDUSTRY WITH AN UNCERTAIN FUTURE?

Directive 2010/31/EU on the energy performance of buildings (EPBD)
The paper

• **Aim**
  - Explore **key issues for successful investments**
  - Raise questions about the **future of the DH sector**

• **Scope**
  - Focus on **residential buildings in Central and Eastern Europe (CEE); discussion relevant to other contexts**

• **Research questions**
  - What **cost burden** imposes on consumers?
  - How **deep** to retrofit?
  - Reasons for **public sector involvement**?
  - Are **technical solutions** enough?
  - What is the **future of DH** in a low-energy buildings’ EU?
A cost burden on consumers
Per unit price of DH vs. other heat sources in Western Europe

GERMANY

Figure 3: German development of specific full costs in Euro per MWh

Source: Euroheat and Power (2011)
A cost burden on consumers
Per unit price of DH vs. other heat sources in Western Europe

Figure 4: Energy Price Index Austria

Source: Euroheat and Power (2011)
A cost burden on consumers
Actual DH costs in Central and Eastern Europe

Annual domestic heating costs (€ per year, 2009)

Average size of the dwelling (sqm.)

HUNGARY

The inherited legacy

VERTICAL LOOP – ONE PIPE SYSTEM

- Lack of individual metering nor temperature control
- Inability to disconnect individual apartments
- No fuel poverty-related health impacts, i.e., excess winter mortality and morbidity

Source: Sigmond (2009)
A hidden fuel poverty type

Effects on welfare

Decreased consumption of other domestic goods and services

30% of the Hungarian households living in panel buildings spend more on energy than on food and non-alc. beverages

Source: Tirado Herrero and Urge-Vosatz (2011)
A *hidden* fuel poverty type

The average debt level is about 16.5% in 2009

**LITHUANIA**

- In Budapest III, indebtedness to DH companies is often so high that it cannot be managed by the municipality's debt relief services.
- In Lithuania, over 15% of all DH users are indebted to heat providers (2000-2010).
- Affects the performance of DH companies.
- Maintenance and upgrading of the network.
- Potential wider economic effects.

- In Romania, reducing DH debts became a condition for IMF lending.

**Central European University**
How deep to go?
Deep and mid retrofits of prefab panel buildings in Hungary

Private costs vs. benefits
Additional argument for deep retrofits

The lock-in risk

![Graph showing total space heating energy use (TWh/year) from 2010 to 2080. The graph compares BASE, MID, and DEEP scenarios. The DEEP scenario shows a significant reduction in energy use by 2050, with a 58% lock-in risk indicated by a blue arrow.]
Arguments for public sector involvement

- **Barriers** to energy efficiency investments
  - Shared ownership of buildings with DH
  - Transaction costs

- **Social benefits** of energy efficiency investments
  - Avoided **GHG emissions** ($CO_2$, $CH_4$ and $N_2O$)
  - Avoided **non-GHG emissions** ($NO_x$, $SO_x$, PM)
    - External cost of emission of pollutants: NewExt project
Social cost-benefit analysis

Costs and benefits (MEUR2010 per year)

- Total investment costs
- Total energy savings
- Total CO2 avoided
- Total SOx emissions avoided
- Total NOx emissions avoided
- Total PM emissions avoided
- Total benefits

Difference between energy saving benefits and external benefits
Additional co-benefits

• Net employment creation
  - In HU and PL, tens to hundreds of thousands additional employments have been forecasted for deep retrofits (Tirado Herrero et al., 2011)

• Reduced energy dependency

• Fiscal effects
  - Increased government revenues (i.e., income tax and VAT) and reduced unemp. & social expenses

• Increased market value of properties
  - +12% premium for A-labeled properties in Holland (Brounen and Kok, 2010)
Are technical solutions enough?
Large fixed costs and structure of DH tariffs

Variable costs
- fuel

Fixed costs
- capital
- maintenance
- labour
Are technical solutions enough?

Large fixed costs and structure of DH tariffs

Large positive NPV from 2040 onwards
Are technical solutions enough?

Large fixed costs and structure of DH tariffs

NPV @ 4% discount rate (MEUR2010)

% of energy savings realized as household heating costs reduction

80%
70%
60%
50%
40%

Time horizon (years)

0 10 20 30 40 50 60 70

(1,500)
(1,000)
(500)
0

Negative net present values

BASE to DEEP
Are technical solutions enough?
Improving the conditions under which DH is served

• Individual meter-based billing
  – Incentive to save energy at household level
  – Conventional fuel poverty effects, i.e., inadequate thermal comfort levels

• Competition between heat sources
  – Lower prices
  – Household’s right to disconnect and switch

• Independent, capable regulators

Source: OECD/IEA (2004); Tirado Herrero and Urge-Vosatz (2011)
The future role of DH in a low energy buildings’ EU

• (?) Economic viability of the DH sector when low or nearly zero energy buildings become the norm
  - Fixed costs and obligation to remain connected

• Denmark
  - “Some of the houses being built today are so well insulated and energy efficient that it is not worth connecting them to district heat” (DAE, 2005)

• Norway
  - The obligation to remain connected to DH networks is a barrier to low-energy residential buildings (Thyholt and Hestnes, 2008)
Conclusions

• **Cost burden** (in CEE Member States)
• **Deep retrofit** of buildings with DH
  – Maximizes energy and carbon savings, co-benefits
• **Sub-sector specific obstacles**
  – Fixed costs, rigid tariff system
• **Improved conditions** for DH provision
  – Individual billing, competition, right to disconnect
• **Uncertain future** of the DH sector
  – Economic and labour implications
  • **EXIT STRATEGY** for the DH industry
THANK YOU!

http://3csep.ceu.hu/
3csep@ceu.hu