Business models for improving energy efficiency

The use of low-grade industrial waste heat in China’s district heating system
Objective

Develop a strategy for improving the energy efficiency of China’s district heating systems

- **Scope:** Industry, buildings and heat utilities
- **Drivers:** Local air pollution, increasing heating costs, potential of industrial waste heat, and heat market reform
- **Outcomes:** Business models and policy to enable the commoditisation of industrial waste heat
Project Context

- China has the world’s largest district heating system, providing a social welfare service.
- Heating services in China primarily rely on coal.
- Industry accounts for $\frac{3}{3}$ of total primary energy consumption in China.
- Industrial surplus heat could represent 30% of industrial consumption.
Business models for district heating system efficiency

Opportunity

- Low-grade surplus heat from industry and CHP in Northern China is estimated to be:
  - 3.0 billion GJ in the winter
  - Equivalent to nearly all of the total energy demand for district heating
## District heating system efficiency: Key policies

### Energy pricing policies
- Changing the energy source from coal to cleaner fuels

### Energy conservation policies
- How consumers use and pay for heating
- Metering
- Equitable pricing

### Energy efficiency policies
- Industrial energy efficiency
- Building energy efficiency

### Social benefit policies
- Air quality benefits
- Economic benefits
- Well-being benefits
District heating system efficiency: Policy Challenges & Options

- Integrate heat planning into a broader energy policy agenda
- Determine how cost-effective recovery of industrial surplus heat can be for district heating
- Transform heat into a commodity
- Pass responsibility for heat service payments to households
- Local government leadership and coordination between organisations
District heating system efficiency: Business model framework

Heat Producer
- Extracting

Heat Utility / Network Owner
- Integrating
- Adjusting
- Transporting

End Users of Heat
- Consuming
Potential business models
ESCO as an intermediary

Key aspects

<table>
<thead>
<tr>
<th>Benefits</th>
<th>The market is open to private ESCOs.</th>
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<tr>
<td>Challenges</td>
<td>Incentive split for waste heat price exist between ESCO and heat utility.</td>
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<td>ESCO needs to negotiate with both heat producer and heat utility.</td>
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An independent ESCO links heat producer and heat utility.
# Existing pilot project

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<th>Key aspects</th>
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<tr>
<td>Chifeng city, Inner Mongolia province</td>
<td>▪ Waste heat recovery from a copper company</td>
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<td>▪ Operational since winter 2013.</td>
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<tr>
<td>Qianxi city, Hebei province</td>
<td>▪ Waste heat recovery from steel companies</td>
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<tr>
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<td>▪ Operational since Jan. 2015</td>
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<tr>
<td>Anshan city, Liaoning province</td>
<td>▪ Waste heat recovery from steel companies</td>
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<td></td>
<td>▪ In preparation</td>
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<tr>
<td>Taiyuan city, Shanxi province</td>
<td>▪ In preparation</td>
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<tr>
<td>Qingdao, Shandong province</td>
<td>▪ In preparation</td>
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THANK YOU
EXTRA SLIDES
Potential business models
ESCO under the Heat Utility business

Key aspects

• Heat utility and ESCO are within an integrated structure.

Benefits
• No incentive split for waste heat price exist between ESCO and heat utility.

Challenges
• Heat utility needs to invest.
**Potential business models**

**ESCO under the Heat Producer business**

- **Heat Producer creates a captive ESCO.**

### Benefits
- Heat producer invests in energy efficiency measures.

### Challenges
- Incentive split for waste heat price exist between ESCO and heat utility.
- Negotiated access to monopoly heat network.
District heating system efficiency: Business model framework

Heat Producer

Extracting

Incentive compatibility
District heating system efficiency: Business model framework

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- Industrial energy efficiency
- CHP plants and Renewable energy System optimisation
- 3rd party access and Heat pricing structure
District heating system efficiency: Business model framework

Demand-driven system
Decoupling policies
Targeted social assistance

End Users of Heat
Consuming
District heating system efficiency: Business model framework

Heat Producer
- Extracting

Heat Utility / Network Owner
- Integrating
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- Transporting

End Users of Heat
- Consuming