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2.2.1

China's Climate Change Approach

Purpose: Information

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Energy Campaigns and Climate Change in China

1. Background

In China, due to rapid economic growth, total primary energy consumption increased from 400 Mtoe in 1978 to nearly 1540 Mtoe in 2005, with an annual average rate of increase of 4.7% (see Figure 1)(China Energy Year Book 2002-2003, 2004; China Year Book 2004, 2004). Coal is the major energy source, providing 70.7% in 1978, decreased to 68% in 2000 and then increased to 68.9% in 2005 of total primary energy use (see Figure 2). Recent years have witnessed a dramatic surge in the rate of increase of energy use in China and widespread energy shortages.

Figure 1 Energy production and consumption in China

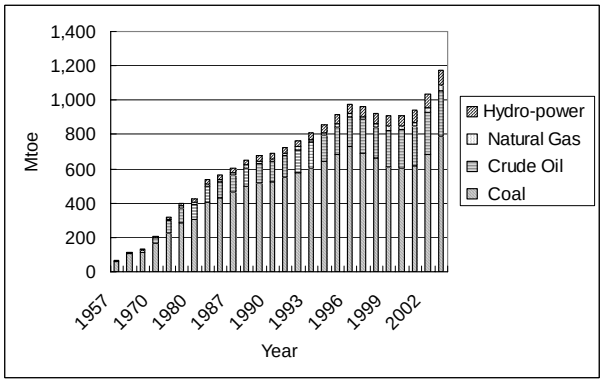
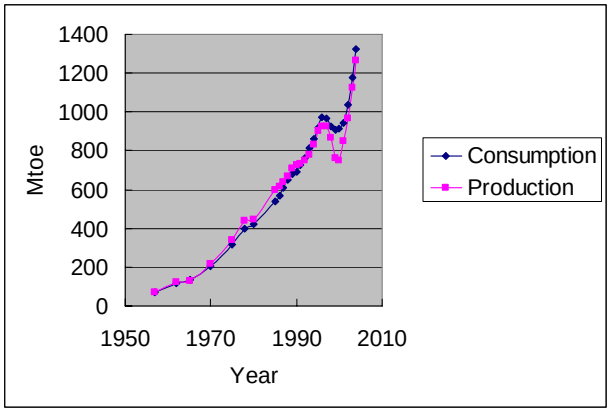


Figure 2 Primary energy use in China by energy type



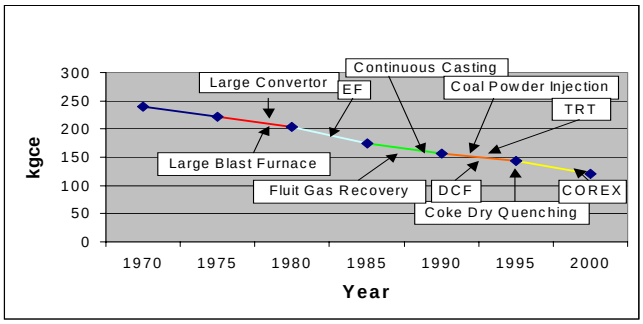
China is the largest coal-producing and -consuming country in the world. Between 1980 and 2005, total raw coal output increased from 620 Mt to more than 2204 Mt, with an average annual growth rate of 5.2% per year. Prior to 2000, the share of coal use in total energy use decreased, but it increased again from 67.8% in 2000 to 68.9% in 2005. The heavy dependence on coal has led to serious environmental problems and represents a burden for the transportation system.

From 1980 to 2005, total installed capacity of electricity power generation increased from 66 GW to 510 GW. In the same period, electricity output increased from 300 TWh to 2500 TWh. In 2005, newly installed capacity reached 70 GW.

Between 1980 and 2005, total crude oil output increased from 106 Mt to 181 Mt. In 2002, 149 Mt was produced on land and 18 Mt was produced offshore. Crude oil output in China accounts for 4.8% of the world total.

Energy efficiency improvement and energy conservation are given high priority in the energy development strategy in China, as is the efficient and clean use of coal and other fossil energy sources. The objective of developing clean coal technology is to improve coal utilization efficiency, to reduce environmental pollution and to promote economic development. High efficiency and clean technology will be crucial for China to achieve a low-emission development path. Figure 3 illustrates the way in which energy efficiency improvements in the steel-making industry have been driven by advanced technology diffusion.

Figure 3 Technology progress and energy efficiency improvement in steel making industry



Note: EF- electric furnace, TRT-Top Gas Pressure Recovery Turbine, DCF-Direct Current Furnace

2. National Policies

The 16th CPC National Congress advanced that China will achieve the objectives of building an all-around, well-off society by 2020. Along with the increase of population and the acceleration of industrialization and urbanization, the demand for energy will increase significantly. The imbalance between energy constraints and economic development, and the environmental pollution brought about by energy utilization will become even more evident.

In November 2004, the China Medium and Long Term Energy Conservation Plan (MLTECP) was announced. This plan aims to push the whole society towards energy conservation and energy intensity reduction, to remove energy bottlenecks, to build an energy saving society, and to promote a sustainable social and economic development and thus realize the grand objective of building a society that is well-off in every aspect. The plan foresees incentive policies to intensify energy conservation and to implement the guideline of giving priority to energy conservation. It also includes efforts to:

- Implement unified and harmonized energy and environmental policies to promote energy conservation;
- Implement industrial policies to facilitate structural adjustment;
- Strengthen energy conservation management according to laws;
- Accelerate development, demonstration and promotion of energy conservation technology;

- Promote new market-based energy conservation mechanisms;
- Reinforce energy conservation regulation on key energy consuming units;
- Intensify promotion, education and training on energy conservation;
- Enhance organization and leadership, and promote program implementation.

