Energy Conservation and Energy Efficiency Improvement in China

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I. A brief introduction to China's energy production and consumption

- ***Mainly based on domestic supply***
  - ***Share of import in TPEC around 10% in China***
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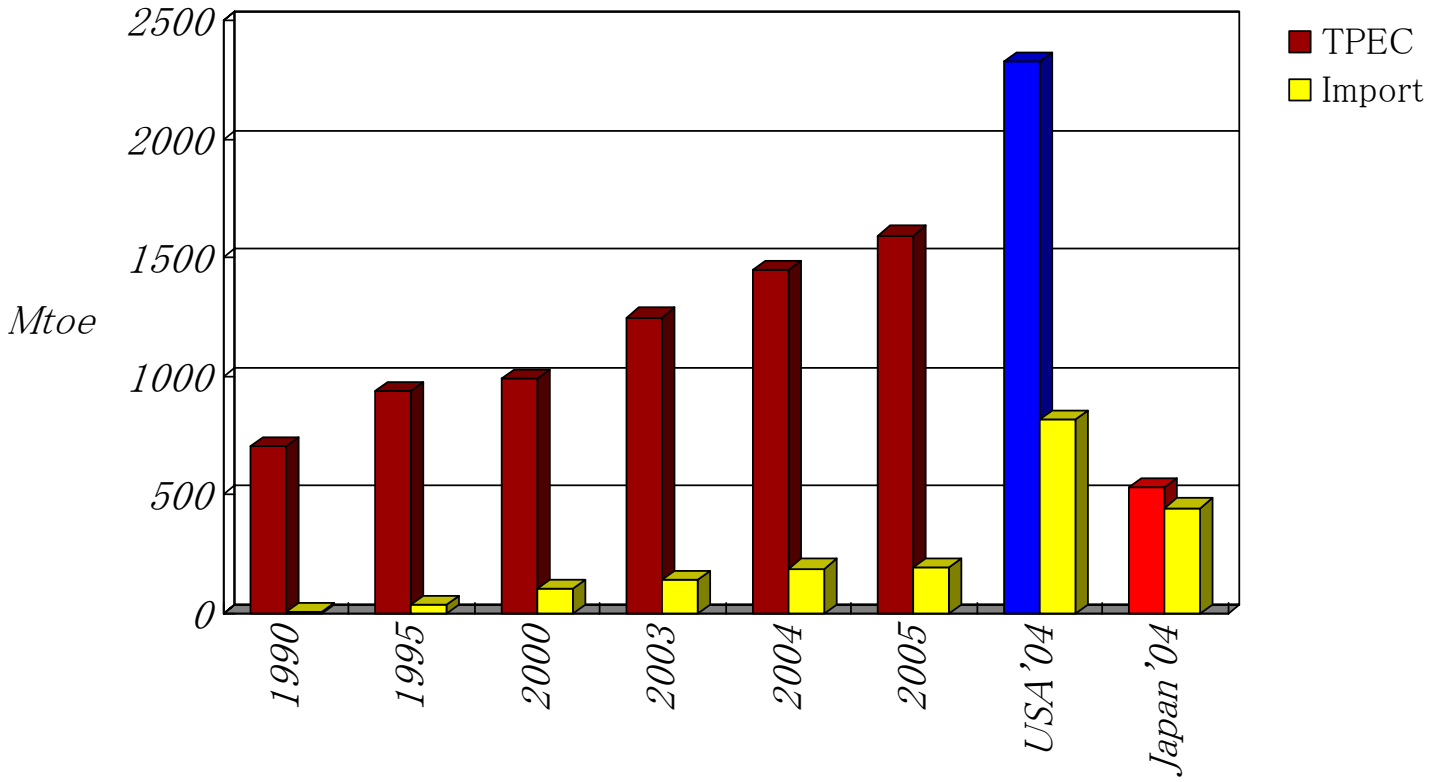
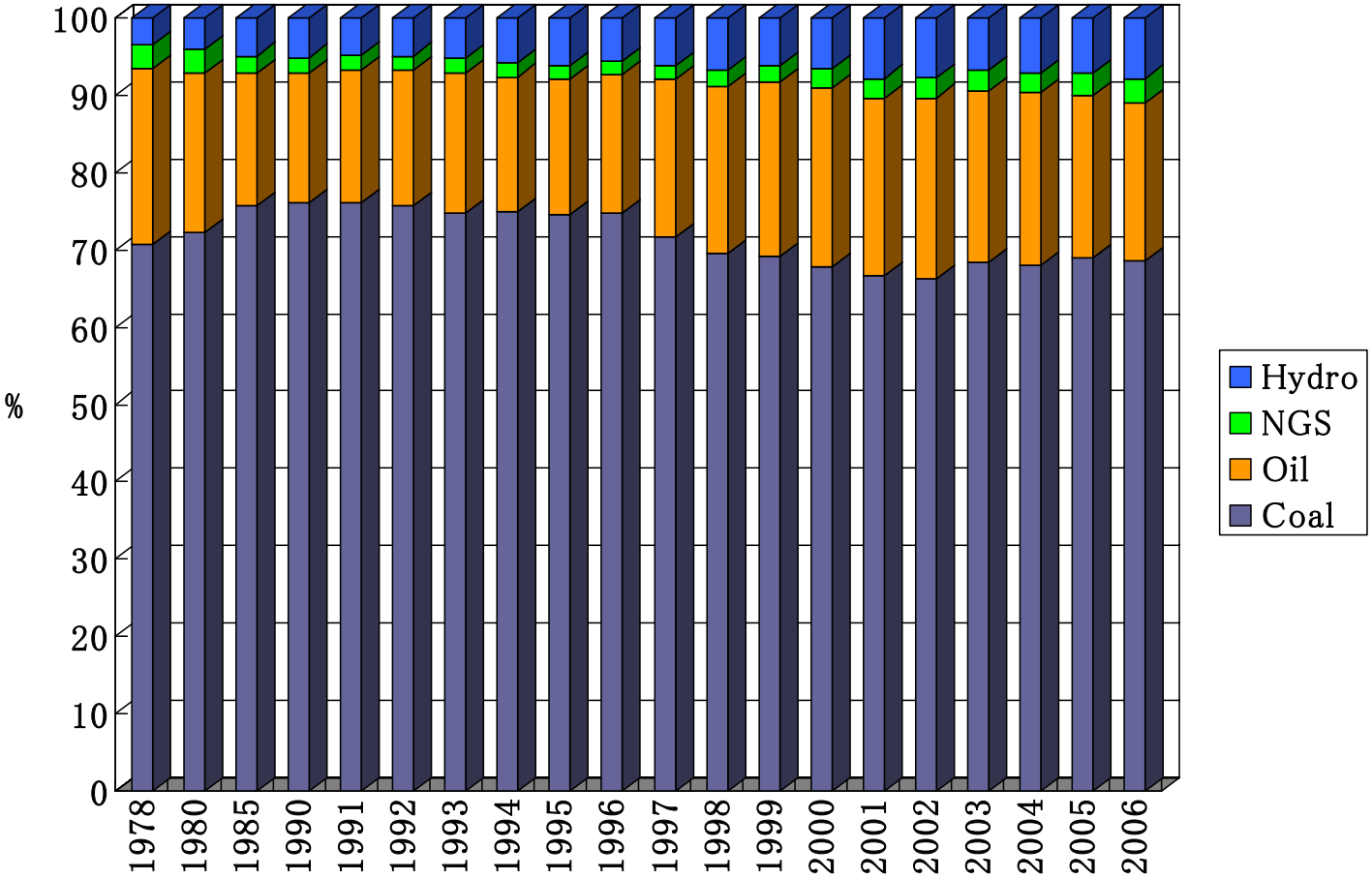
TPEC and Import in China



