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Natural Gas Market Projects in Beijing, Shanghai, and Guangdong

Current Status of Beijing Energy Use & the Future Development Goals

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Preface (1)

- Large city with 14.56 million permanent population (2003)
- High economic growth rate, GDP per capita:2798 US\$ (2003)
- Development goals in Beijing Municipal Planning 2004-2020:

year	permanent population (million people)	GDP per capita (US\$)
2010	16	> 5,000
2020	18	> 10,000

Preface (2)

- Population increase and economic growth both rely on energy use.
- Coal dominant energy structure leads to the serious air pollution problem.
- One of the high energy consumption cities in the world.

Urgent tasks for Beijing's development:

- ✓energy restructuring
- ✓energy efficiency improvement
- ✓energy use improvement
- ✓especially the promotion of clean energy (eg. NG and renewable energy)

Outline

- Energy consumption status in Beijing
- Energy supply status in Beijing
- Use of renewable energy in Beijing
- Problems existing in Beijing's energy use
- Future development goals of Beijing energy system

Energy consumption status in Beijing (1)

----Total energy consumption

A city with large amount of energy consumption:

- In recent years, Beijing's total energy consumption has the second rank in Chinese large cities, only inferior to Shanghai.
- Beijing's total energy consumption:
40.76mtce in 2000
47.08mtce in 2003
- From 1990 to 2003, annual growth rate is 4.3%, an average increase of 1.5 mtce per year.

Energy consumption status in Beijing (1)

----Total energy consumption

Coal is the dominant energy type:

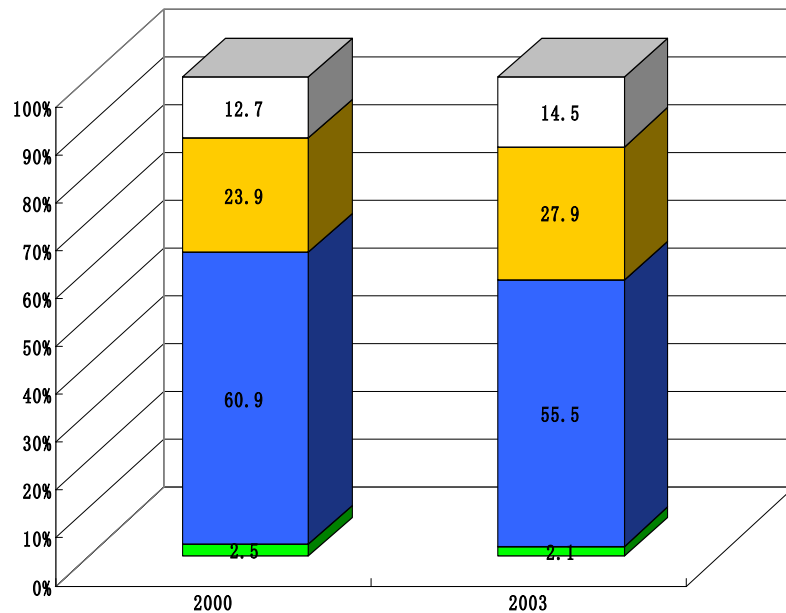
year	coal consumption (mtce)	% in total energy consumption
2000	20.44	50.1%
2003	21.94	46.6%

- coal consumption increased.
- Its proportion in Beijing's total energy consumption decreased.

Energy consumption status in Beijing (1)

----Total energy consumption

The secondary industry accounts for the highest proportion:



■ First Industry ■ Second Industry ■ Tertiary Industry □ Residential Consumption

	2000 (mtce)	2003 (mtce)
Primary Industry	1.02	1.00
Secondary Industry	24.82	26.15
Tertiary Industry	9.74	13.12
Residential Consumption	5.18	6.81
Total	40.76	47.08

- The proportion decreased because of the industry restructuring.
- Still high compared to 30-40% in developed countries.
- Energy-intensive industries, eg. smelting and pressing of metals, petroleum processing and coking, chemical engineering, nonmetal mineral products, and etc. lead to the high energy consumption level.