If the government targets for energy conservation contained in the MLTECP are achieved, we estimate that energy demand growth in China will drop significantly – from 11.9% annually during the 10th FYP period 2001-05, to only 3.8% annually between 2006 and 2010, assuming a GDP growth rate of 8.5%. The impact of this energy conservation strategy on Chinese enterprises could be significant, given the energy-intensive nature of the economy. Whereas the machinery and equipment sectors may benefit from rising investment in energy conservation, environmental protection and renewable energy, upstream oil companies could suffer.

The Chinese political system is currently in the process of devising more detailed sectoral implementation plans under the 11th 5-Year-Plan, including an Energy Plan, which is expected to draw heavily on the MLTECP. One specific initiative currently under preparation is the "1000-Enterprise Program," which would require the largest energy end-using enterprises – many of which are state-controlled enterprises – to report on their energy use and to enter into voluntary agreements with the government. These companies are responsible for approximately 30% of China's total energy demand, and the program is expected to result in fuel savings equivalent to 500 million TCE (14.7 EJ) by 2010. As provincial and local plans for implementation of the 11th 5-Year-Plan are devised over the next months, more concrete carrots and sticks for enterprises to engage in energy efficiency improvements will emerge.

China's 11th Five-Year Plan for National Economic and Social Development (11th FYP) puts energy at the top of the agenda and represents a major shift in government strategy towards a "scientific approach to development." For the first time, the Chinese Communist Party formally recognized that economic growth (measured in GDP terms) is not an adequate measure of economic development. This policy shift is reflected explicitly in the 11th FYP, which only contains two quantitative targets:

- doubling of per-capita GDP between 2000 and 2010 and
- a 20% reduction in energy intensity (energy consumption per unit of GDP) over the period 2006-2010.

3. Energy and Emission Scenarios for China

3.1 Major assumptions

The major assumptions used in this study (including population, GDP growth and mix) are given in the following tables. The assumptions for population come from other studies. The assumed GDP growth rate is consistent with government targets and research by the Development Research Center (Zheng et al.,2004; Tan et al., 2002; Qu, 2003; Liu et al., 2002)

Table 1 Population assumption, million

	2000	2010	2020	2030
Population	1284	1380	1460	1530
Urban	413	676	919	1071
Rural	872	703	540	459

Note: Assumptions by authors, based on review of relevant studies

Table 2 GDP growth in China

	2000-2010	2010-2020	2020-2030
Annual GDP Growth Rate	8.6%	7.7%	6.5%

In order to analyze energy trading, we used the IPCC SRES B2 scenario as a global scenario (Jiang et al.,2000a). The IPCC SRES scenario is a scenario family developed by the Intergovernmental Panel on Climate Change in 2001, which includes seven scenario groups. The B2 scenario reflects a world with good intentions, which it is not always capable of implementing. This storyline is most consistent with current national and international developments. On balance, the B2 world is one of central tendencies that can be characterized as neutral progress among SRES scenarios. Human welfare, equality and environmental protection all have high priority, but the world proves unable to tackle these concerns at a global level and resolves them as best it can regionally or locally. Generally, high educational levels promote both development and environmental protection. Education and welfare programs are widely pursued, leading to reductions in mortality and to a lesser extent fertility. This results in a central population projection of about 10.4 billion people by 2100, consistent with the United Nations median projection. Gross World Product (GWP) grows at an intermediate growth rate of 2 percent per year, reaching about US$ 235 trillion in 2100. The B2 storyline also presents a generally favorable climate for innovation and technological change, especially in view of high educational levels compared to today and relatively efficient markets at the regional level. B2 is a world of “regional stewardship” that, in some regions, is particularly frugal with energy and many other natural resources. Consequently, energy system structures differ among the regions. Overall high priority is given to environmental protection, although global policies prove elusive and regional polices vary widely. Major assumptions are given in Tables 3 to 5.

For the Developing Asia-Pacific region, the B2 scenario assumes that economic development utilizes resources so as to maintain equity for the future, while maintaining balance among regions as well as between urban and rural areas. Such an approach is introduced based on the recognition of environmental issues and sustainable development. This scenario can be described as regional stewardship from a global perspective, based on a natural evolution of the present institutional policies and structures. It is characterized by limited population growth, medium economic growth, inequality reduction, weak global governance but strong national and regional governance, a strong de-urbanization trend, strong pursuit of environmental improvement, and encouragement of renewable energy use. It is a low per capita economic development scenario. In this scenario, the per capita GDP in the region is only 1/5 that of the OECD countries by 2100.

All of China’s emission scenarios were developed under the IPCC SRES B2 scenario. In IPAC-emission model, international energy trade was included in the study based on the resource cost effective availability (Jiang et al., 2000b; Jiang et al., 1999).

Table 3 Key Scenario Drivers Assumed for the Developing Asia-Pacific and the World in IPAC-Emission model

Item	Assumptions
Asia-Pacific Population	4.7 billion in 2050 5.0 billion in 2100
Asia-Pacific Annual GDP Growth Rate	5.7% from 1990 to 2050, 3.8% from 2050 to 2100
World Population	11.7 billion in 2100
World GDP	$250 trillion in 2100
GDP/ capita trends	Disparity remains GDP/capita of OECD becomes 7 times of non-OECD (now 13 times).
AEEI	1.0%-1.2%
International Trade	Low trade across regions High trade cost
Urbanization	Increase in developing world before 2050, decrease in developed world

Table 4 Assumptions for B2 Scenario for the Developing Asia-Pacific and the world

Item	Assumptions
Resource availability	Oil/gas: medium; Biomass: high
Energy exploitation cost	Medium
Non-carbon renewable energy cost	High for nuclear, medium for solar and others
Biomass availability	Medium
End-use technology efficiency improvement	Medium
Social efficiency improvement	Medium
Transport conservation	High
Dematerialization trend	Medium
Land-use productivity improvement	Medium
Meat-oriented food habit	Low
Desulphurization degree	High

