

District heating in China – now and in the future

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Outline

- 1. Current status and trend of DH in China
- 2. Challenges and issues of DH in China
- 3. Clean technology transition
- 4. Policy reform obstacles
- 5. Technology implementations of H.E. Energy

Current status and trend

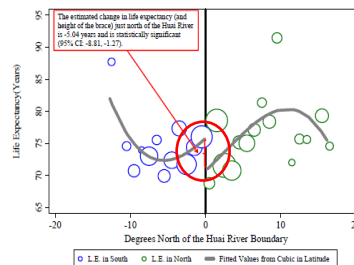
- China is facing severe PM 2.5 issue (60% from coal)



Current status and trend

-China's coal-dominated heating reduces life expectancy by 5.5 years, study says

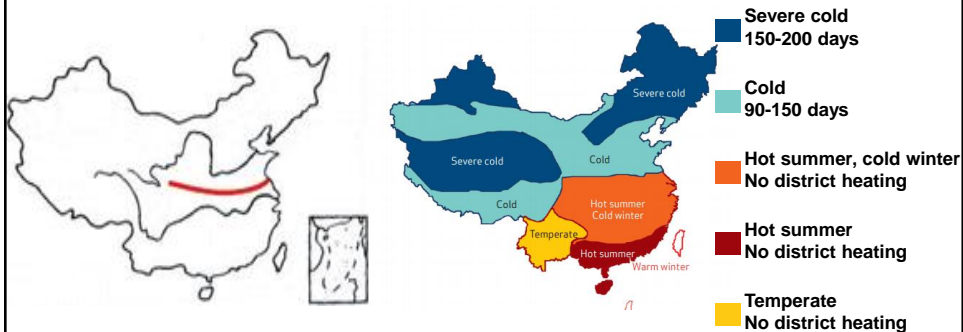
North and South China Denoted by Huai River/Quiling Mountains 0° Celsius Line



Source: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2291154

Current status and trend

Recently DH is built in the north China bounded by Hua-River line, still dominated by coal-fired plants.



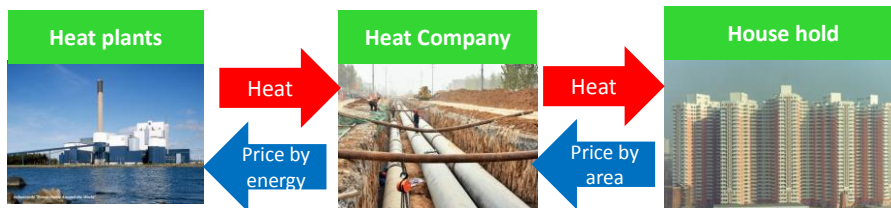
Source: Tsinghua University

Current status and trend

-District heating grid is controlled by city government-owned enterprise. Heat price is calculated by building area.

-Legal minimum indoor temperature: 18°C

-heat for industry (steam) is separate.



Current status and trend

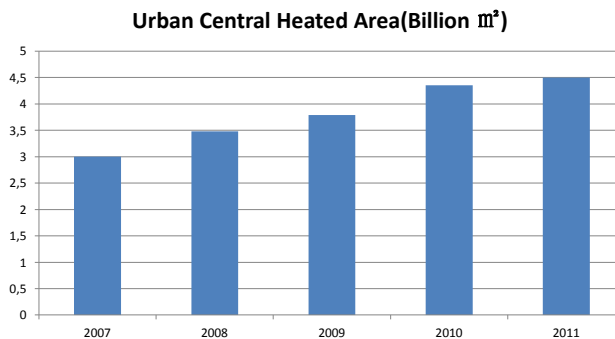
- Urbanization has created incremental heat demand



