



**International
Energy Agency**

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Business models for improving energy efficiency

*The use of low-grade industrial waste heat in
China's district heating system*

Business models for district heating system efficiency

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 $\frac{2}{3}$ of total primary energy consumption in China
- Industrial surplus heat could represent 30% of industrial consumption

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

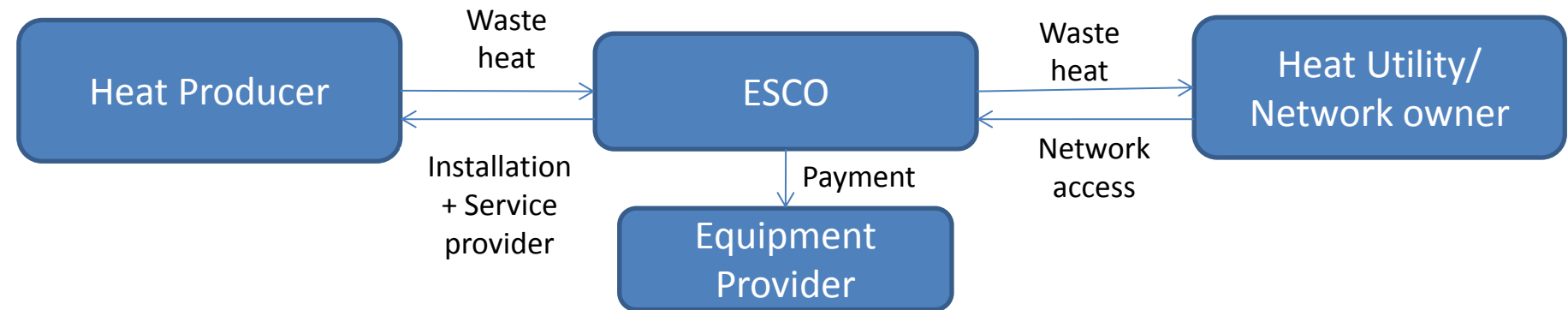
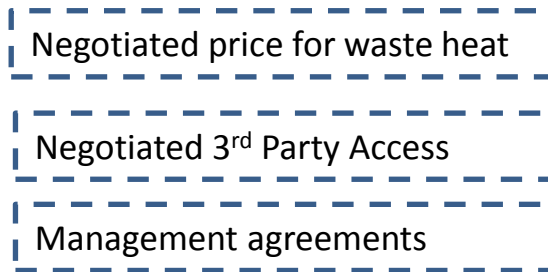


End Users of Heat

Consuming

Potential business models

ESCO as an intermediary



Key aspects	<ul style="list-style-type: none"> An independent ESCO links heat producer and heat utility.
Benefits	<ul style="list-style-type: none"> The market is open to private ESCOs.
Challenges	<ul style="list-style-type: none"> Incentive split for waste heat price exist between ESCO and heat utility. ESCO needs to negotiate with both heat producer and heat utility.

Existing pilot project

Pilot projects	Key aspects
Chifeng city, Inner Mongolia province	<ul style="list-style-type: none"> Waste heat recovery from a copper company Operational since winter 2013.
Qianxi city, Hebei province	<ul style="list-style-type: none"> Waste heat recovery from steel companies Operational since Jan. 2015
Anshan city, Liaoning province	<ul style="list-style-type: none"> Waste heat recovery from steel companies In preparation
Taiyuan city, Shanxi province	<ul style="list-style-type: none"> In preparation
Qingdao, Shandong province	<ul style="list-style-type: none"> In preparation