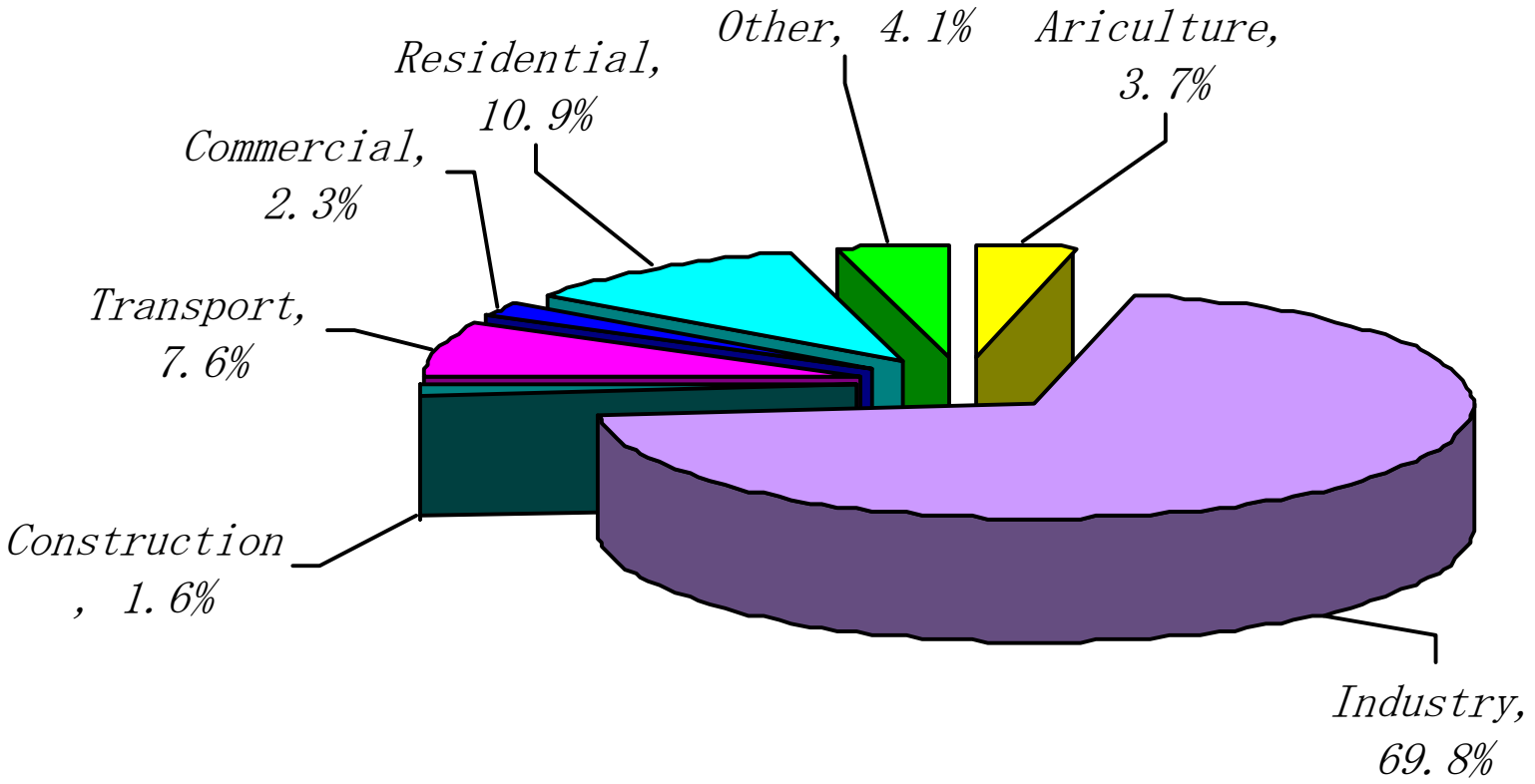
Sources: China Energy Statistical Yearbook 2006.
IEA Statistics.

