

The First Conference on the 4DH, October 3, Aalborg, Denmark

Sustainable District Heating in China

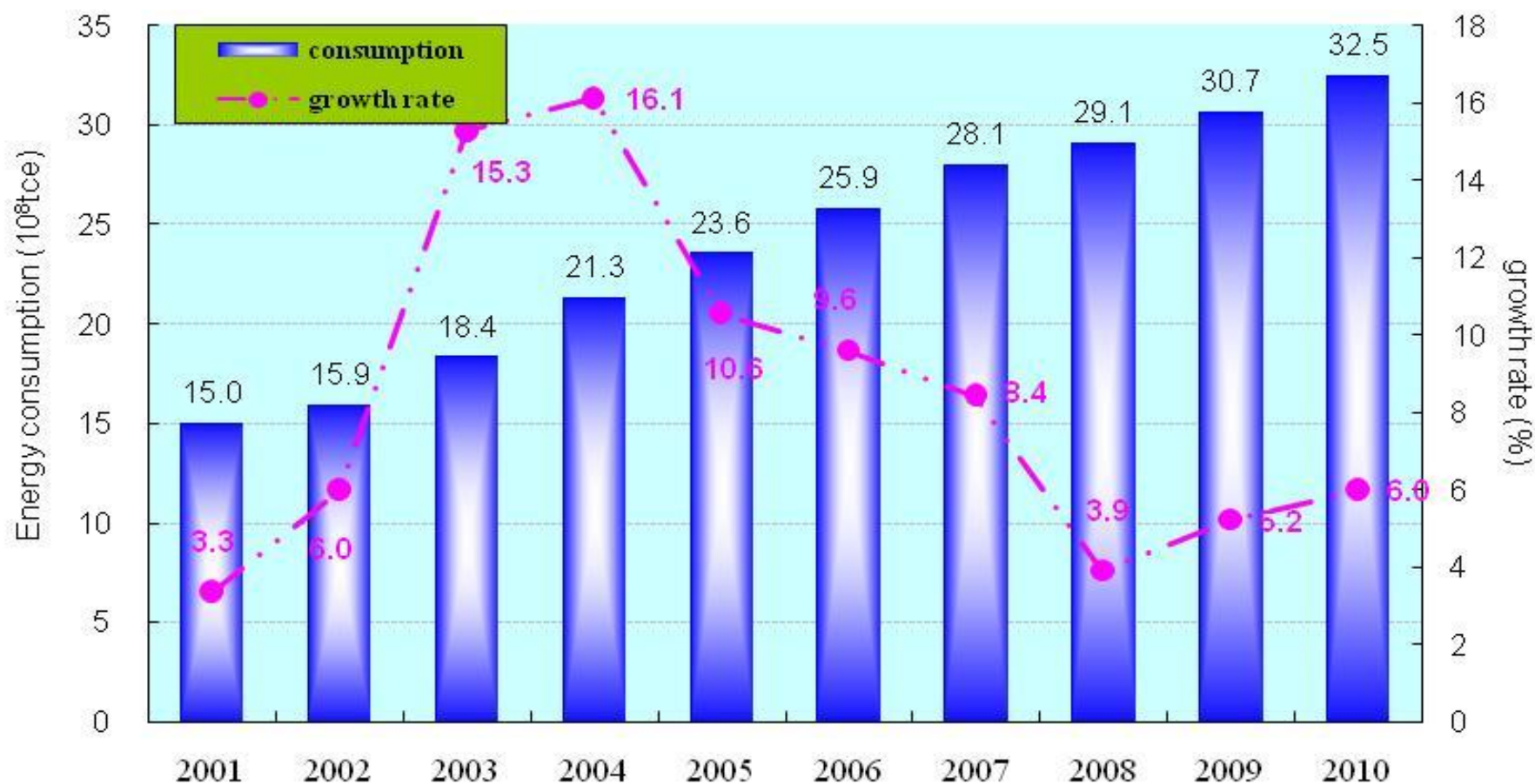
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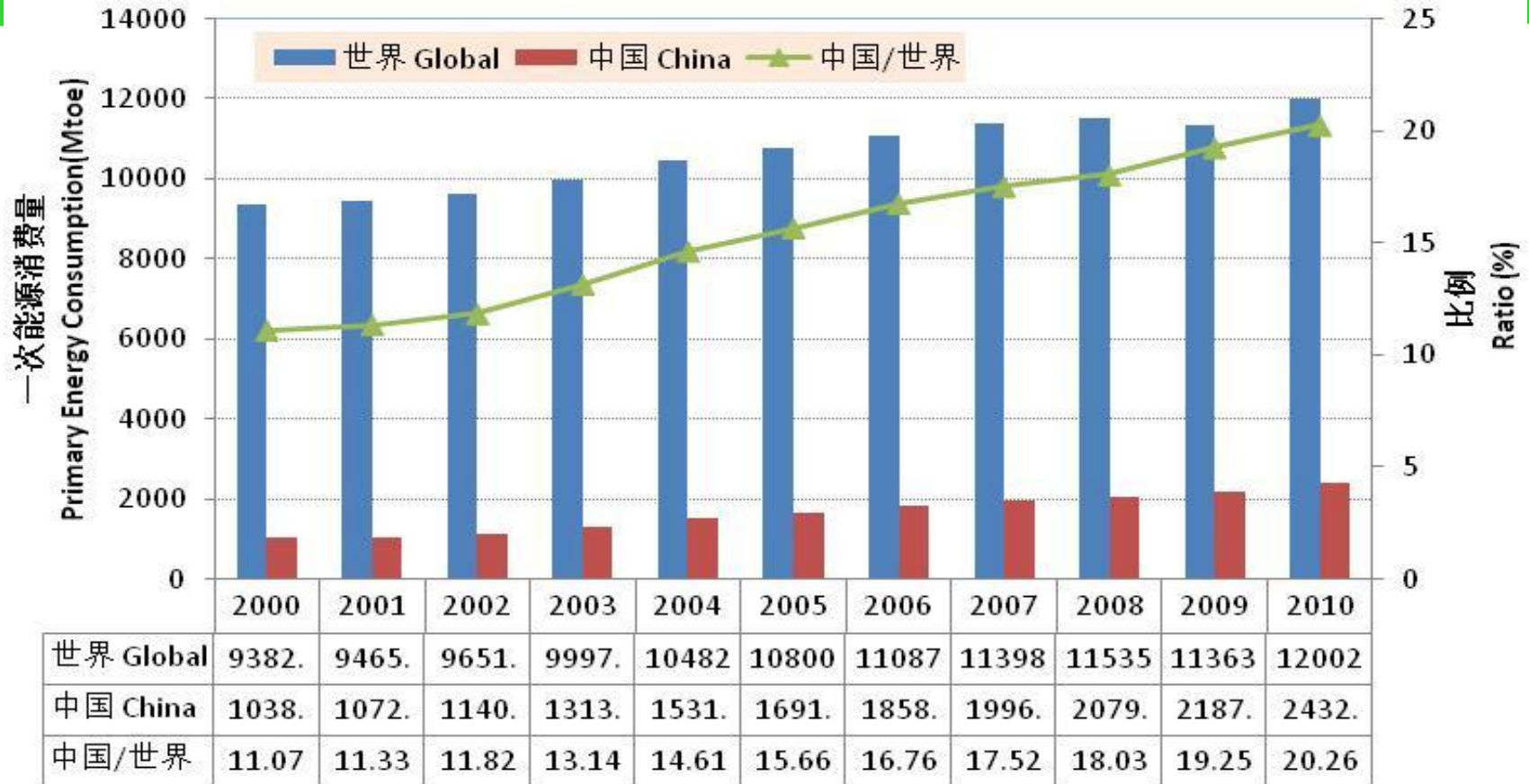
The Context of Sustainable District Heating in China