Table 5 Factors influenced by key driving forces

Driving forces	Sectors	Factors	Policies to promote the Change
Social Efficiency Change	Industry	Value added change by sub-sectors within the sector (as service demand of some sub-sectors including machinery, other chemical, other mining, other industry sector etc.) Products structure change within one sector(as service demand in most industrial sectors)	Various policies relative to value added such as price policy, national plan for key industry, promote well working market Market oriented policies, national development policies.
	Residential and Commercial	Energy activity change within the sector(such as change of use of heating, cooling; use of more efficient electric appliances etc.)	Public education, price policies
	Transport	Change of transport mode(more public transport, non-mobilty etc.) Traffic volume conservation(use less private car)	Transport development policies, public education
Technology progress	For all sectors	Efficiency progress for technology(unit energy use improvement) Technology mix change(, more advanced technologies) Fuel mix change(more renewable energy and nuclear)	Technology R&D promotion, market oriented policies, international collaboration Market oriented policies, environmental regulation National energy industry policies, import & export policies, tax system

3.2 Scenarios

In order to analyze future energy demand and emissions in China, we consider three scenarios. Considering the uncertainty for energy intensive products demand with impact of WTO accession, a baseline scenario and a high demand scenario were given. Another one is policy scenario. The three scenarios are defined as follows:

- Baseline scenario: This scenario gives a basic trend to describe future economic activities. There will be better international trading and China's economy will be part of global economy. Therefore China could rely on international markets and energy resource imports to meet part of its energy supply needs.

- Policy scenario: Various energy and emission control policies are assumed for this low demand scenario, which reflects energy supply and environmental constraints.

The basic assumptions for the three scenarios, such as population and GDP growth, are the same.

Policy options to be considered in the policy scenario are given in Table 6. These policy options were defined based on policy potential in China and technology trends (Qu, 2003; Liu et al., 2002; IPCC 2001a; IPCC 2002)

Table 6 Policy options used in the modeling study

Policy options	Explanation
Technology promotion policy	End use technology efficiency increase by using new technologies
Energy efficiency standard for buildings	New buildings reach 75% increase standard in 2030
Renewable energy development policy	Promote use of renewable energy(subsidy for wind power, biomass power generation; government supporting village biogas supply system)
Energy tax	Introduce vehicle tax by 2005, and energy tax by 2015
Public transport policies	In cities public transport in 2030 will take 10 to 15% higher share than 2000.
Transport Efficiency Improvement	High fuel efficiency vehicles widely used, including hybrid vehicle, compact cars, advanced diesel car
Power Generation Efficiency	Efficiency of coal fired power plants increase to 40% by 2030
Nature Gas Incentive	Enhance natural gas supply, localization of technology to reduce cost
Nuclear power development	National promotion program by setting up target, enhanced government investment, technology development

3.3 Results

Energy demand is calculated using the IPAC-Emission model, Baseline scenario results are given in Figures 4 to 6.

