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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

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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?

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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

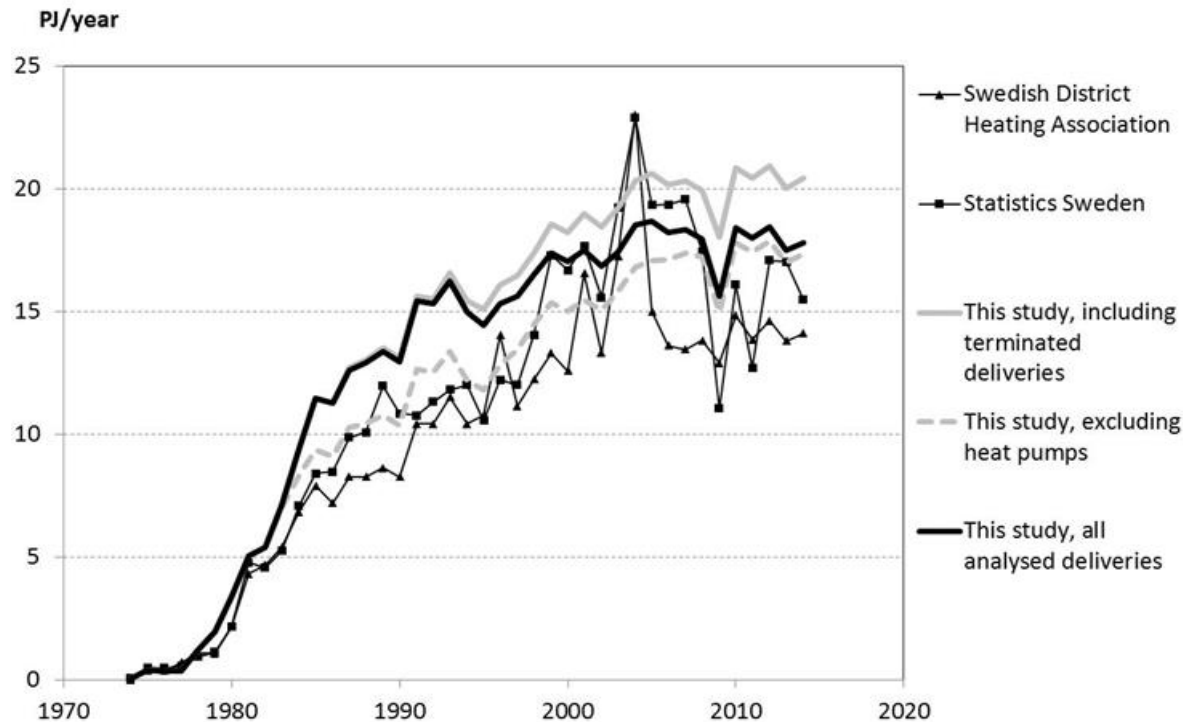
Low temperature industrial heat recoveries have been included with the corresponding electricity input

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4. The Swedish experience (continued)

Increasing volumes

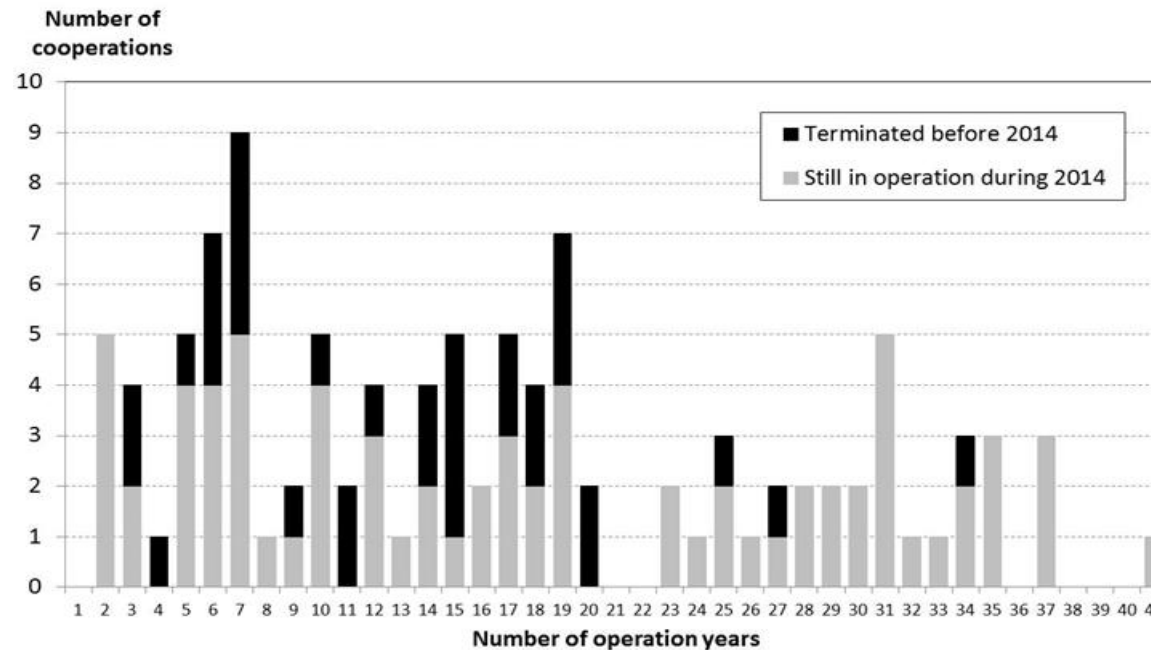


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4. The Swedish experience (continued)