China's Primary Energy Consumption



China in Global Primary Energy Consumption

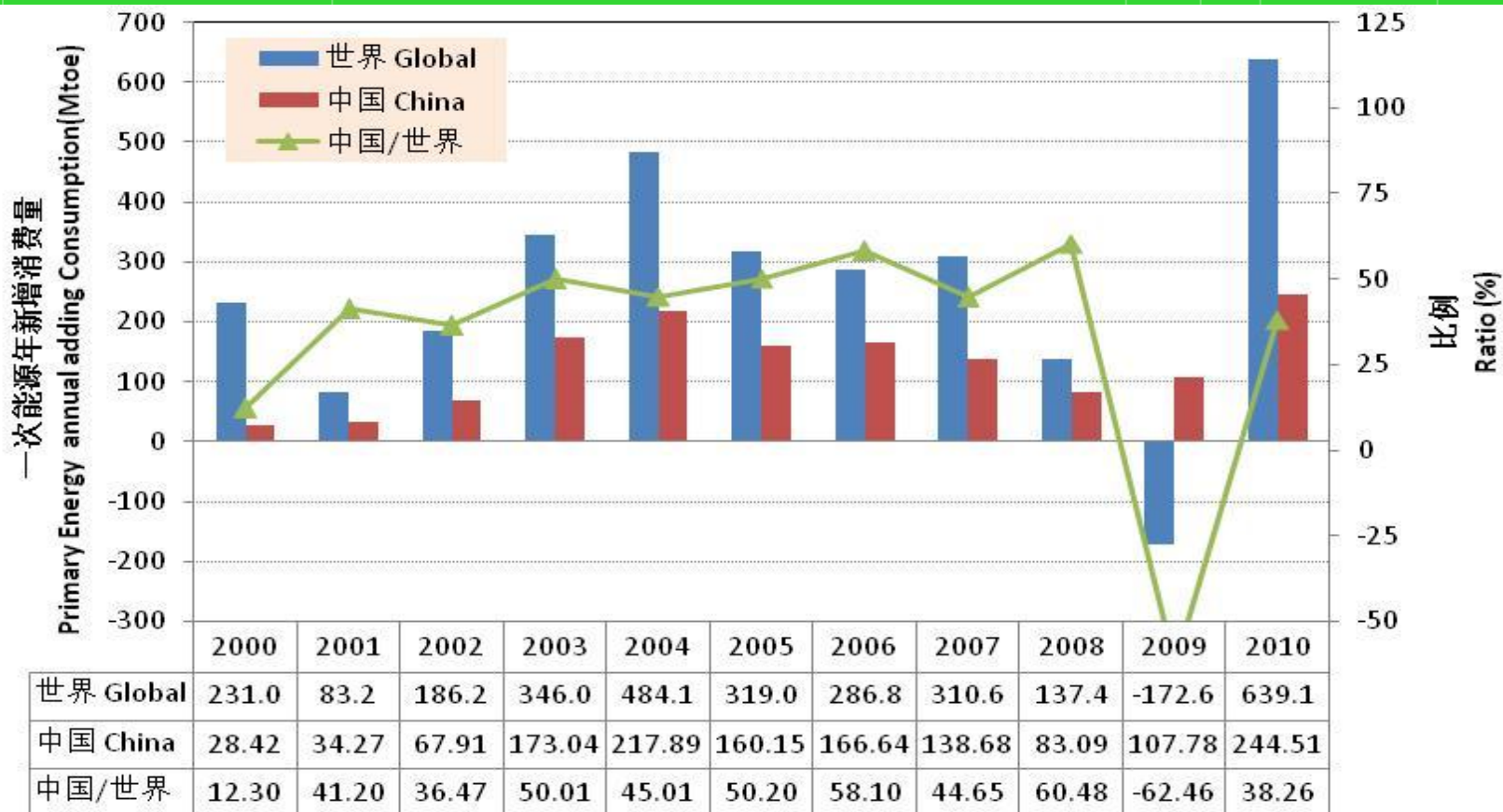


Source: BP statistical_review_of_world_energy_full_report_2011

Growth rate 2000~2010: Global 2.5% vs. China 8.89%



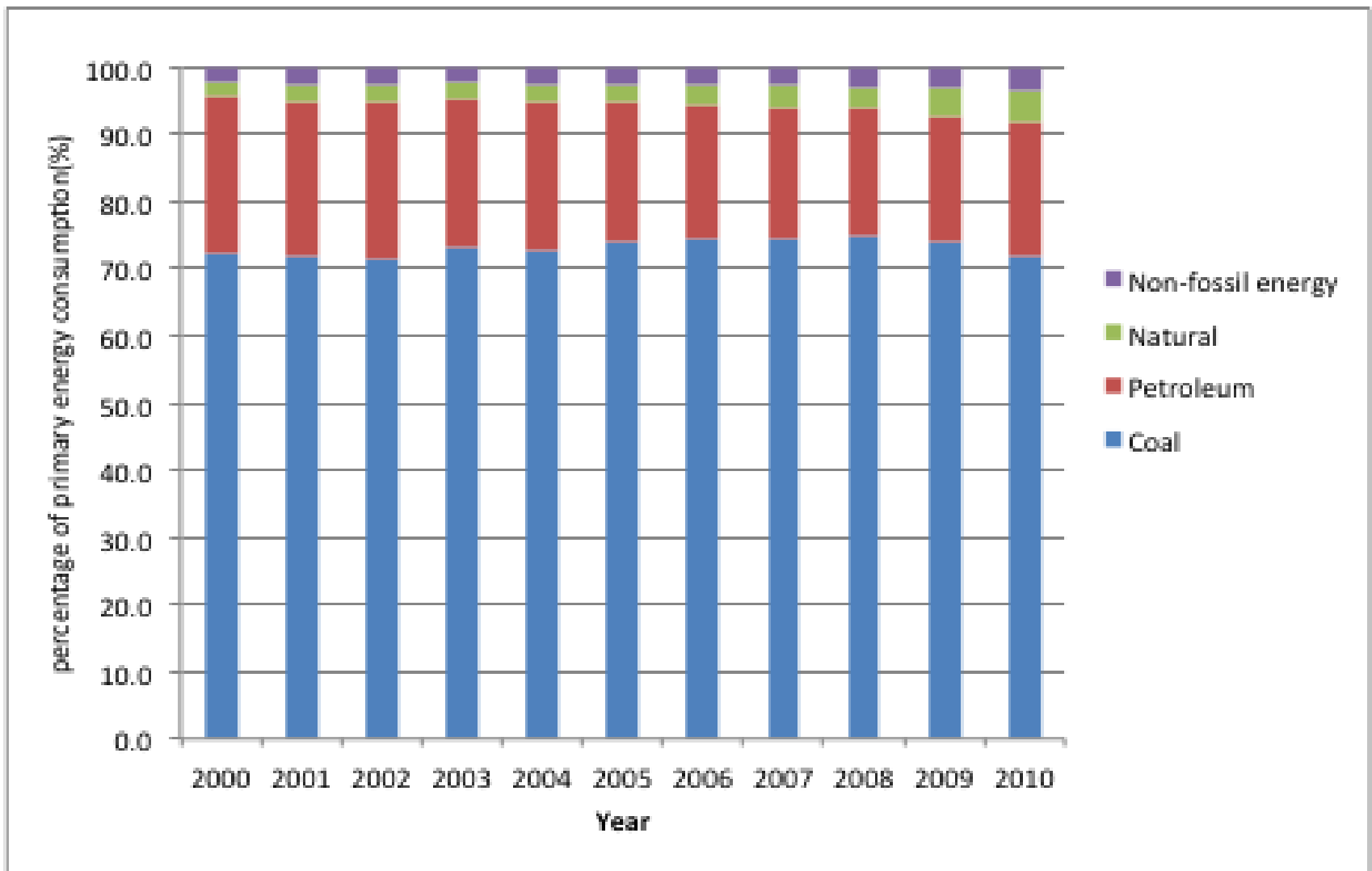
China in Global Increased Energy Consumption