Coal dominated energy mix



Mix of TPES in China.
Source: China Energy Statistical Yearbook 2006.

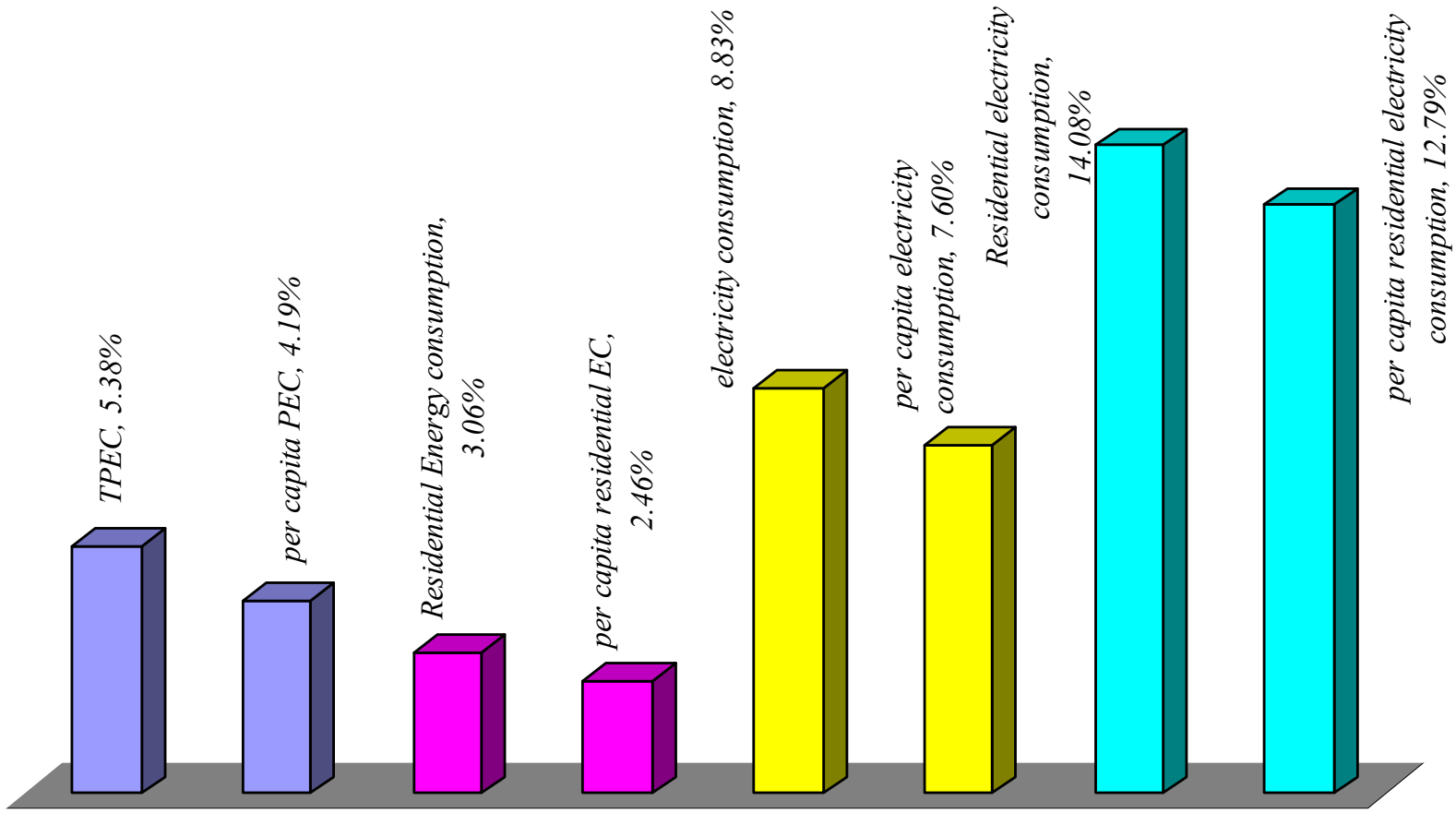
Industry is the major energy end-use sector



Share of TPEC by end-use sectors in China (2005)

Source: China Energy Statistical Yearbook 2006.