Energy consumption status in Beijing (1)

----Total energy consumption

2000-2003, energy consumption change by sectors:

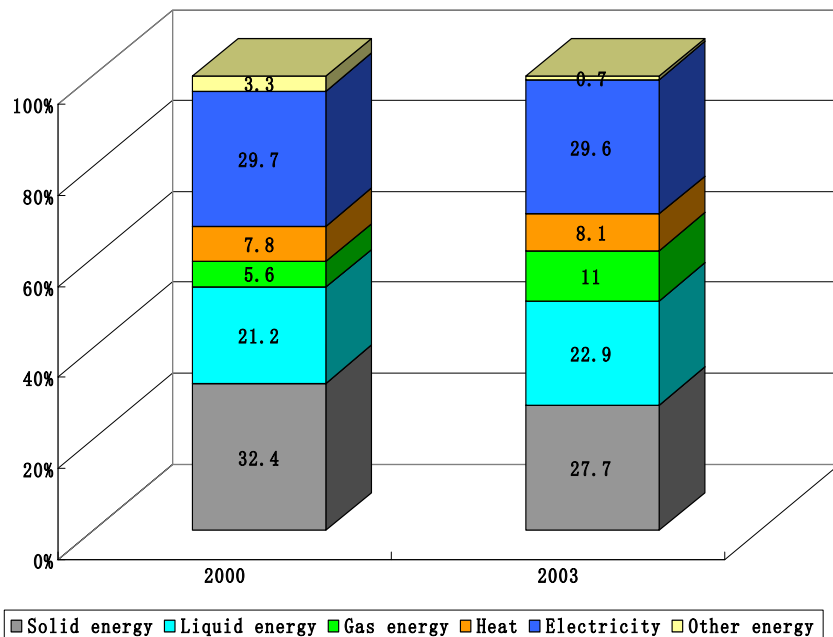
	energy consumption	% in total energy consumption
Primary Industry	decrease	decrease
Secondary Industry	increase	decrease
Tertiary Industry	increase	increase
Residential Consumption	increase	increase

- The three industries: the results of industry restructuring.
- Residential Consumption: increase of home electric appliances & hot water demand.

Energy consumption status in Beijing (2)

----End-use energy consumption

End-use energy consumption by types:



	2000 (mtce)	2003 (mtce)	2000-2003 average annual growth rate
Solid energy	13.02	12.58	-1.2%
Liquid energy	8.50	10.39	6.9%
Gas energy	2.23	4.98	30.3%
Heat	3.12	3.66	5.5%
Electricity	11.93	13.42	4.0%
Other energy	134	32	
Total	40.14	45.35	4.2%

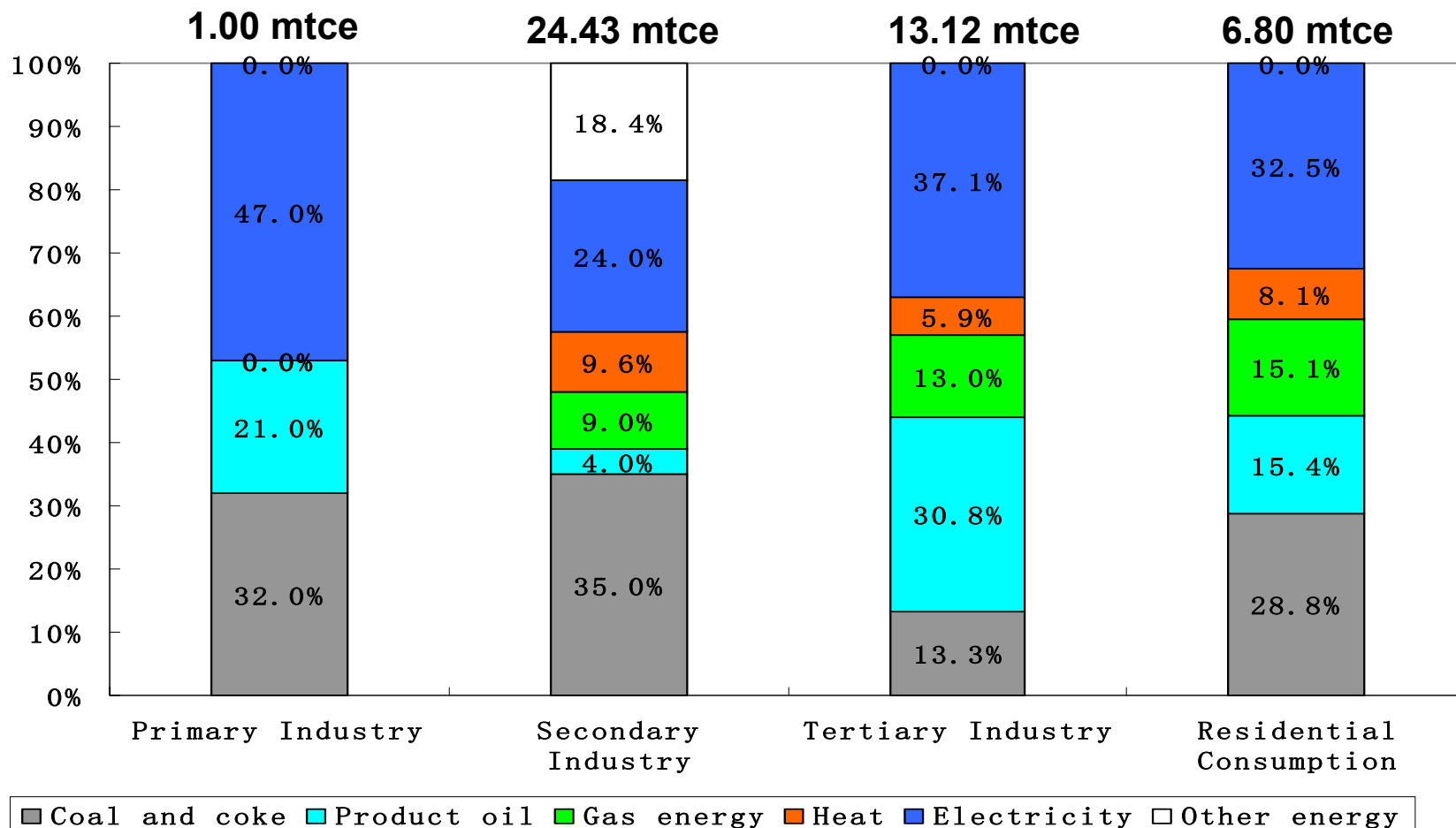
Optimizing trends of energy mix:

- Decrease of solid energy consumption and its % in total end-use consumption
- Increase of high quality energy, eg. electricity, gas and heat
- Increase of liquid energy consumption, while its % in total end-use consumption did not have great change

Energy consumption status in Beijing (2)

----End-use energy consumption

End-use energy consumption by sectors:



Energy supply status in Beijing (1)

Very limited energy resources:

- The domestic primary energy productions are only coal and small hydro power.
- More than 80% of Beijing's total energy supply relies on import from other provinces or countries.

Supply of some main energy types:

year	2000		2003	
	Import	Domestic production	Import	Domestic production
Coal (10 ⁴ t)	2356	690	2167	957
Crude oil (10 ⁴ t)	758	0	720	0
Product oil (10 ⁴ t)	234	409	428	386
Natural gas (10 ⁸ m ³)	13	0	24	0
Electricity (10 ⁸ kWh)	197	190	275	188

Energy supply status in Beijing (2)

Energy import:

- More than 2/3 of the coal supply was imported from Shanxi or other provinces.
- 100% of the crude oil supply was imported from other provinces and other countries.
- With the increase of automobile number, the import of product oil is increasing, and the import amount surpassed the domestic production of product oil in 2003.
- 100% of the NG supply was from the west gas fields and the North China Oil and Gas Field. The import amount is increasing rapidly.
- Less than 50% of the electricity supply was from Beijing's local power plants, and the rest was imported from the North China Power Grid. The import amount is increasing.

Energy export:

There are large scales of energy processing and conversion industries in Beijing, including power generation, heat supply, coking and oil refining. Some amount of secondary energy is exported from Beijing every year.

Use of renewable energy in Beijing

- The use of renewable energy has not been counted in the statistic of Beijing's total energy consumption.
- Beijing has made some progress in the development and use of small hydro power, geothermal energy, biomass energy and solar energy.
- In 2003, Beijing's total use of renewable energy was 517.7 thousand tce, equal to 1.1% of the year's total energy consumption.