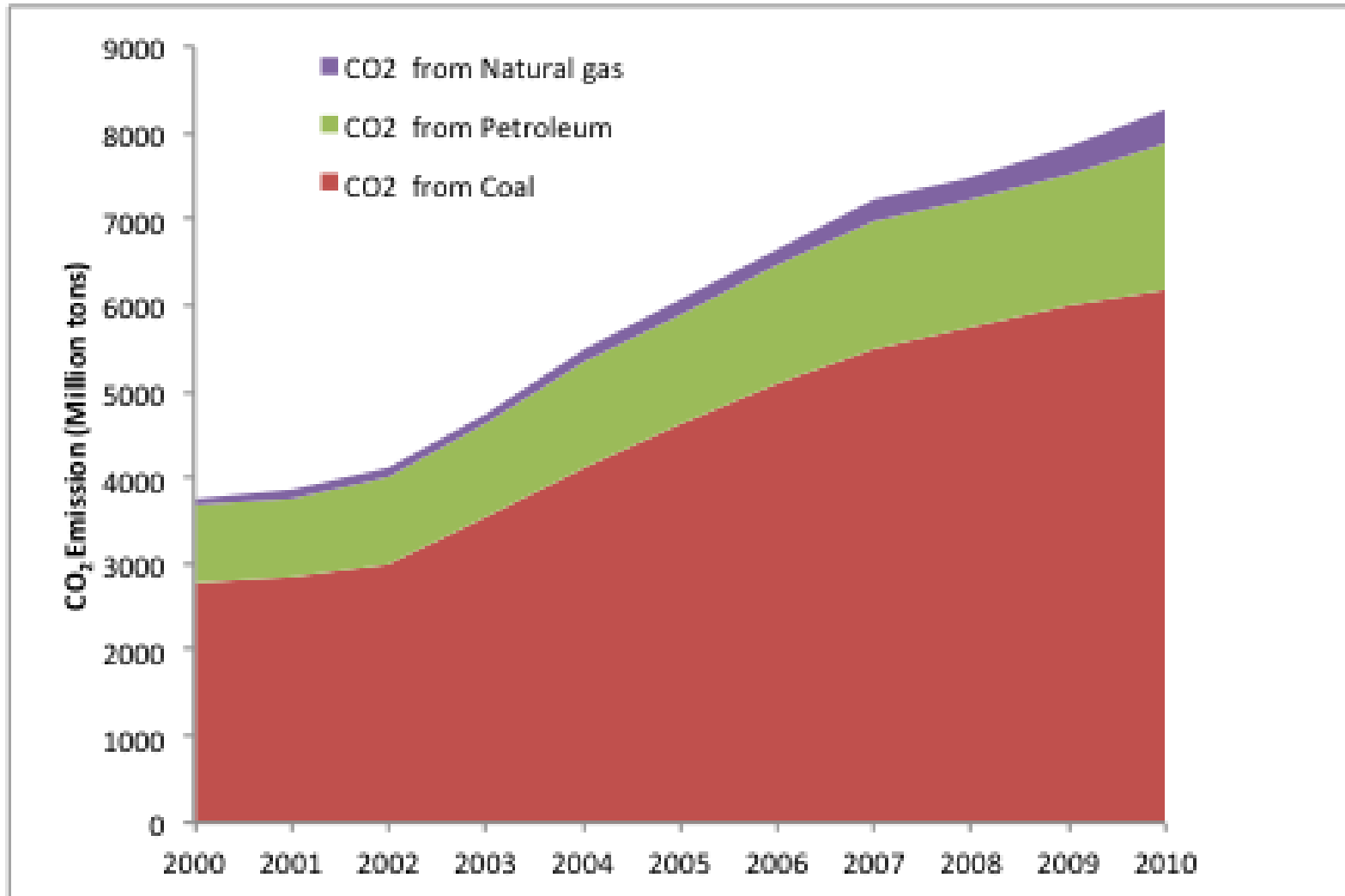
Source: BP statistical_review_of_world_energy_full_report_2011

Increased Energy Consumption 2000~2010: Global 2.62Btoe/ China 1.93Btoe (53.2%)