- ***Residential energy consumption increased as a result of improvement in living standard.***

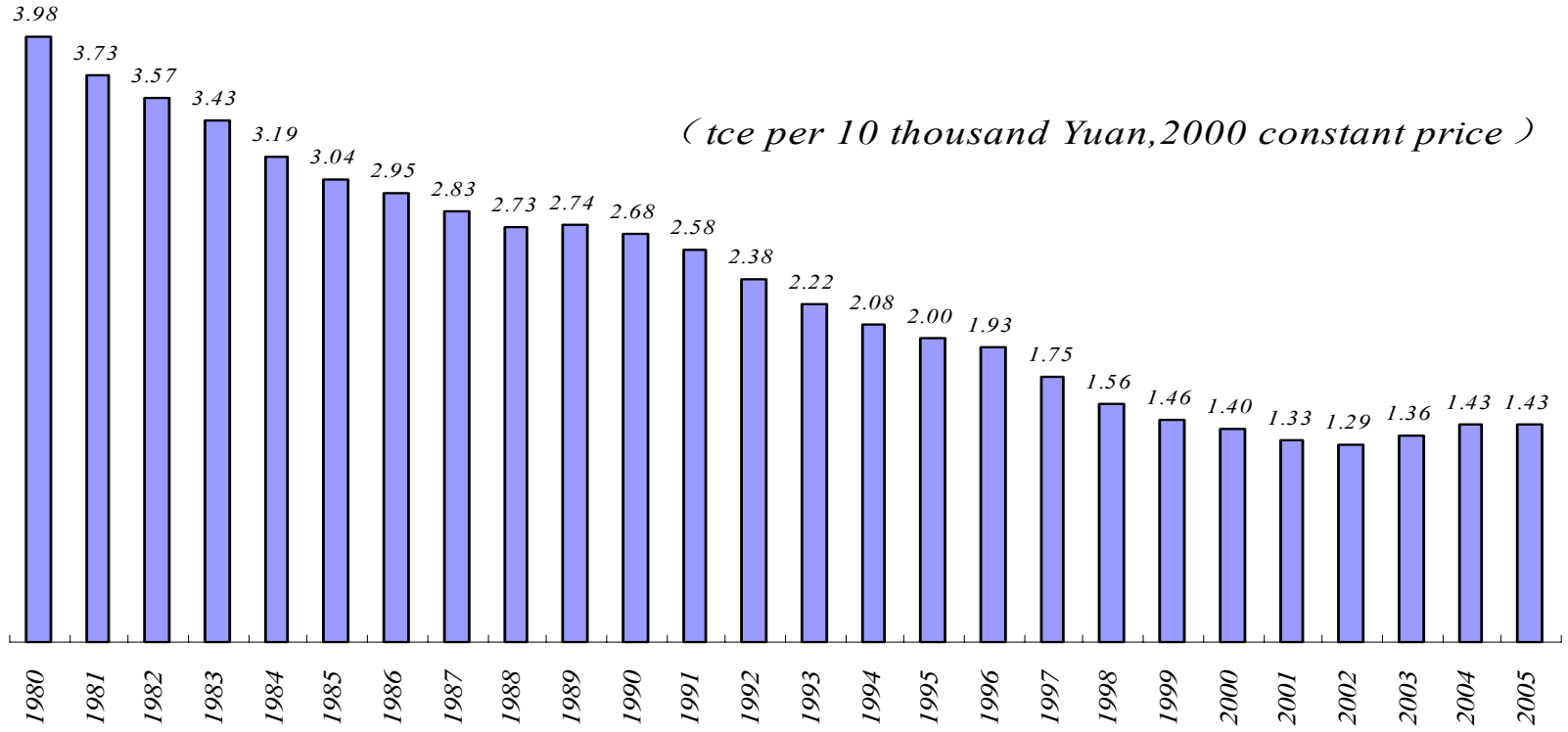


Percentage change between 1981 and 2005 in per capita residential energy consumption and per capita electricity consumption in China

II. China's achievements in energy conservation and energy efficiency improvement

- ***As early as 1980s, the Government of China adopted the principle of "equal treatment to development and conservation with immediate emphasis on the latter", making energy conservation as a matter of strategic importance in energy policy.***
- ***The breakdown of GDP across the primary, secondary and tertiary industries in 1990 is 26.9:41.3:31.8, while in 2005 it is 12.6:47.5:39.9.***
- ***The internal composition of the secondary industry has significantly changed with the increase of high value-added products due to the rapid development in machinery, information technology and electronic sectors. Such change has brought about significant energy conservation benefits.***