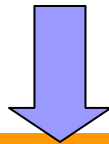
Use of renewable energy in 2003	10⁴tce	%
Geothermal energy	6.61	12.8
Solar energy	40.80	78.8
Biomass energy	4.03	7.8
Small hydro-power plant	0.33	0.6
Total	51.77	100

Problems existing in Beijing's energy use (1)

----Air pollution caused by energy

Energy use's contribution to Beijing's air pollutant concentrations
(an investigation by Beijing's environmental protection institutions):

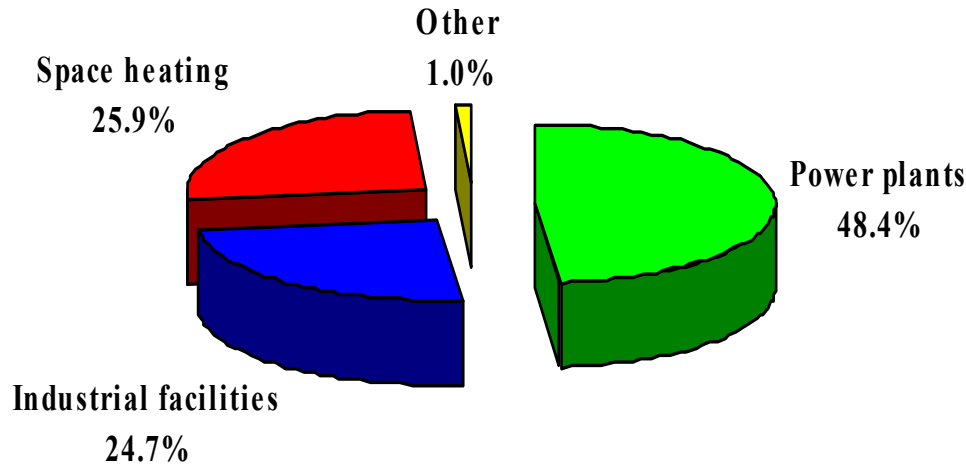
- SO₂: >90%
- NO_x: about 100% (including the emissions from automobiles)
- TSP: about 1/3 (the rest parts are from sand blown by wind and inorganizational dust emissions)



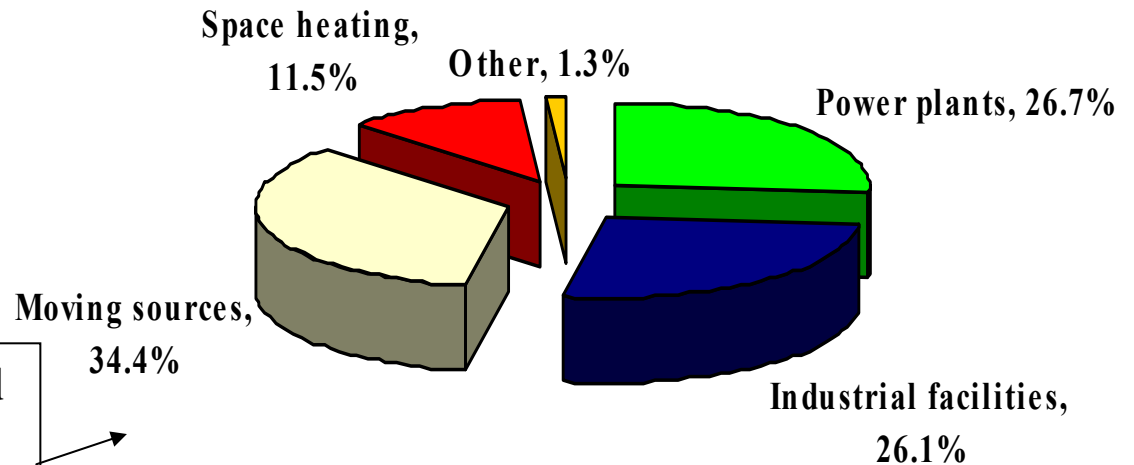
- Energy use makes dominant contribution to the emissions of SO₂ and NO_x,
- but is not the main cause for TSP emissions.

Problems existing in Beijing's energy use (1)

----Air pollution caused by energy



Main SO2 emission sources and their contribution to the total emission in urban area of Beijing (1999 statistic data)