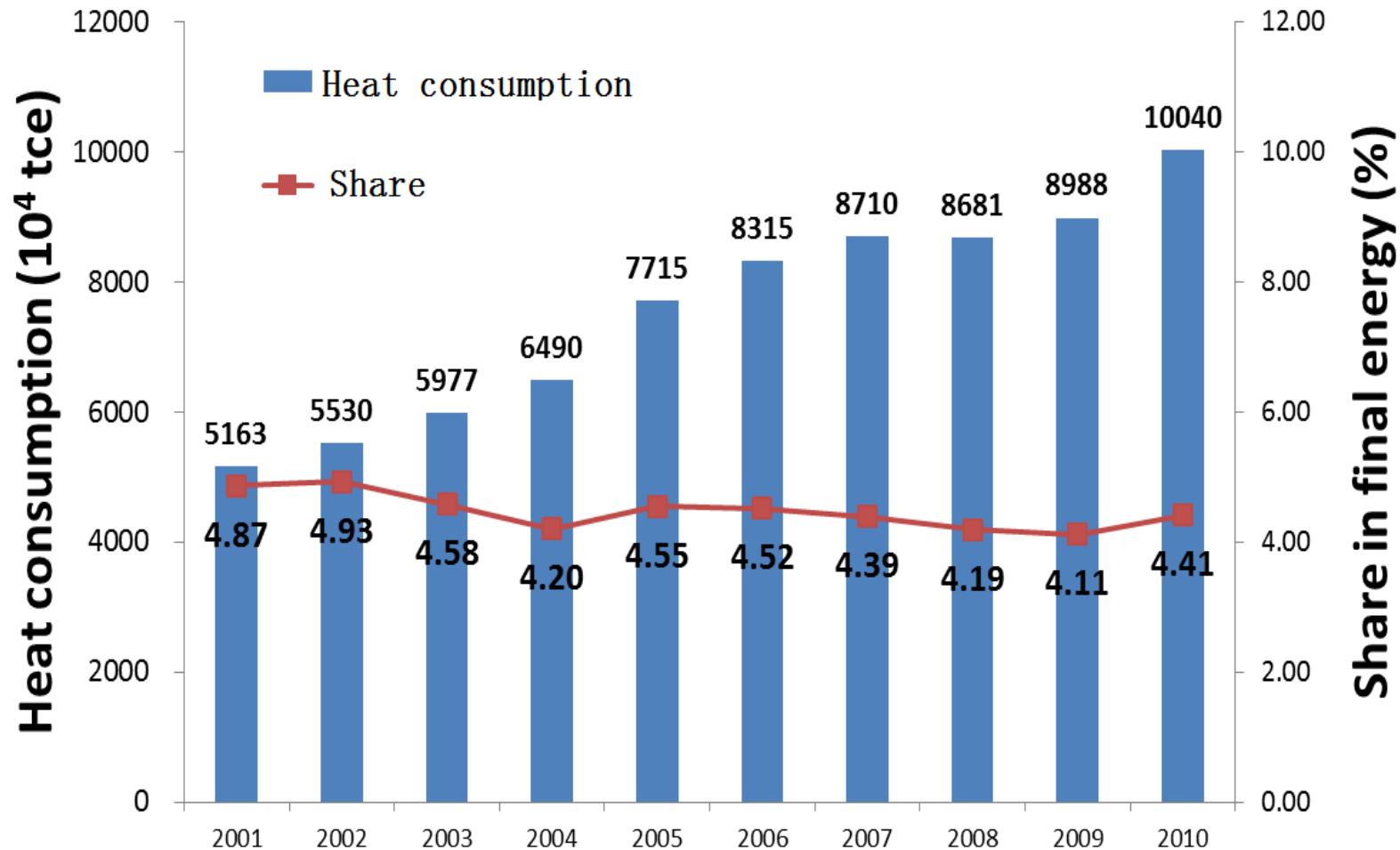
Energy Supply Mix in China



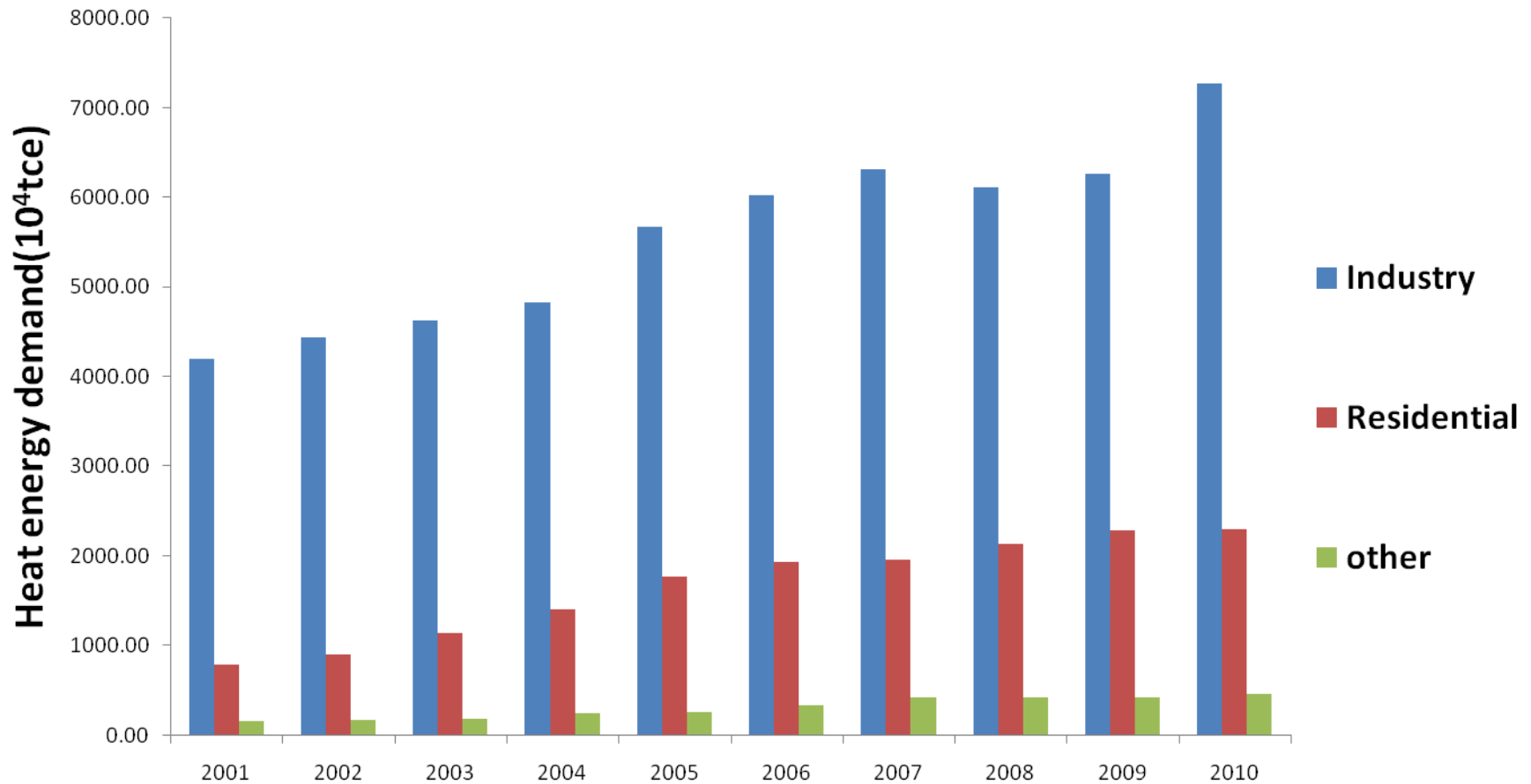
CO2 Emission from Fossil Fuel Burning



Heating in Final Energy Consumption



Heat Consumption by Sector

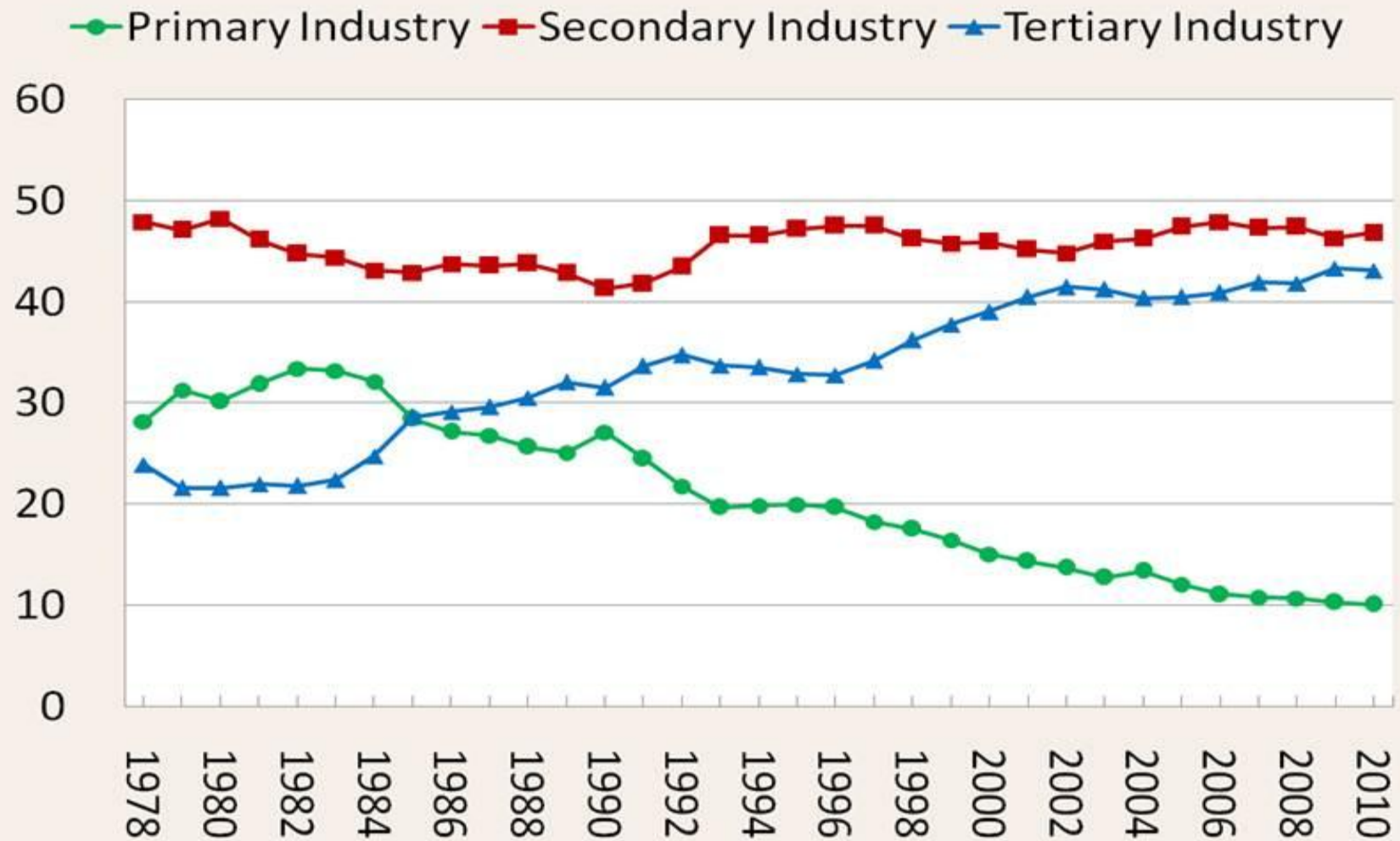


Source: China energy statistic yearbook 2002-2011

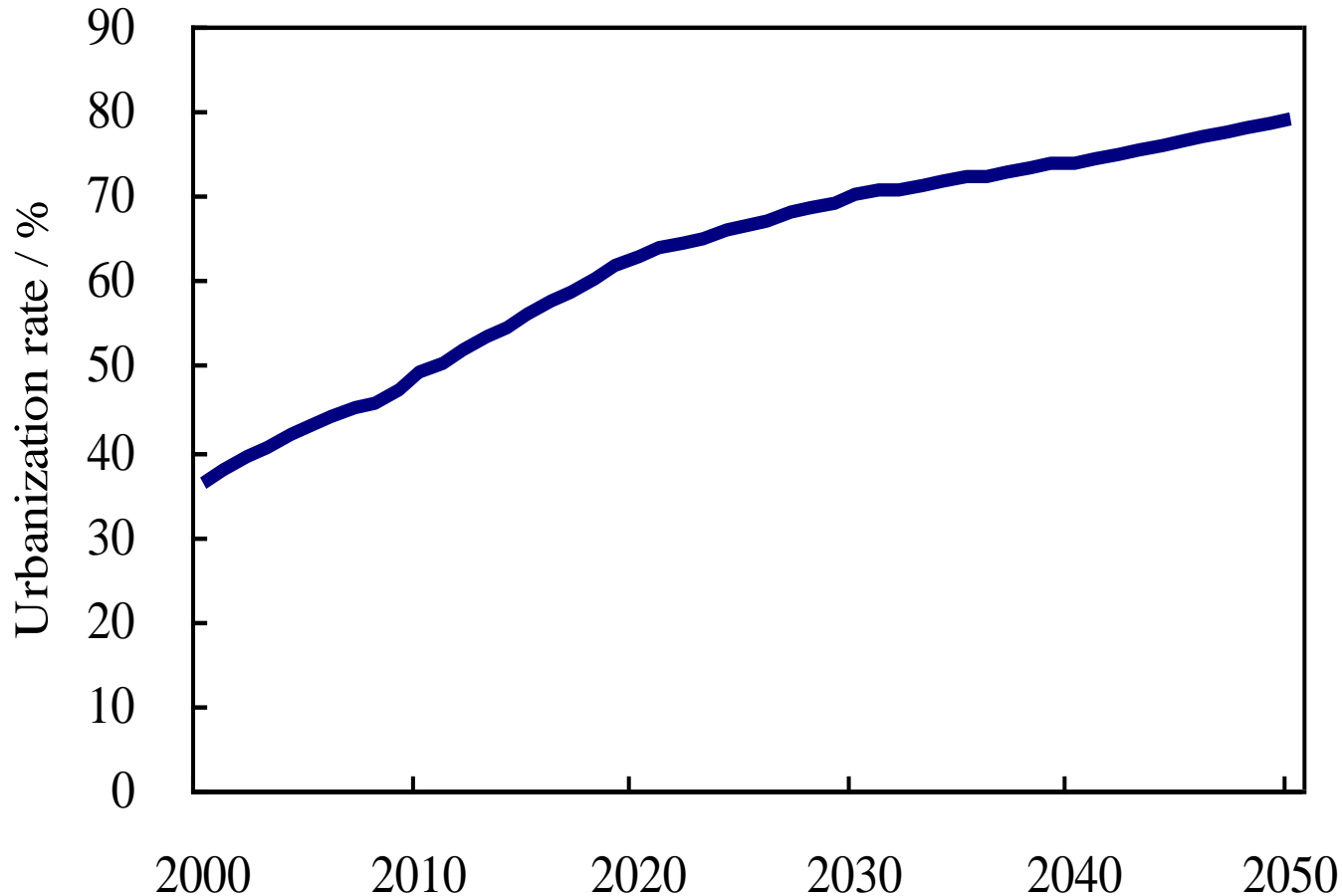


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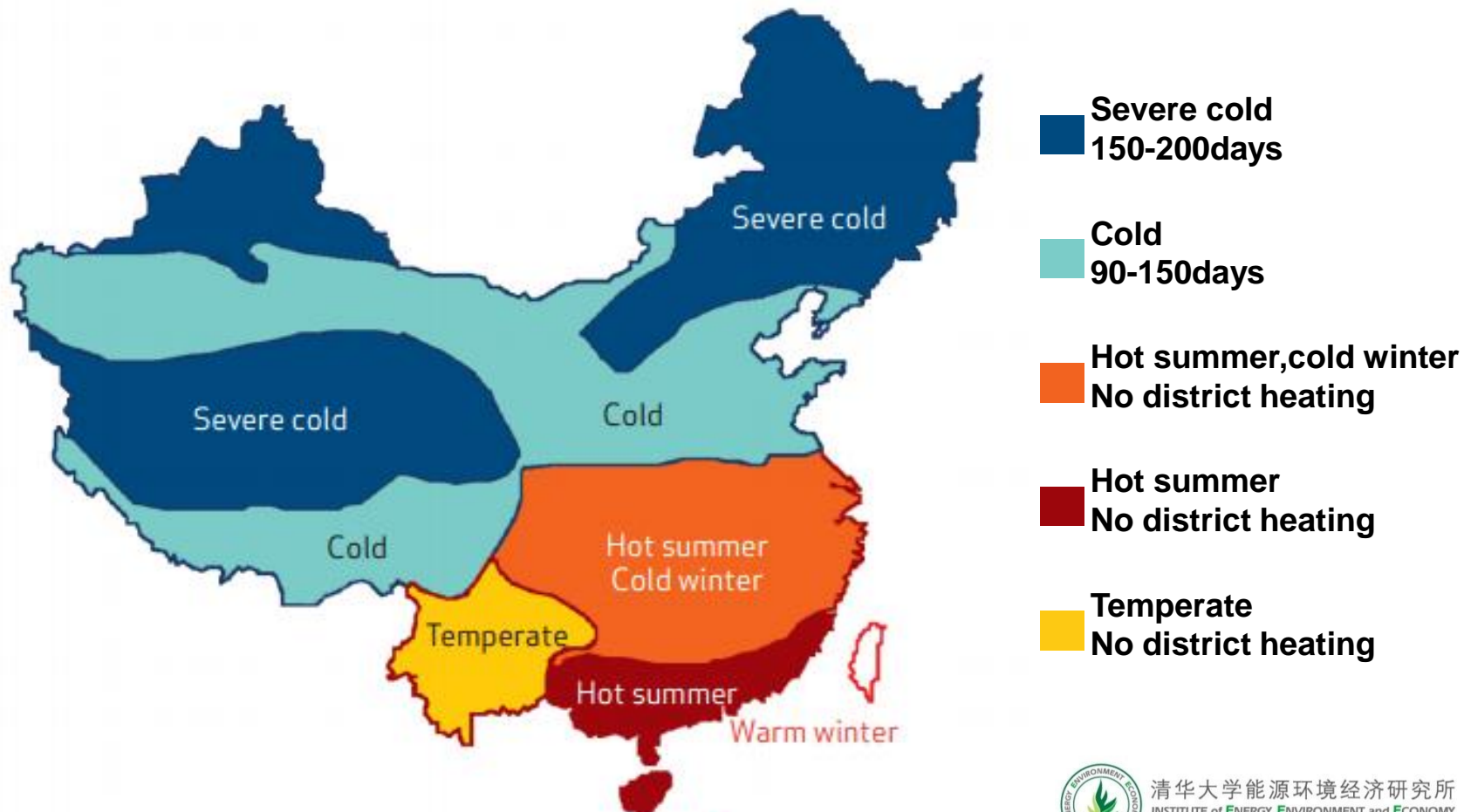
Industrialization



China's urbanization rate growth



Geographic Distribution of Space Heating



Local Environment Degradation



Drivers of Sustainable District Heating in China

- Meeting large amount of increased demand for energy