Figure 4 Final energy demand in baseline scenario

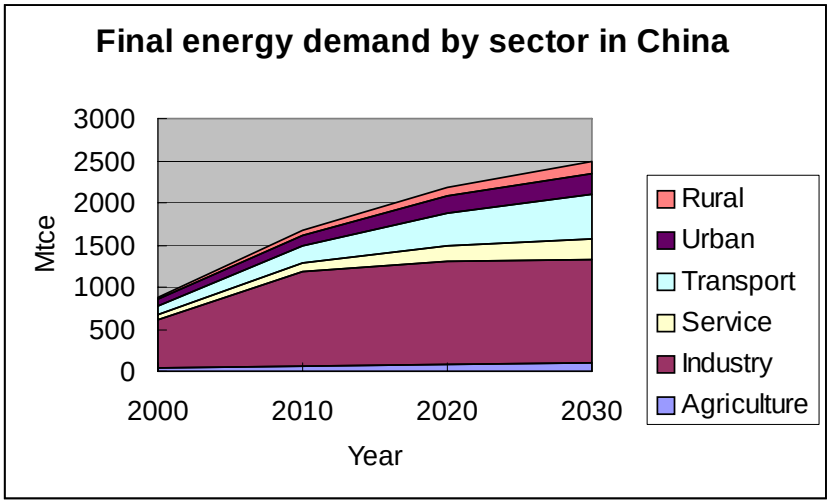


Figure 5 Final energy demand by sector in baseline scenario

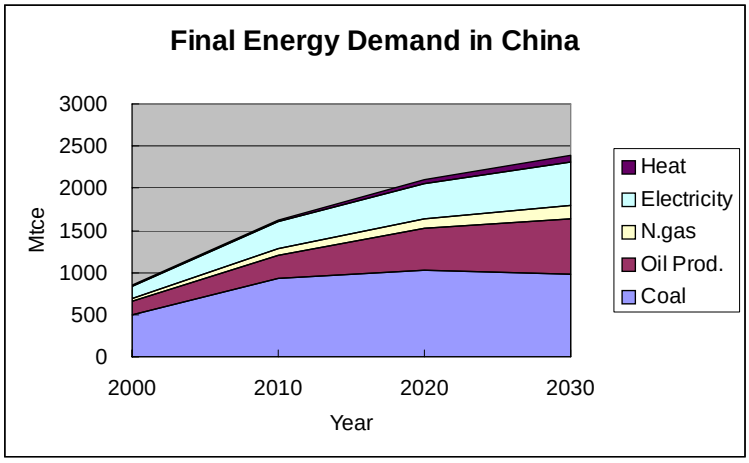
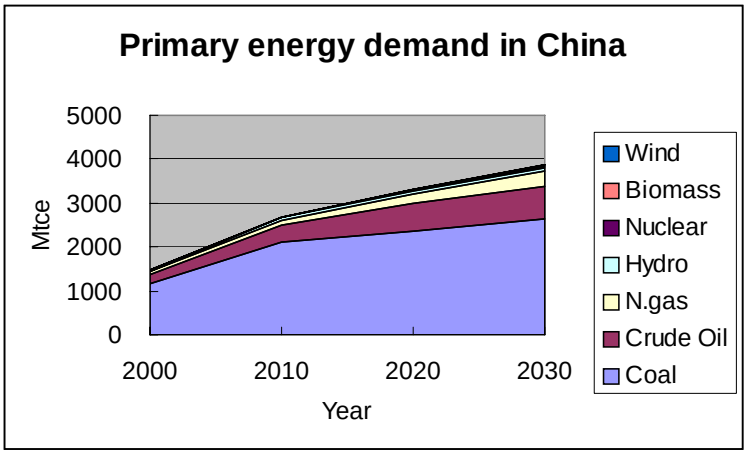
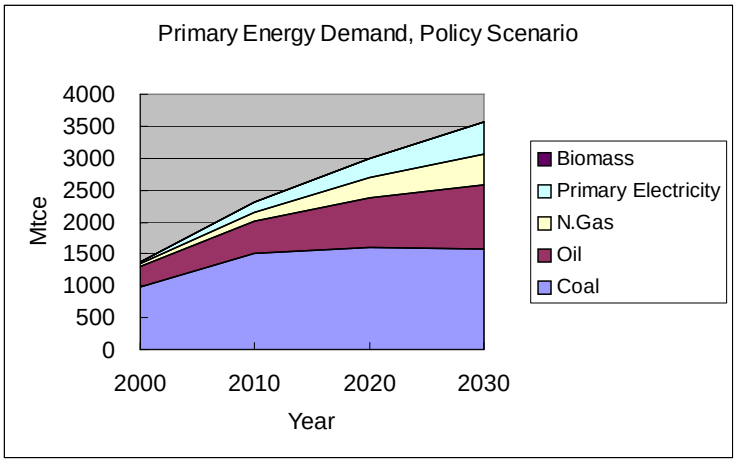


Figure 6 Primary energy demand in baseline scenario



By assuming the adoption of energy and environmental policy measures, the policy scenario results are described in Figures 13 and 14. Compared to the baseline scenario, there is nearly 245 million toe energy demand reduction in 2020, 280 mtoe in 2030. By exploring the policy options, we found there is big pressure to apply these policy option in order to reach the lower energy demand scenario, and also need to be introduced at early time because of long life span of energy technologies.

Figure 7 Primary energy demand in policy scenario



If we look at the effects for policy options used in the policy scenario, by comparing with baseline scenario and high demand scenario, we found there are a package of policy options could be adopted now to reduce the growth rate of energy demand. For example policy to promote penetration rate of high energy efficiency technologies(see table 7), fiscal energy and environment policies including vehicle fuel taxes, subsidies for renewable energy, emission taxes, resource taxes etc., and policy to promote public involvement, are important for China to go to a low energy demand scenario.

Table 7 Technologies contributing to Energy saving and GHG emission reduction in short and middle-term

Sector	Technologies
Steel Industry	Large size equipment (Coke Oven, Blast furnace, Basic oxygen furnace ,etc.), Equipment of coke dry quenching, Continuous casting machine, TRT Continuous rolling machine, Equipment of coke oven gas, OH gas and Blast Furnace gas recovery , DC-electric arc furnace
Chemical Industry	Large size equipment for Chemical Production, Waste Heat Recover System, Ion membrane technology, Existing Technology Improving
Paper Making	Co-generation System, facilities of residue heat utilization, Black liquor recovery system, Continuous distillation system
Textile	Co-generation System, Shuttleless loom, High Speed Printing and Dyeing
Non-ferrous metal	Reverberator furnace, Waste Heat Recover System, QSL for lead and zinc production
Building Materials	Dry process rotary kiln with pre-calciner, Electric power generator with residue heat, Colburn process, Hoffman kiln, Tunnel kiln
Machinery	High speed cutting, Electric-hydraulic hammer, Heat Preservation Furnace
Residential	Cooking by gas, Centralized Space Heating System, Energy Saving Electric Appliance, High Efficient Lighting, Solar thermal for hot water, insulation of building and energy efficient windows
Service	Centralized Space Heating System, Centralized Cooling Heating System, Co-generation System, Energy Saving Electric Appliance, High Efficient Lighting
Transport	Hybrid vehicle, advanced diesel truck, Low Energy Use Car, Electric Car, Fuel cell vehicle, Natural Gas Car, Electric Railway Locomotives, public transport development
Common Use Technology	High Efficiency Boiler, Fluid Bed Combustion Technology, High Efficiency Electric Motor Speed Adjustable Motor, Centrifugal Electric Fun, Energy Saving Lighting
Power generation	Super critical unit, Natural Gas Combined Cycle, Pressured Fluid Bed Combustion Boiler, Wind turbine, Integrated Gasification Combined Cycle, Smaller Scale Hydropower, biomass based power generation

4. Clean Coal Technology Future

4.1 Global progress

In 2000, Version 21 program in United States was initiated. This program focus various advanced new integrated technology development, to promote high efficient and clean utilization of coal. Final target of the program is to development clean coal technologies with nearly zero emission. The basic idea is to start from coal gasification, and gas is further changed to H2, H2 could be used for power generation with efficiency nearly 60%, through fuel cell and gas turbine combined cycle. H2 could also be used as transportation fuel. Co2 from the process could be collected and stored.

Early Entrance Co-production Plant(EECP) was planed to be in commercial use in 2007 with financial support from DOE, to verify technology feasibility and risk control. This program initiated three feasible pilot phase projects.