- ***During the period of 1991 ~ 2005, China has achieved an annual GDP growth rate of 10.2% with an annual growth rate of 5.6% in energy consumption, i.e. about 0.55 of the elasticity of energy consumption.***



- ***For energy-intensive products, per unit energy consumption has declined strikingly.***
  - ***As calculated on a year-by-year comparison, during the period of 1991 ~ 2005, an accumulated 800 million tce of energy were saved by economy restructuring and energy efficiency improvement, which is equivalent to a reduction of 1.8 billion tons of CO_2 emissions.***

Energy efficiency improvement in China's key energy-intensive sectors

	1980	1990	2000	2003	2004	International advanced
Thermal power (gce/kWh)	448	427	392	381	376	316
Steel (kgce/t)	-	997	789	726	702	646
Cement (kgce/t)	219	201	181	-	157	126
Ethylene (kgce/t)	2013	1580	1212	890		714

- ***Optimizing energy mix by developing low-carbon energy and renewable energy***
  - ***Share of coal in China's primary energy mix decreased from 76.2% in 1990 to 68.9% in 2005, whereas the shares of oil, gas and hydro increased from 16.6%, 2.1% and 5.1% in 1990 to 21.0%, 2.9% and 7.2% in 2005, respectively.***
  - ***By the end of 2005***
    - ***hydropower :117GW (23%) /401 TWh (16.2%)***
    - ***biogas digesters : 8000 million m^3 biogas annually***
    - ***biomass generation: 2 GW***
    - ***wind power: 1.3 GW***
    - ***photovoltaic: 70 MW***
    - ***solar heaters: 85 million m^2***
  - ***In 2005, the utilization of renewable energy in China equaled to 166 million tce, accounting for 7.5% of China's total energy consumption, and equivalent to a reduction of 380 million tons CO_2 emissions.***

- ***Strengthening laws and regulations***
- ***2004:***
  - ***China Medium and Long Term Energy Development Plan Outlines 2004-2020 (State Council)***
  - ***China Medium and Long Term Energy Conservation Plan (NDRC)***
- ***2005:***
  - ***Renewable Energy Law (National People's Congress)***
  - ***Notification on the Immediate Priorities for Building a Conservation-oriented Society and Views on Accelerating the Development of Circular Economy (State Council)***
  - ***Decision to Publish and Implement the Interim Provisions on Promoting Industrial Restructuring (State Council)***
  - ***Decision to Strengthen Environmental Protection by Applying the Scientific Approach of Development (State Council)***
- ***2006:***
  - ***Decision to Strengthen Energy Conservation (State Council)***

III. Energy efficiency policies and measures and the expected effects on GHG mitigation

China's Medium and Long Term Energy Development Plan Outlines 2004-2020 (State Council) presented the following energy conservation target:

index	*unit*	*1990*	*2002*	*2010*	*2020*
Energy intensity	*(tce/10 thousand Yuan)*	*5.32*	*2.68*	*2.25*	*1.54*
			1991~2002	*2003~2010*	*2003~2020*
Average annual energy saving rate	*(%)*		*5.6*	*2.2*	*3*
Energy savings	*(100 Mtce)*		*7*	*4*	*14*
SO_2 reduction	*(10 kt)*		*1050*	*-*	*2100*

	2005	*2010*	*2020*
Thermal power (gce/kWh)	*377*	*360*	*320*
Steel (kgce/t)	*700*	*685*	*640*
Non-ferrous metals (kgce/t)	*4.67*	*4.60*	*4.45*
Cement (kgce/t)	*159*	*148*	*129*
Ethylene (kgce/t)	*700*	*650*	*600*

- ***The 11th Five-year Plan of Social Economic Development of the P. R. China presented more ambitious targets for energy conservation and energy efficiency improvement.***
- ***China will achieve the target of about 20% reduction of energy consumption per unit GDP by 2010 from the 2005 level, and consequently makes great contributions to mitigating GHG emissions.***

- ***(1) Accelerate the formulation and implementation of related laws and regulations***
  - ***Improve exiting energy-saving regulations and standards***
  - ***Strengthen supervision and monitoring on energy conservation***

