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Risk assessment of industrial heat recoveries in district heating systems

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Session:
Future district heating production and systems
Risk assessment of industrial heat recoveries in district heating systems

Outline of presentation
1) Problem and questions of research
2) Waste heat recovery potential
3) Known barriers to waste heat recovery
4) The Swedish experience
5) Concluding remarks
1. Problem and questions of research

Problem:
Why is the potential for waste heat recovery investments not fully exploited?

Questions of research:
(1) Are waste heat recovery investments viable?
(2) What risk factors are associated with the investments?
2. Waste heat recovery potential

There is approximately 2600-2700 PJ/year industrial waste heat available*
*Corresponds to approximately 5% of the final energy consumption in the EU

In Sweden 15.5 PJ were recovered**
**Corresponds to 10% of the final energy consumed

*Persson et al. 2017 (Heat Roadmap Europe 4) and Miró et al. 2015
**Statistics Sweden 2015
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3. Known barriers to waste heat recovery

- No district heating adjacent to the waste heat source

- The investment is not cost efficient
  - pipeline
  - advanced technological solution
  - low temperature of the waste heat

- Policy implications
  - competes with CHP (biofuels) and waste incineration
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3. Known barriers to waste heat recovery (continued)

- The value of the investment is uncertain
  - limited investment capital
  - what should the price of the heat be?
- Partnership
  - the district heating company depends on heat deliveries
  - transparency and trust must be built
- Risk assessment
  - the risk of the waste heat provider going out of business is valued higher than the benefits of doing the investment
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4. The Swedish experience

- 1974-2014
- 107 industrial heat deliveries (1786 operation years)

Source:

Swedish DH association
Statistics Sweden
Swedish Energy Market Inspectorate
Personal interviews, research articles and articles in newspapers and trade magazines

Low temperature industrial heat recoveries have been included with the corresponding electricity input
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4. The Swedish experience (continued)

Increasing volumes
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4. The Swedish experience (continued)

Long co-operations (average number of operation years 18; 13)
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4. The Swedish experience (continued)

Large co-operations are viable (average heat delivery of 17 PJ; 3 PJ)
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4. The Swedish experience (continued)

Co-operations take place in expected industries

![Graph showing annual average heat recovery in PJ for different industries. The graph compares terminated before 2014 vs still in operation during 2014.](image-url)
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4. The Swedish experience (continued)

The risk of the industry closing down is 13 %– 20 %

33 out of 107 co-operations have been terminated

-14: industrial close-down
-11: heat substitutes
-2: technical issues
-6: unknown
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4. The Swedish experience (continued)

Heat pump co-operations are more scarce and more risky

-19 locations (18%)

-73% of the heat pump co-operations are no longer in use in 2014 (in contrast with 77% of the non-heat pump co-operations)

-The volumes of heat pump co-operations are low (average heat delivery is 1.1 PJ compared to 16.1 PJ for co-operations still in use 2014)

The inclusion of electricity increases the risk of the investment
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5. Concluding Remarks

(1) Are waste heat recovery investments viable? YES
   - Investments are paid back (+ 4 to 8 years)
   - The risk of the waste heat source going out of business is between 13-20 
     Lower prices
     Less fixed capital

(2) What risk factors are associated with the investments?
   - Size is a risk factor
   - Temperature level of waste heat is a risk factor
   - Industry is not a risk factor
     New business logic; partnership
5. Concluding Remarks

...why is the potential of waste heat recovery investments underutilized?

• Contradictive policies

• Implement a new business logic (partnership)

• Potential errors in the investment calculation (making the NPV negative)
  - Large volumes should have a lower risk premium than small
  - The risk of “going out of business” is exaggerated
  - The foreseen electricity price is too low (heat pumps)
  - The alternative usage of capital is not valued
  - The competitive advantage of lower price is not valued
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THANK YOU FOR YOUR ATTENTION

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www.4dh.eu    www.reinvestproject.eu    www.heatroadmap.eu
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QUESTIONS?

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