In United States, Air Product&Chemicals Co. and Eastman Chemical Products Co. started to construct pilot phase plants on LPMEOH and LPDME, which are the technologies to produce methanol, Dimethyl Ether, and co-generation. These plants were constructed in 1997.

Some famous international companies including BP, GE, Air Products and Chemicals, Shell made study on coal integrated generation system. There are more then ten sets IGCC system in petro-chemical companies in the world.

However as coal use is reducing in many European countries, the investment for clean coal technology R&D is decreasing. Even in United State, the investment for energy technology R&D is also decreasing. This presented challenge for future clean coal technology development, and need more initiatives and international collaborations.

4.2 Clean coal technology development in China

Coal washing: in 2003, coal washing rate is only 24%, remain very low washing rate.

Coal-Water mixture: There are huge development of coal-water mixture in China. In 1999 the production capacity was less than 900 thousand ton. The production capacity increased to be nearly 7 million ton in 2003.

Industry briquette: because of high price, progress of industry briquette is slow. Recently air pollution issues raised the possibility to use more industry briquette.

Ultra-super critical unit: 1GW unit is under construction in Yuantian Power Plant, which started construction in 2004 and will be in operation in 2007. This is one component of National 863 Project.

IGCC: Project fesibility study was done for Beijing IGCC project and Yantai IGCC project during 1995 to 2000. And now Yantai IGCC project is under construction. Yanzhou Coal Mine Group also made plan for IGCC, together with methanol generation system. This project started construction in 2003.

Underground coal gasification: Shan Dong Lineng Group made plan for a pilot phase project on underground coal gasification. This project inlcuds four gasification furnace with total capacity 3million m3 per day.

Poly-Generation: in 973 Program, a preliminary analysis was conducted, and several companies, research institutes, universities are planning to construct gasification power generation, fuel and feedstock poly-generation system.

Direct Coal Liquefaction: In 2002, shenhua Direct Coal Liquefaction project was approved by State Council and started construction. This project is expected to start production in 2007. Fundamental research for direct coal liquefaction is taken by research institutes such as China Coal Research Academy.

Desulphurisation: with recent rapid increase of coal fired power plants, newly construct coal fired power plant with sulphur content higher than 1% equipped with desulphurisation technology. And due to air pollution in cities, some existing coal fired power plants near cities also started to equip with desulphurisation equipments.

Low Nox Combustion technology: still in research process. One pilot project is under construction. As research project, more then ten units equipped with low Nox combustor.

4.3 National programs and planning

The National High Technology Research and Development Program (863 Program) was launched in March 1986 with the aim of enhancing China's international competitiveness and improving China's overall capability of R&D in high technology. The Program covers 20 subject topics selected from eight priority areas: Biotechnology, Information, Automation, Energy, Advanced Materials, Marine, Space and Laser. The first six areas are managed by the Ministry of Science and Technology (MOST) of the People's Republic of China. In the program, there are several key energy technologies. Clean coal technology development is one component of that. In this program under Tenth-Five-Year Plan, advanced coal fired power generation, advanced coal conversion, fluid gas purification of coal combustion were put as key research topics.

The Coal-Fired MHD Power Generating Technology Project has completed the designing and manufacturing of a helical electrical MHD propeller used for conducting performance test of the high field superconducting electrical MHD propeller. Through international cooperation, the performance test of a 15-tesla high field helical closed-loop electrical MHD propeller was conducted successfully, the actual field intensity being 14 teslas. Besides, a 700A electrode current and 9.3-14% propeller efficiency were achieved under the high field condition.

By recognizing the importance of coal in China, clean coal focused policies were adopted in China. In 1995, China Clean Coal Ninth-Five-Year Plan and Development Framework up to 2010 were announced by government. This plan mainly covers four areas including coal processing, high efficient clean combustion., coal conversion, emission control and disposal processing. Fourteen technologies were specified in the plan: coal washing and dressing, briquette, coal liquefaction, FBDC, PFBC, IGCC, fuel cell, fluid gas control, utilization of waste from power plants, utilization of coal bed methane, coal stone washing water use, industrial boiler and kiln.

4.4 Energy scenarios with focus on clean coal

The future projections are made under a baseline scenario China. This scenario gives a basic trend to describe future economic activities. There will be better international trading and China’s economy will be part of global economy. Therefore China could rely on international markets and energy resource imports to meet part of its energy supply needs.

From the energy scenarios we can see coal will play very important role in both primary energy supply and final energy supply. Coal production could reach 1.31 billion tce by 2020 and 1.48 billion tce by 2030. Chinese coal industry experts estimate an upper bound of coal production of 1.2 billion tce by 2020. Coal demand, therefore, could exceed domestic coal production in China(Figure 7 and 8).

Figure 8 Energy production in baseline scenario

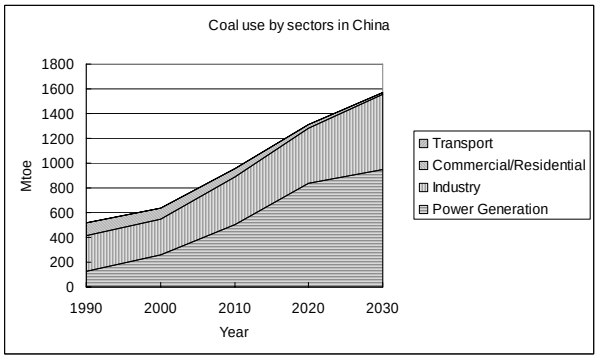
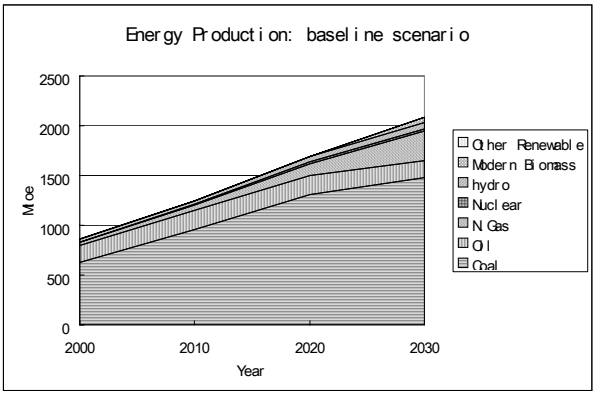


Figure 9 Coal use by sectors



In the baseline scenario, development of these technologies was set up in a preliminary diffusion way. Table 8 shows the technology involvement in the baseline scenario.