- ***(2) Strengthen institutional innovation and mechanism construction***
  - ***Establish target-oriented responsibility and assessment systems for energy conservation.***
  - ***Carry out comprehensive resource planning and electric power demand side management, integrate energy saving as a kind of energy resource into overall planning so as to guide reasonable resource allocation.***
  - ***Actively promote the authentication of energy-saving products and implement energy-efficient labeling management system.***
  - ***Put forward contract-based energy management to overcome market barriers in promoting new energy-saving technologies***
  - ***Promote industrialization of energy-saving practices, aiming at providing all-around services such as diagnosis, design, financing, renovation, operation and management for enterprises to implement energy-saving renovation.***
  - ***Establish an energy-saving investment assurance mechanism to promote the development of energy-saving technological service system.***
  - ***Popularize energy-saving voluntary agreements to motivate enthusiasm from enterprises and industrial societies to save energy.***

- ***(3) Strengthen relevant policies and measures***
  - ***Vigorously adjust industrial structure and its regional distribution***
  - ***Strictly implement the Industrial Restructuring Guiding Catalog***
  - ***Formulate preferential policies for energy-saving products.***
  - ***Study financial and tax policies to encourage the development of energy-saving and environment-friendly vehicles, and to speed up the elimination of inefficient vehicles.***

- ***(4) Strengthen the development and dissemination of energy conservation technologies in key sectors***
  - ***Iron and steel industry***
  - ***Nonferrous metal industry***
  - ***Oil and petrochemical industry***
  - ***Building material industry***
  - ***Transportation***
  - ***Agricultural machinery***
  - ***Building***
  - ***Commercial and residential energy conservation***

- ***(5) Further carry out the 10 prioritized programmes for energy conservation as presented in China's Medium-and-Long-Term Energy Conservation Plan***
  - *Upgrading of Low-efficiency Coal-fired Industrial Boiler (Kiln)*
  - *District Heat and Power Cogeneration*
  - *Recovery of Residual Heat and Pressure*
  - *Oil Saving and Substitution*
  - *Energy Conservation of Motor System*
  - *Optimization of Energy System*
  - *Energy Conservation in Buildings*
  - *Green Lighting*
  - *Energy Conservation in Government Agencies*
  - *Energy Conservation Monitoring and Technological Support System*
- ***Through the implementation of these programmes, it is estimated that 240 Mtce of energy can be conserved during the 11th five-year plan period (2006-2010), equivalent to 550 Mt CO_2 reductions.***

IV. Technology needs

- ***China is at the stage of large-scale infrastructure construction, and is in urgent need of advanced technology for energy efficiency improvement so as to control GHG emission growing trend.***
- ***China's technology need in energy efficiency area mainly covers:***
  - ***advanced energy production and utilization technology***
  - ***environmental protection and resource comprehensive utilization technology***
  - ***high-efficiency transportation technology***
  - ***new type of high efficiency building material technology***
  - ***etc.***

- ***Among these needs the following technologies are the priorities:***
  - ***high-efficiency, low-pollution for coal-fired power generation***
  - ***large scale unit for hydropower generation***
  - ***new generation nuclear power generation***
  - ***renewable energy technology***
  - ***building energy conservation technology***
  - ***clean fuel vehicle technology***
  - ***hybrid vehicle technology***
  - ***urban rail-based traffic technology***
  - ***fuel cell and hydrogen technology***
  - ***oxygen-rich coal-spray blast furnace & long-life span technology***
  - ***upgrade of medium and small scale nitrogen fertilizer processes***
  - ***new type of building materials***

V. Conclusions

- ***Owing to the limitation of domestic reserves of energy resources and the increasing energy demand, China has been practicing energy conservation as a basic energy strategy for decades;***
- ***Energy conservation and energy efficiency improvement is now the top prioritized energy strategy for China;***
- ***Through its continuous and strengthened efforts on energy conservation and energy efficiency improvement, China will continue to make greater contributions to mitigating GHG emissions while pursuing sustainable development;***
- ***China needs advanced energy technologies to achieve higher energy efficiency.***