Long co-operations (average number of operation years 18; 13)

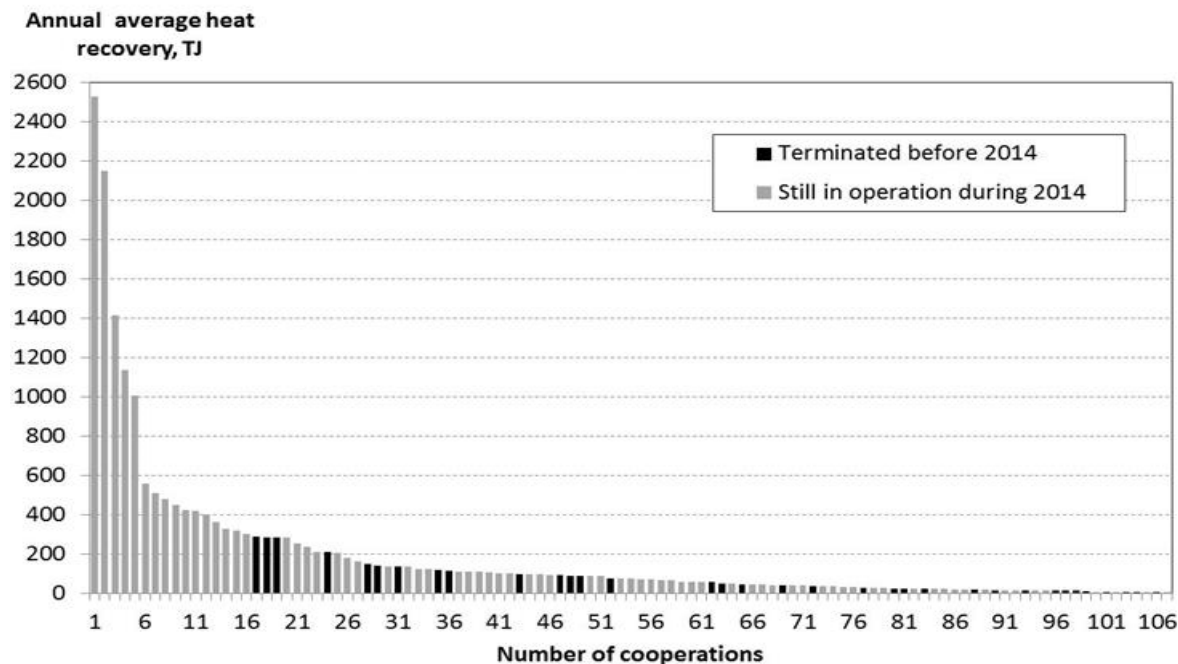


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4. The Swedish experience (continued)

Large co-operations are viable (average heat delivery of 17 PJ; 3 PJ)

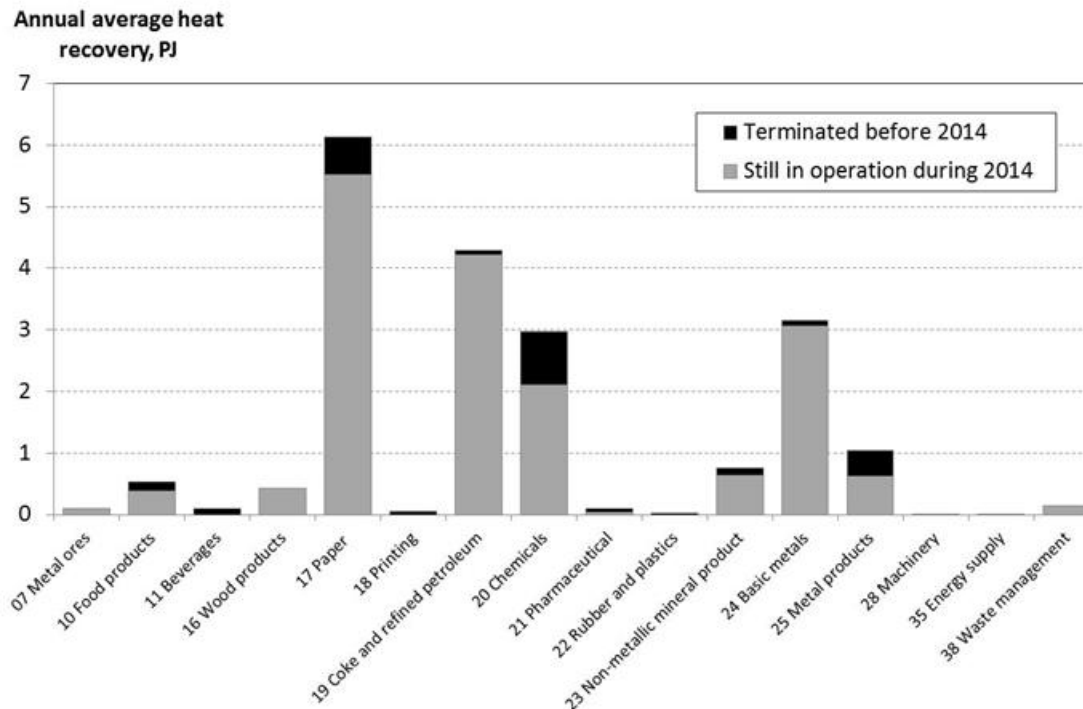


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4. The Swedish experience (continued)

Co-operations take place in expected industries



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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

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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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QUESTIONS?

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