Table 8 Clean coal technologies in baseline scenario

Sector	Technology	Share in 2030
Power generation	Super Critical	25%
	IGCC	4%
Industry/Boiler	Advanced boiler	45%
Industry/Kiln	Advanced kiln	38%
Coal processing	Coal liquefaction	2% of total coal
Desulfurazation in power plants		58% of total coal fired power plants

By assuming the adoption of energy and environmental policy measures, the policy scenario results are described in Figures 5 and 6. Compared to the baseline scenario, there is nearly 245 million tce energy demand lower in 2020, 280 mtce in 2030. There is 160mtoe coal saved. By exploring the policy options, we found there is big pressure to apply these policy option in order to reach the lower energy demand scenario, and also need to be introduced at early time because of long life span of energy technologies. Among these policy options, clean coal technology development and diffusion is one of the key components. Major assumption for clean coal technology development in this scenario is given in table 9.

Table 10 clean coal technology in policy scenario

Sector/Process	Technology	Share in 2030
Power generation	Super Critical	25%
	IGCC	30%
Industry/Boiler	Advanced boiler	75%
Industry/Kiln	Advanced kiln	70%
Coal processing	Coal liquefaction	10% of total coal
Desulphurisation in power plants		80% of total coal fired power plants

5. Discussion / Conclusion

- With rapid energy demand increase, a full range of effort for energy conservation, efficient technology development and diffusion should be the top priority. Some countermeasures, such as building energy efficiency standard, renewable energy use in buildings, fuel tax for vehicles etc., which were not strictly implemented should be used now.
- There will be a rapid development period for energy supply industry in next several decades. Energy supply industry in China should fully realize the pressure they will face. A long-term development strategy is very essential. A clear policy framework for energy development should be given.
- Technology progress should be emphasized to look for lower energy demand in future.
- Further policy options such as energy tax, resource tax, export tax for energy intensive products etc. should be considered.
- Need integrated policy package, rather then energy and climate change policies. Economy activities are more important then energy and climate change mitigation policies.
- China could contribute to technology R&D from the view point of global technology progress, mainly including clean coal technologies and renewable energy utilization technologies.
- International collaboration is important, Demand from development, local environment, Climate Change, technology is crucial for large scale mitigation. And we have to work earlier to get correct infrastructure constructed.
- Existing international organizations and collaboration partnership should play important role, such as World Bank, UN, Asia Pacific Partnership on Clean Development and Climate, etc.
- Domestic energy and environment policies are much consistent with climate change mitigation policies.
- Emission target is important, but actions are much more important. Evaluation of national effort for climate change should base on actions.
- Negotiation on commits will get much political concerning and need long time.
- China is taking largest energy conservation/renewable/nuclear campaign in the world. This could be included in climate change regime and be encouraged
- Need to establish international technology R&D collaboration framework, research centers/research program