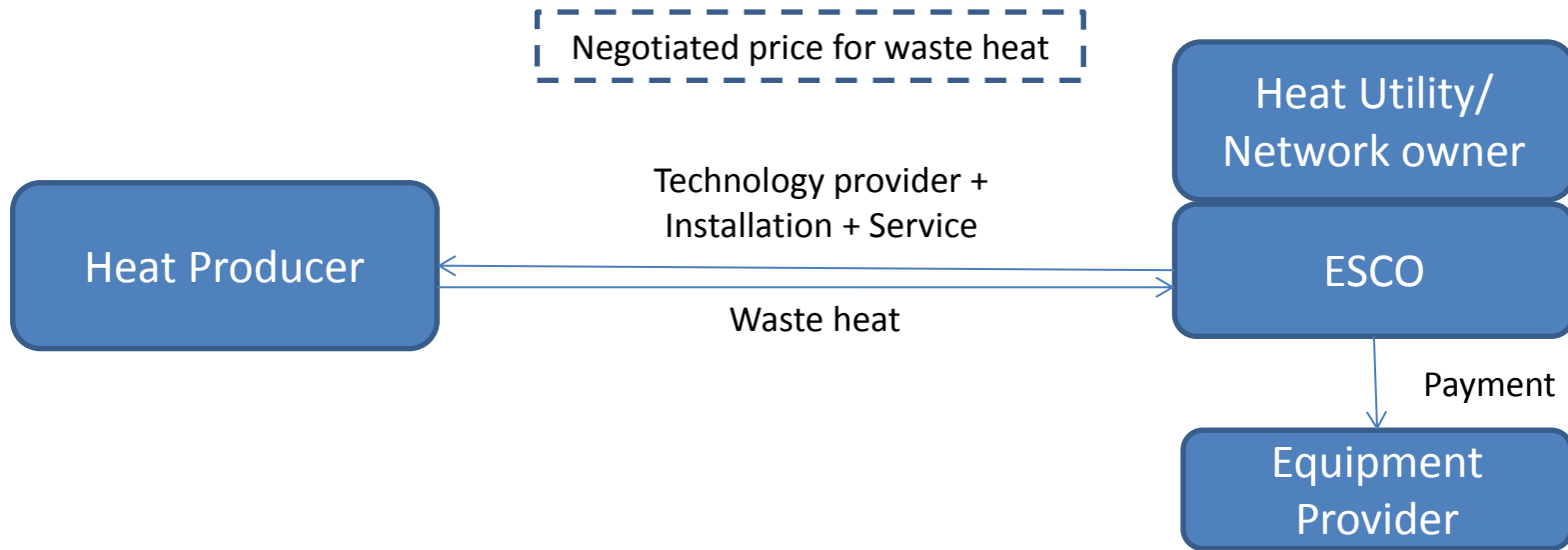


THANK YOU



EXTRA SLIDES

Potential business models ESCO under the Heat Utility business

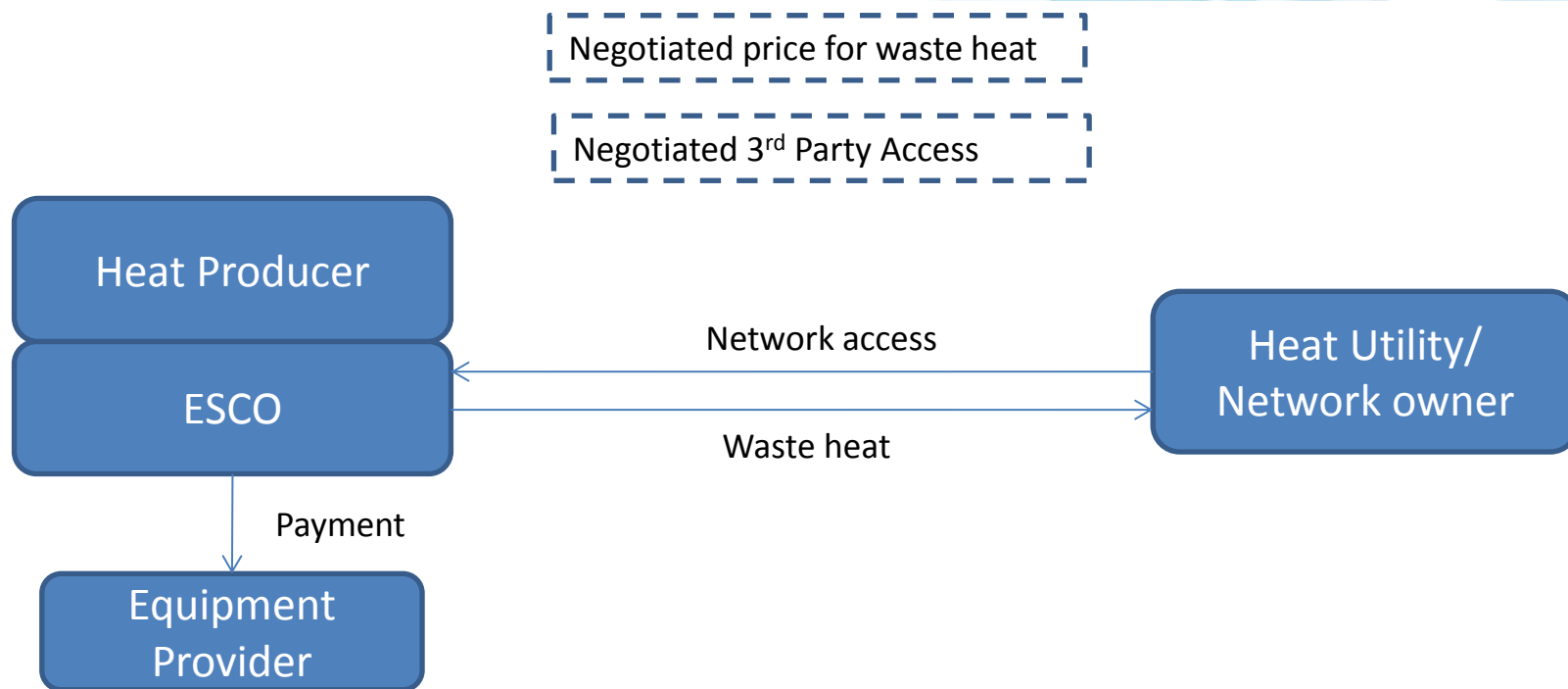


Key aspects	<ul style="list-style-type: none"> Heat utility and ESCO are within an integrated structure.
Benefits	<ul style="list-style-type: none"> No incentive split for waste heat price exist between ESCO and heat utility.
Challenges	<ul style="list-style-type: none"> Heat utility needs to invest.

Potential business models

ESCO under the Heat Producer business

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Key aspects	<ul style="list-style-type: none"> Heat producer creates a captive ESCO.
Benefits	<ul style="list-style-type: none"> Heat producer invests in energy efficiency measures.
Challenges	<ul style="list-style-type: none"> Incentive split for waste heat price exist between ESCO and heat utility. Negotiated access to monopoly heat network

Heat Producer

Extracting



Incentive
compatibility

District heating system efficiency: Business model framework

Heat Producer

Extracting

Heat Utility / Network Owner

Integrating

Adjusting

Transporting

Industrial energy
efficiency

CHP plants
Renewable energy
System optimisation

3rd party access
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

Adjusting

Transporting



End Users of Heat

Consuming