Source: Ministry of Housing and Urban-Rural Development, China

Current status and trend

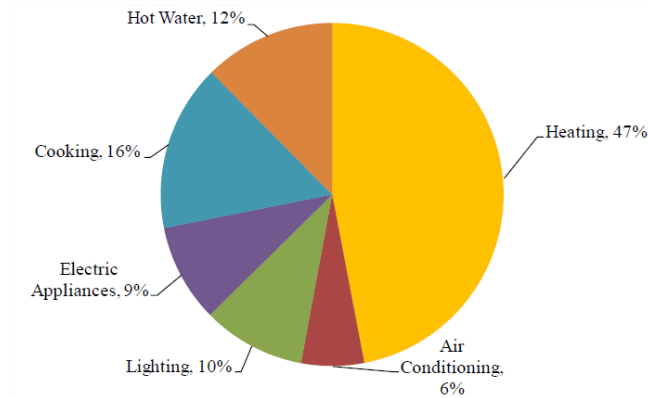
- District heating has seen fast growth in past years because of the accelerating urbanization (area=almost 45 Copenhagen)



Source: Ministry of Housing and Urban-Rural Development, China

Current status and trend

Heating takes account nearly half of total energy consumption of urban residential buildings at present.

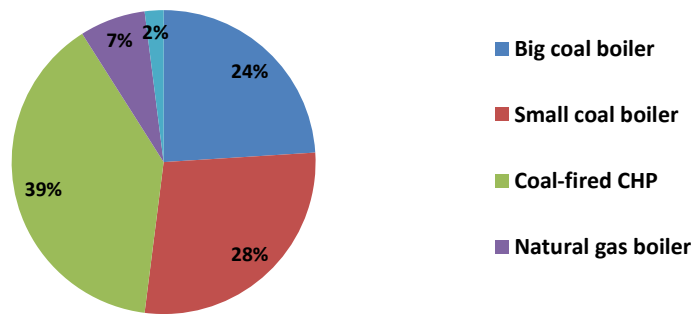


Source: BEERC (2011)

Current status and trend

- Now China's district heating is dominated by CHP(big city) and coal boiler(small city).

**Technology mix of District heat in China
(Heated Area)**



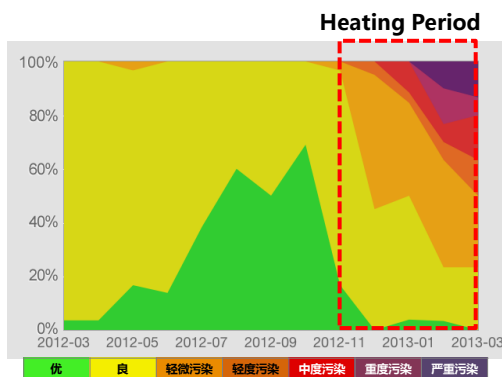
Source: Tsinghua University

Current status and trend

- **Small plant decommission program** : 200MW-300MW level combined plants are replacing the small coal boilers in big cities.
- **Long-distance system transition**: high temperature & pressure pipe, centralized heating centers in cities
- **Combined system in big cities**: Big coal-fired CHP plants in central city with high demand, coal boilers for suburbs , natural gas boiler as back-up for peak load duration.

Challenges and issues

- **Environmental issue in winter** : Coal-fired district heating caused tremendous pollution in Northern big cities.



Taiyuan, Shanxi

- Plants located in densely populated area
- Contribute 50% of pollution in winter

Source: Tsinghua University

Challenges and issues

Production shortage constrained by heat grid expansion :

- Explosive growth of satellite cities
- Fast increasing population in limited blocks
- Industrial park expansion
- **Grid infrastructure with underestimate prediction**



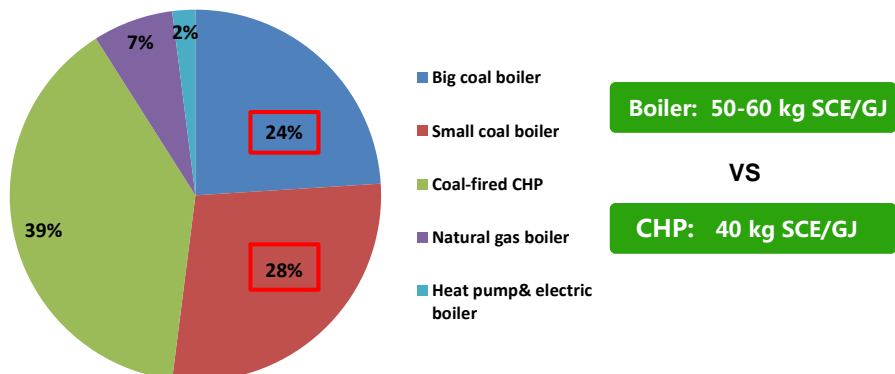
1990

2010

Challenges and issues

Inefficient energy use in current system :