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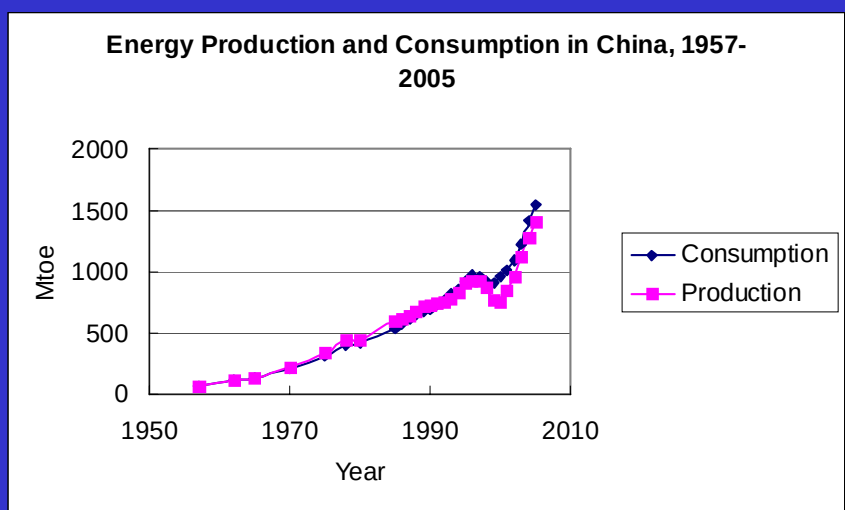
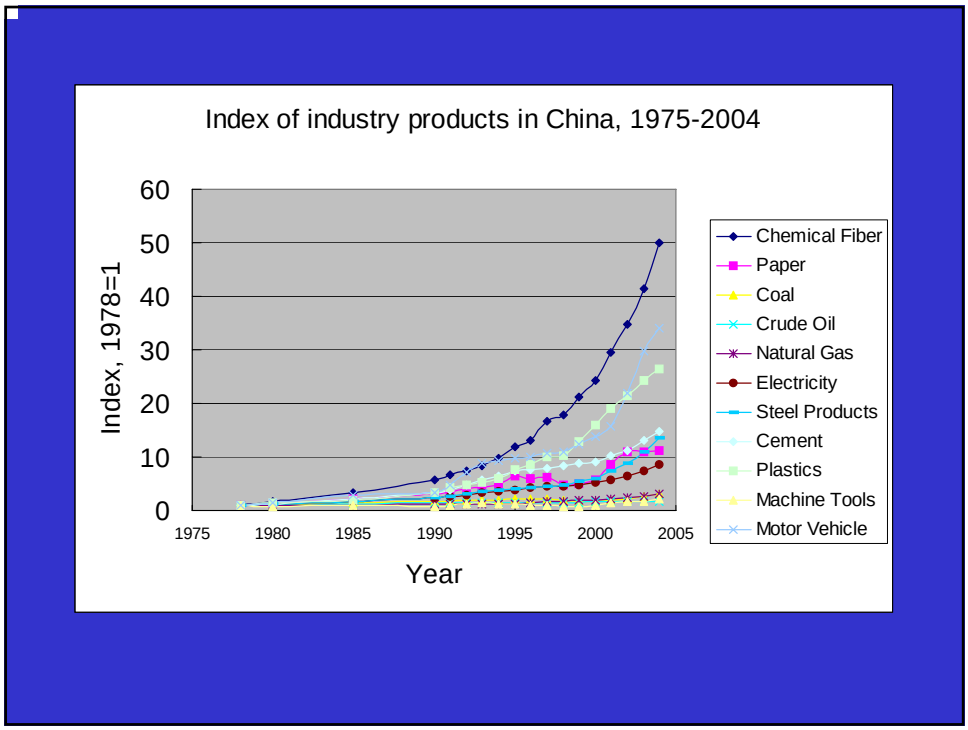
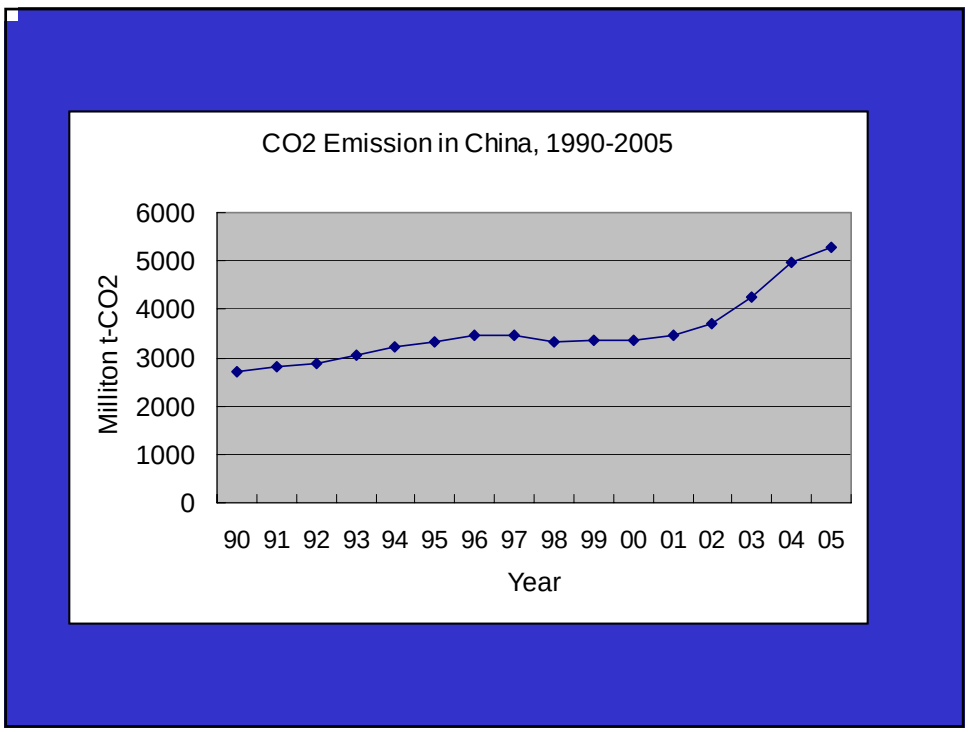
APEC 2007 Annual Conference of APEC Centre, 18-20 April, Melbourne




Index of industry products in China, 1975-2004
Index, 1978=1
60
50
40
30
20
10
0
1975
1980
1985
1990
1995
2000
2005
Year
Chemical Fiber
Paper
Coal
Crude Oil
Natural Gas
Electricity
Steel Products
Cement
Plastics
Machine Tools
Motor Vehicle


CO2 Emission in China, 1990-2005
Milliton t-CO2
6000
5000
4000
3000
2000
1000
0
90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05
Year

Energy Policies: After 2003

Energy issue is becoming crucial concerning of government:

- Sustainable development is an important voice in recent years; circular economy is widely accepted
- Widely spread energy shortage: power shortage in 24 provinces in 2004; Gasoline shortage in Guang Dong province in 2005
- Environment target was not reached in 10th Five Year Plan, energy is key driving force
- Accident in coal mine is widely known by public, and major concerning of government on improving life and working standard of rural employees
- Energy price increase is getting much more attention on energy

Energy Policies: After 2003

National laws and plan

- Long- and Medium-term Energy Conservation Plan, with much more concrete content
- Renewable energy law: renewable energy target by 2020
- 11th Five Year Energy Plan: National energy intensity target: 20% energy intensity reduction from 2005 to 2010

Energy Policies: After 2003

Standard and regulation

- Vehicle fuel efficiency standard
- Strictly implementation of building energy standard in many provinces and cities
- Implementation of energy label of electric appliances
- Release control on coal price for all users
- Higher consumption tax for larger engine vehicles

Sustainable Development and Energy Policies

Renewable energy law: renewable energy target by 2020

Wind:	30GW
Solar Power PV:	1.8GW
Solar heater:	300million m2
Biomass Power:	30GW
Biomass Diesel:	2Mt
Biomass	10Mt
Biomass solid fuel:	50million ton
Small Hydro:	80GW