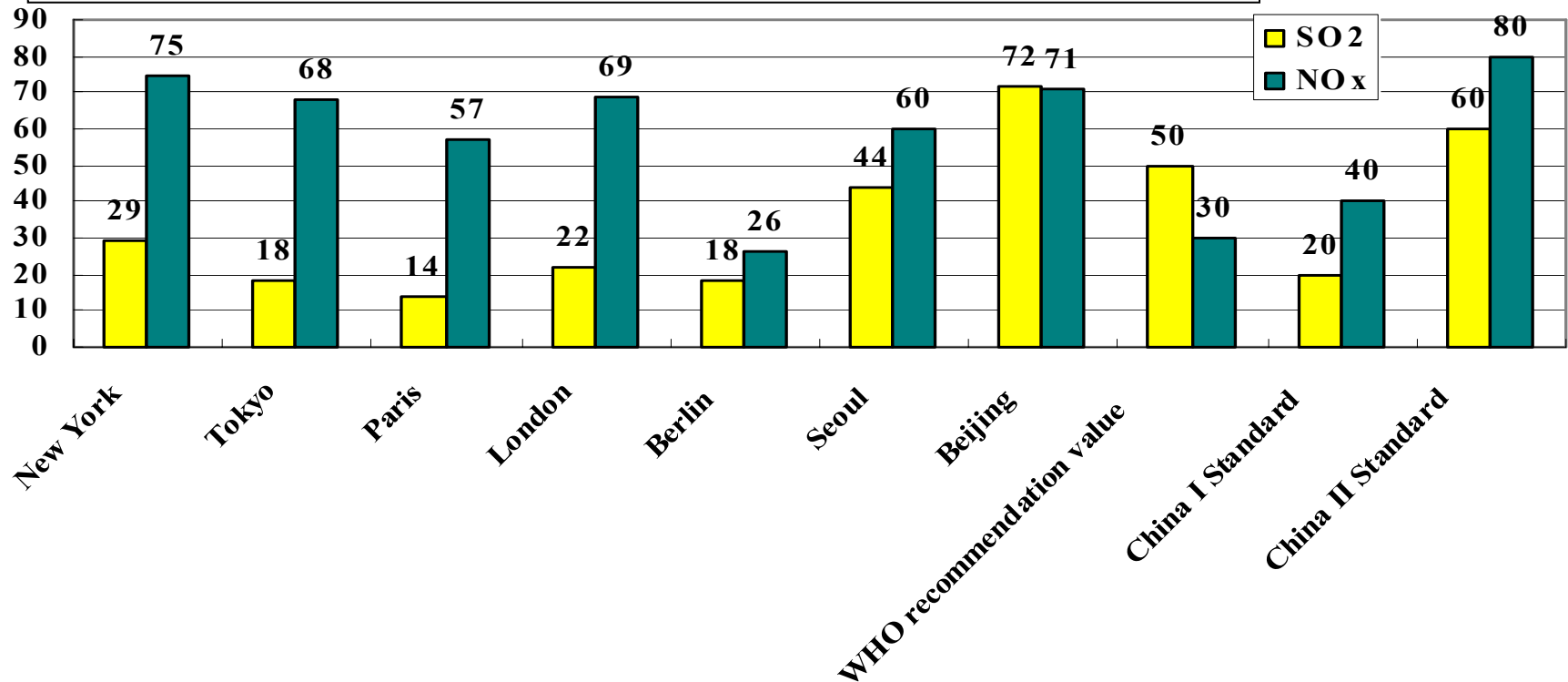


Main NOx emission sources and their contribution to the total emission in urban area of Beijing (1999 statistic data)

Problems existing in Beijing's energy use (1)

----Air pollution caused by energy

Beijing air pollutant annual daily average concentration in 2000 and a comparison

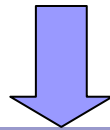


- In 2000, Beijing's air quality was inferior to the levels of most large cities of developed countries.
- The air pollutant concentration did not meet the China II Standard.
- There is even large gap to meet the WHO recommendation value and China I Standard.

Problems existing in Beijing's energy use (1)

----Air pollution caused by energy

- Through the energy restructuring, Beijing's SO₂ pollution is reducing. The annual daily average concentration of SO₂ decreased to 61 μg/m³ in 2003, close to the China II Standard, and 55 μg/m³ in 2004, better than the China II Standard.
- Due to the rapid increase of automobile number, the NO_x emissions are increasing.
- In addition to the TSP pollution from non-energy related emissions



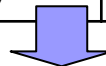
Beijing 's general status of air quality does not yet meet the China II Standard.