- Harnessing local environment pollution
- Energy supply diversification
- Mitigating GHG emission



Technologies for Sustainable District Heating in China



Technologies in District Heating

- Heating Boilers:
 - Coal boilers
 - Natural gas boilers
- CHP
 - Coal-fired CHP plants
 - Natural gas fired CHP plants
 - Biomass fired CHP plants
- Household heating technology
 - Natural gas boiler
 - Electricity heater
 - Air conditioner



Technological Options for Sustainable DH

- Integrated city heating planning
- Technology retrofitting for the existing installations
- Forced retirement of small-sized coal boilers
- Encouraging substitution of natural gas for coal
- Promoting CHP
- Supporting heating from renewable energies



Policy for CHP Technology Diffusion

Mid-and Long-term Energy Conservation Plan

Listing CHP as one of the 10 key National energy conservation programs

2005

2006

2007

2011

2012

China Energy Saving Law

Industrial Guidance Catalogue

Promote CHP/district heating
Encourage foreign investment
For CHP stations in China

Updated Measure for promotion of CHP, NEA

Promote Nat-Gas in CHP
Promote CCHP

Energy Conservation Technology Plan Outline NDRC

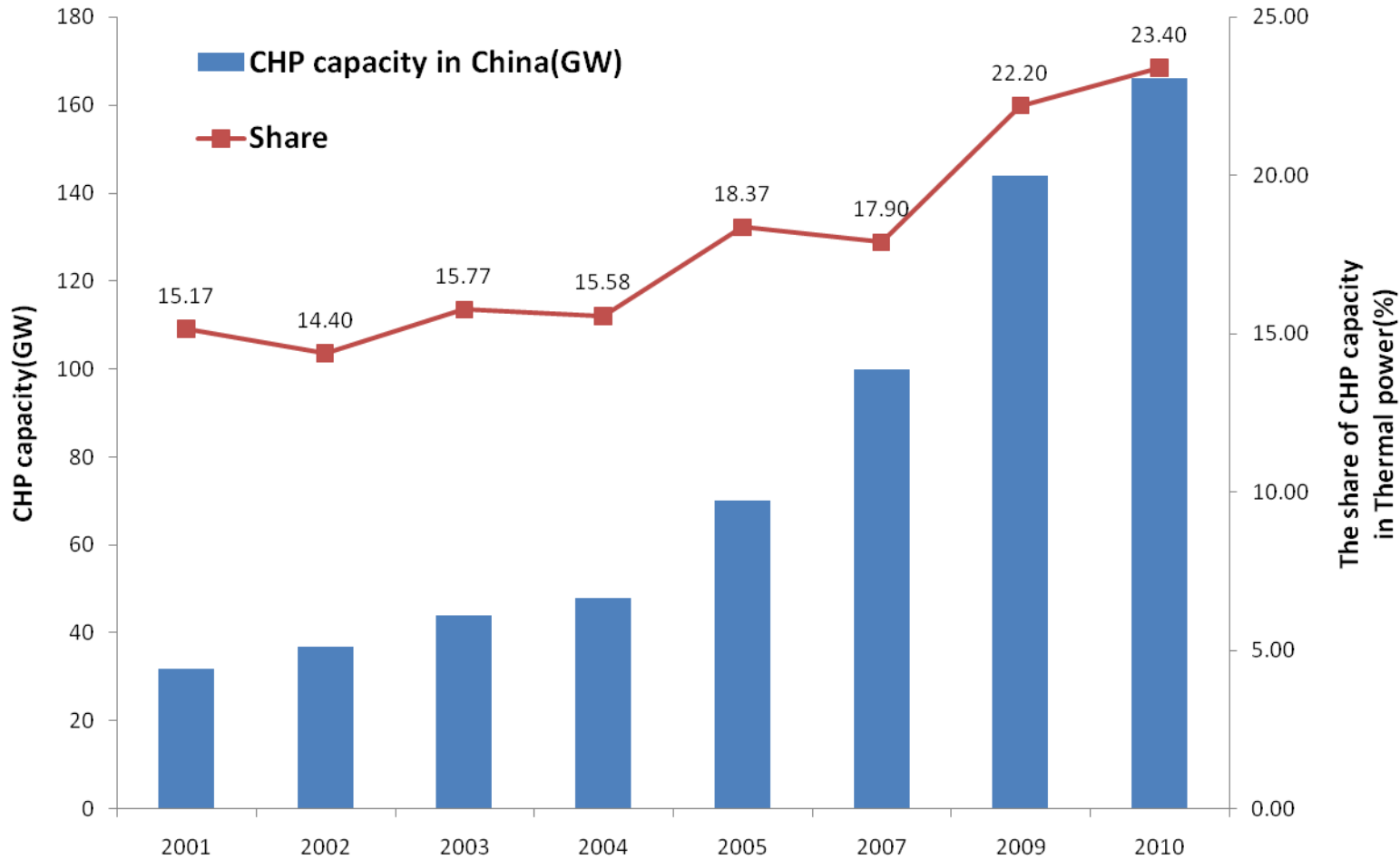
CHP and district heating instead of small boilers, develop CHP and CCHP in big cities