- High share of inefficient/high pollution coal boilers



Challenges and issues

Inefficient energy use in current system :

- Energy waste caused by area based heat pricing system

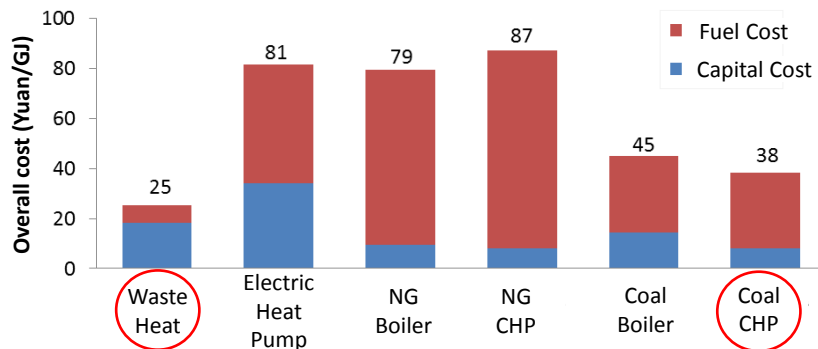


High heat radiation

- Current pricing system:
All the time & All the area
No excitation mechanism for saving energy

Clean technology transition

Cost comparison of different technology



Clean technology transition

Transition to CHP with high integrated efficiency :



Big city (million)



200MW-300MW



Small city

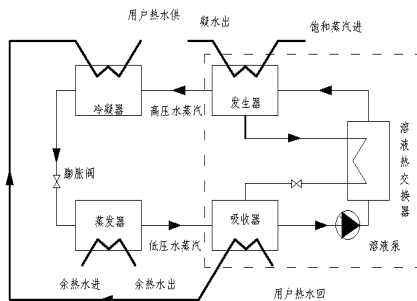


30MW-60MW

Clean technology transition

Potential of industrial waste heat:

- CHP plants & Iron/chemical factory
- loss of low temperature waste heat in cooling tower



Absorption heat pump in CHP

-Incremental **30%** heat production

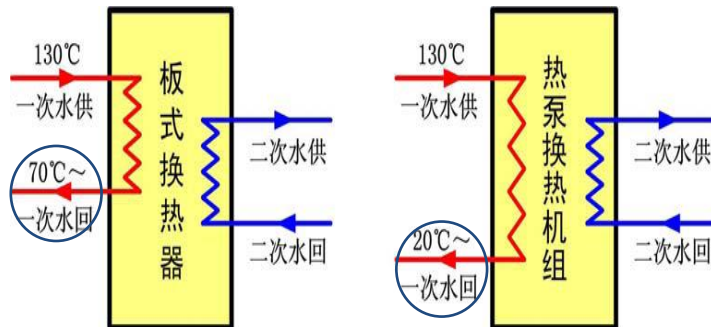
-**10%** energy efficiency increase

-Pay-off period: **3 years**

Clean technology transition

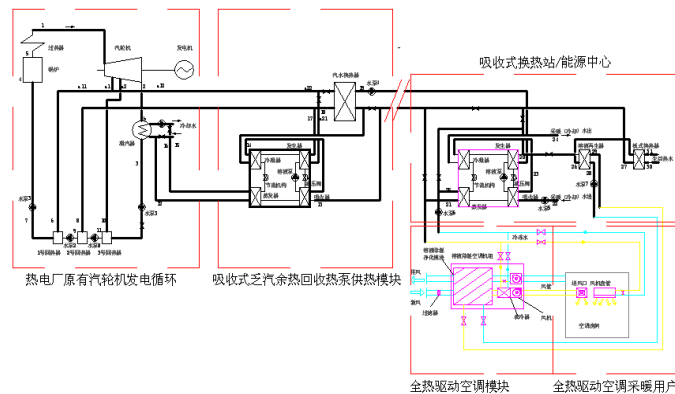
Pump heat exchanger:

- Increase temperature difference
- 40% incremental transmission capacity
- 20% incremental energy efficiency



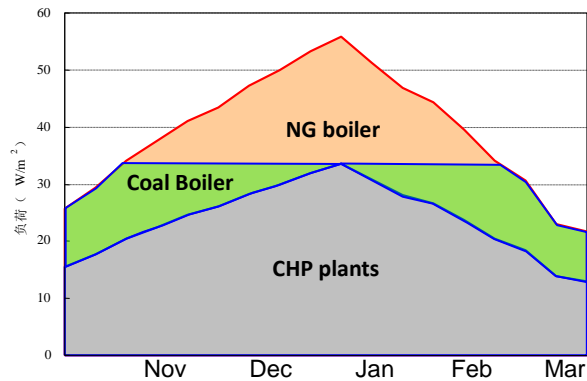
Clean technology transition

Combined cooling, heat and power with heat pump:



Clean technology transition

Natural gas boilers act as peak load unit :



Clean technology transition

Decentralized technology for South China

-More Flexible: Part time and Part space



Wall Mounted
Natural Gas Heater



Hot water floor
Air source heat pump



Geothermal heat pump

Policy reform obstacle

- **Transition from area based pricing to energy based pricing**
 - Avoid inefficient heat for inactivity time
 - Flexibility for indoor temperature
 - Encourage energy saving method of building

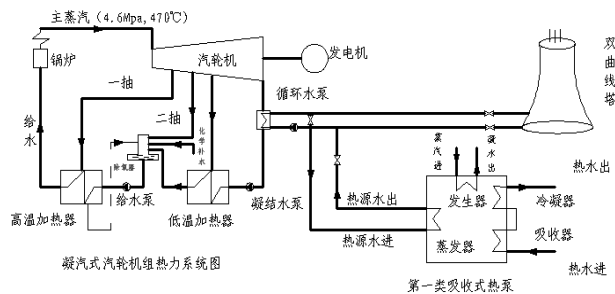
Policy reform obstacle

- **Lack of policy support for CHP project**
 - Lack of fiscal and taxation preferential policy for CHP district heating
 - Lack of CHP project operation supervision and encouragement
 - Heat price distortion of CHP and coal boiler

Technology implementations of H.E. Energy

■ Waste heat recycle project of CHP(800MW Beijing)

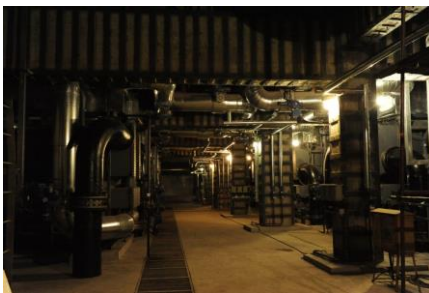
- Absorption heat pump
- 70MW Incremental heat production
- Investment: 80M yuan, 3 years to pay back



Technology implementations of H.E. Energy

■ Waste heat recycle project of CHP(800MW Beijing)

- Annual emission reduction:
 - Coal : 0.3 million tons
 - SO₂: 289t NO_x: 251t CO₂:89880t
- Annual water saving: 0.2 million tons



Technology implementations of H.E. Energy

■ Waste heat recycle of sewage(iron factory)



Former Cinder flushing water



Heat pump transformation

Technology implementations of H.E. Energy

■ Waste heat recycle of sewage(iron factory)

-Introduce anti-scale technology to keep system clean



Without Anti-scale technology



With Anti-scale technology



Thank you!

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