Problems existing in Beijing's energy use (2)

----Energy efficiency

- Beijing's energy efficiency is increasing in recent years.
- In 2003, energy intensity per 10,000RMB GDP was 1.29tce, decreased 7.9% than in 2002, and was better than China's average level 1.44tce in 2003.
- Beijing's energy intensity still has gap to the advanced level both inside and outside China.
- **eg1.** In 2003, energy intensity per 10,000RMB GDP was inferior to Shanghai (1.07tce) and Chongqing(1.19tce).
- **eg2.**北京市 The comparison of Beijing's energy intensity of some energy-intensive productions to the international advanced levels:

	Beijing 2003	International advanced level
Energy intensity per ton of steel product (tce/t)	0.794	0.646
Coal intensity of power supply (gce/kWh)	343	316
Energy intensity per ton of cement clinker (tce/t)	0.128	0.1
Energy intensity per ton of oil refining (toe/t)	0.0155	0.012



Beijing still has large potential in the energy efficiency improvement.

Problems existing in Beijing's energy use (3)

----Energy supply security

Beijing is a typical energy net import region.

The energy supply is highly dependent on import.

- There have been more and more obvious problems on coal and oil production transport and low storage amount.
- The local power grid and power plants have been full-load operated for a long time, causing an increase of accident rate.
- In the winter of 2004, there appeared the shortage of NG supply for space-heating .

Problems existing in Beijing's energy use (4)

----Seasonal energy consumption

There are great differences between peak demand and valley demand for main energy types.

In 2003

- The peak and valley difference ratio of NG was 87.4%:
peak consumption of 19.04million m³/d in the winter
valley consumption of 2.4million m³/d in the summer.
- The peak and valley difference ratio of electricity was 35.4%:
peak load of 8.33 GW in the summer
valley load of 5.38 GW in the winter.

Problems existing in Beijing's energy use (5)

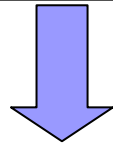
---- Low level of renewable energy development & use

- Since there are few definite encouraging policies, and the investments are deficient, the development and use of renewable energy is still in a low level in Beijing.
- In 2003, Beijing's total use of renewable energy was equal to only 1.1% of the year's total energy consumption.

Future development goals of Beijing energy system

Based on:

- The affiliations between energy, environment and economy
- The development goals in Beijing Municipal Planning 2004-2020 (just got approval by Chinese government)



Future development goals of Beijing energy system include:

- Environmental protection goals
- Energy demand and energy saving goals
- Energy supply security goals
- Economically logical goals

Future development goals of Beijing energy system

---- (1) Environmental protection goals

On the basis of air pollutant emission reductions

- In 2005, the air quality basically reach China II Standard.
- In 2010, the air quality eventually reach China II Standard.
- In the long term, the air quality reach the environmental goals of international city, better than the WHO recommendation value, and close to China I Standard.

Annual daily average air pollutant concentration of the standards ($\mu\text{g}/\text{m}^3$)

	SO₂	NO₂	TSP
China II Standard	≤ 60	≤ 80	≤ 200
China I Standard	≤ 20	≤ 40	≤ 80
WHO recommendation value	≤ 50	≤ 50	≤ 90

Future development goals of Beijing energy system

---- (1) Environmental protection goals

Deeper energy restructuring is required:

- In 2005, the energy structure will be obviously improved, to make condition for the air quality to reach the China II Standard.
- In the long term, the energy structure will meet the goal of high-quality (NG and electricity) energy domination, to make condition for the air quality to reach the international city level.

Future development goals of Beijing energy system

---- (2) Energy demand and energy saving goals

- Energy supply system must meet the energy demand of social economic development.
- At the same time, to support the economic growth and sustainable development, Beijing must be built to an energy conservation city, and the increase of the total energy consumption should be controlled.

Key fields of energy saving: Industrial energy saving, Building energy saving, electricity saving, NG efficiency improvement, and the development and use of renewable energy.

Eg.: in the industrial field, the development of high-tech industries and the restriction and innovation of energy-intensive industries will greatly reduce the growth rate of energy demand, thus to attain low speed growth, or even zero growth of the industrial energy demand.

Future development goals of Beijing energy system

---- (3) Energy supply security goals

- Diversification of energy supply sources: a development from domestic resources import to proper import of international resources, eg. the import of Russian NG.
- Reinforcing of energy preservations: not only an adjustment of the seasonal energy gap, but also a guarantee of local energy supply during the interrupt of energy transport.

Future development goals of Beijing energy system

---- (4) Economically logical goals

- To establish an economically logical energy supply system, supporting Beijing's rapid economic growth and get the best environmental benefits through relatively low economic costs.



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Thank you!