Industrial Energy Saving Plan, MOC

Promote CHP in big industrial factories
Raise efficiency with high-tech equipment
Modify heat grid



CHP Installations in China



Source: China Electricity Council



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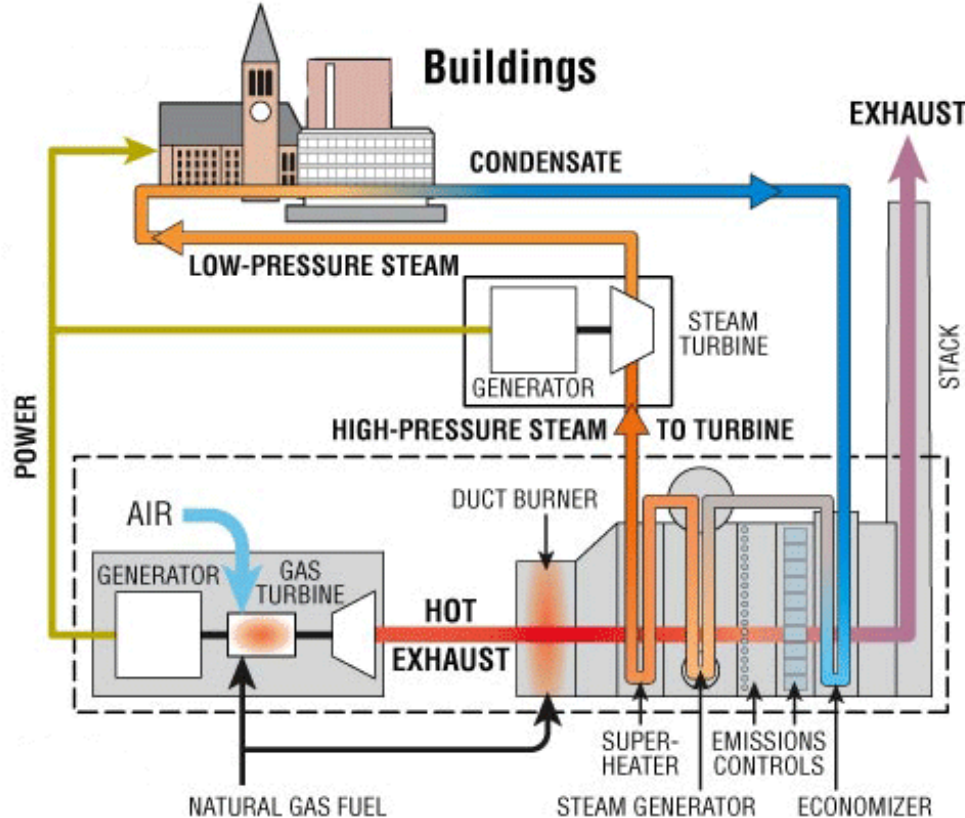
Technology Upgrading in Coal CHP

- Introduction of large sized extraction units of 200MW-300MW
- More flexible for regulating heat and electricity production.
- High efficiency: the average energy consumption for heat supply by CHP declined to 36-37 gce/kJ.



Diffusion of Gas-fired CCHP

- Introduction of gas turbine based combined cool air, heat and power production systems in large public buildings
- Beijing(66MW), Guangdong(67MW), Shanghai(17MW)



The Installation of CCHP at Tsinghua UniversityDH



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Other Options for DH

- Other options : low-temperature nuclear heating system, heat pump, heat storage, solar water heater system, biomass systems



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The Proposed Two City Case Studies: Beijing & Harbin



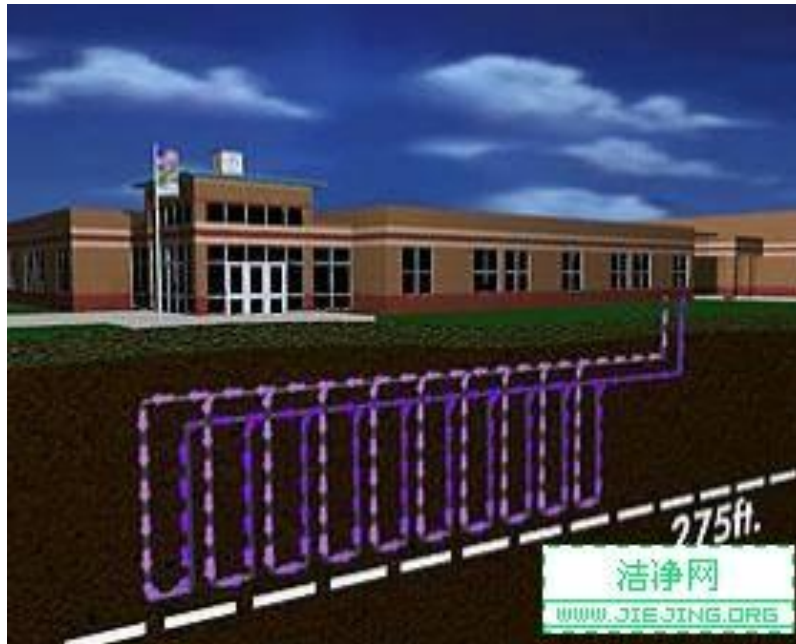
Beijing: Clean DH transformation

- Current heating energy mix: gas (70%), coal (20%), and other(10%)
- Building 4 new big coal-fire plants in suburban area to phase out conventional small sized coal boilers by 2015
- Heat pump and geothermal heating area: 25 Mm²



Beijing: Clean DH transformation

- Million m² -sized geothermal heat pump project in Yanqing district
- Waste industrial heat re-use pilot project
- Biogas heating project in use of fowl manure
- 10 million m² -sized solar heating building

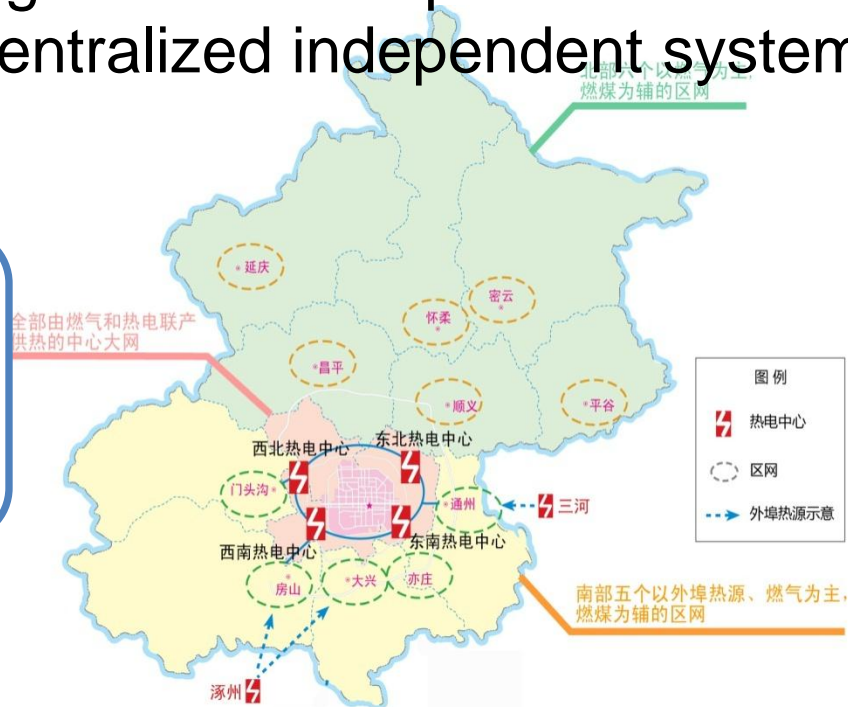


Beijing: Clean DH transformation

Future system: 1+4+N+X

- 1: One big centralized heating grid
- 4: Four big gas fired CHP plants
- N: A number of back-up gas boilers for peak load
- X: Grid-off heat grid decentralized independent systems

**Vision for 2015:
No coal consumption
Within the 5th ring
road**



Harbin: Wind-Heating Integration

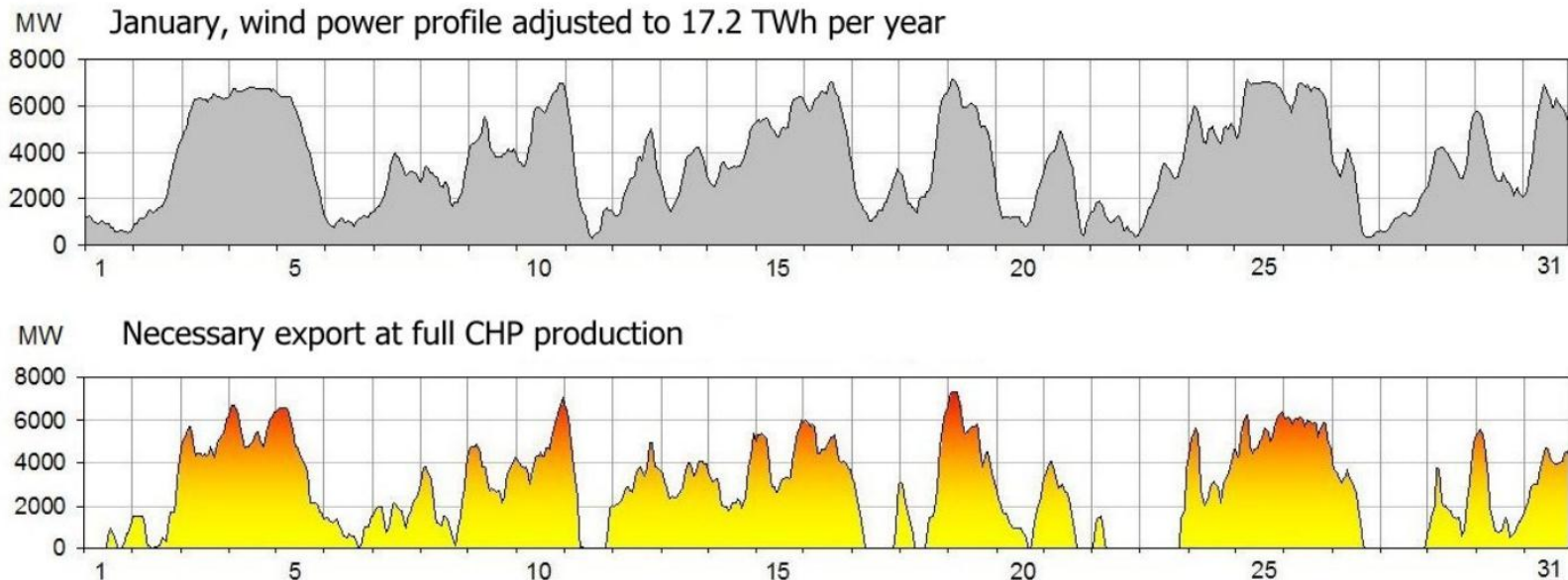
- Wind curtailment issue happened in Northeast, when the installed wind generation capacity reached 15 GW in 2010



Harbin: wind-heating integration

■ No space for wind energy in winter?

- The conflict of low electricity load, high heat demand and best wind availability in the winter of Northeast China
- The figure shows the similarity of the wind power curve and heat demand in winter

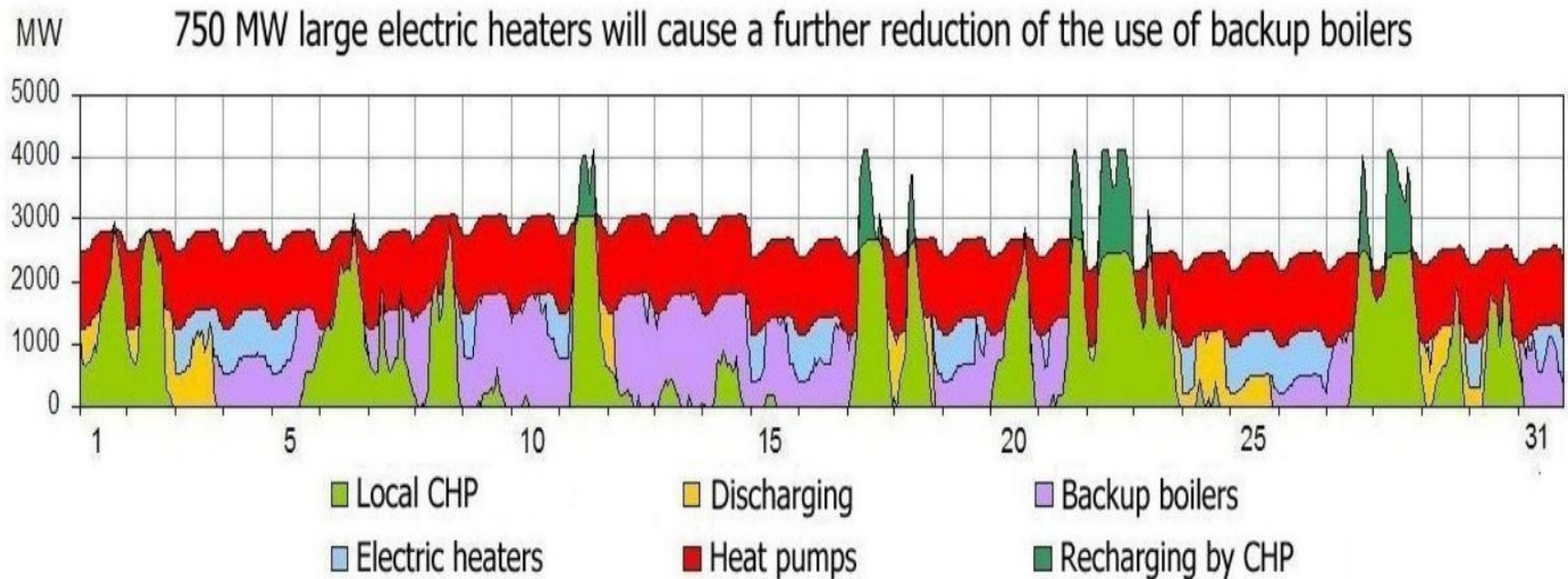


Source: Ea Energy Analyses , 2012



Harbin: Wind-Heating Integration

- Optimization of CHP and wind energy
- Reducing the peak and filling the valley



Source: Ea Energy Analyses , 2012



Thank you for your attention!

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