Energy Policies: After 2003

What's going on:

- Draft Energy Law
- Revise Energy Conservation Law
- Draft Oil and Natural Gas Law
- Renewable energy development plan up to 2020

- Implement fuel tax
- Second vehicle fuel efficiency standard
- Renewable energy policies (pricing, funding)

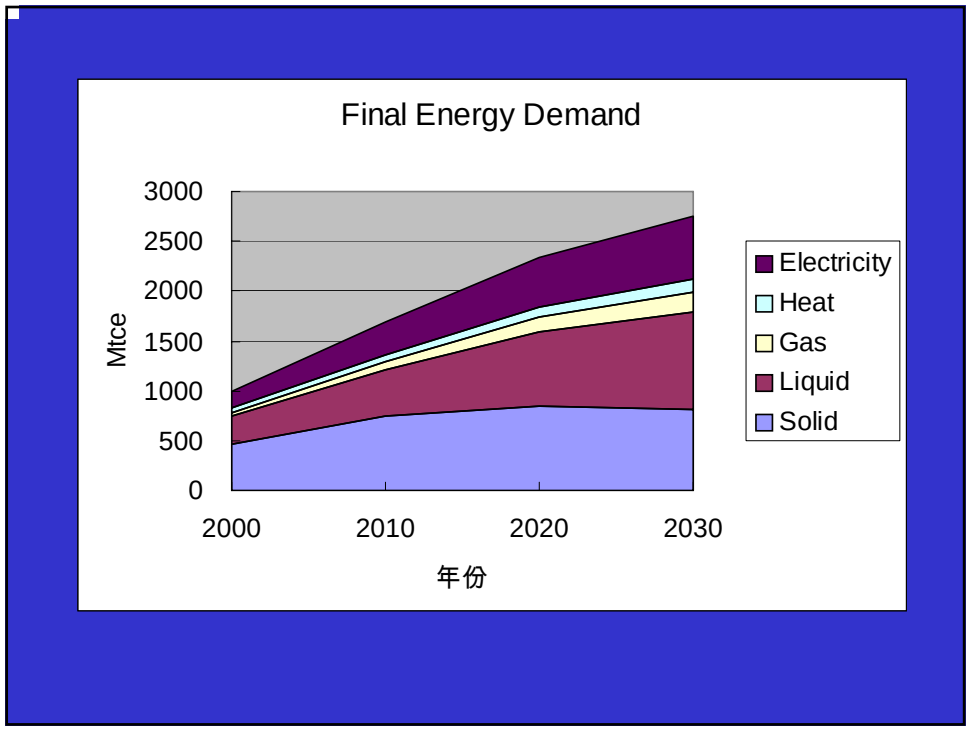
- Energy reporting by government officials
- Energy monitoring for 1000 large energy users

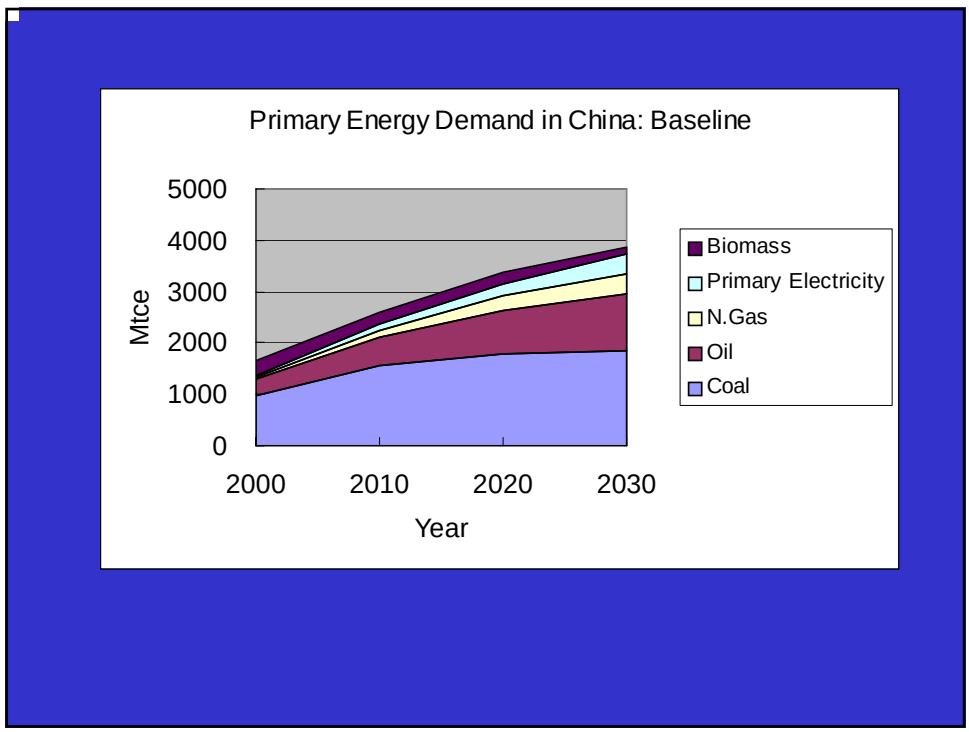
- More than 500 energy conservation projects, in 11th five year plan

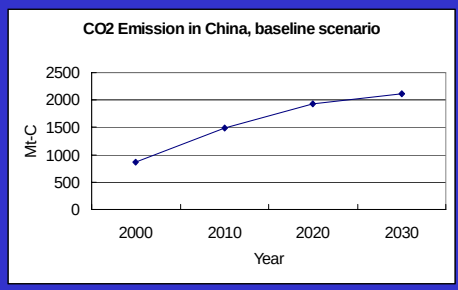
Climate Change Policies in China

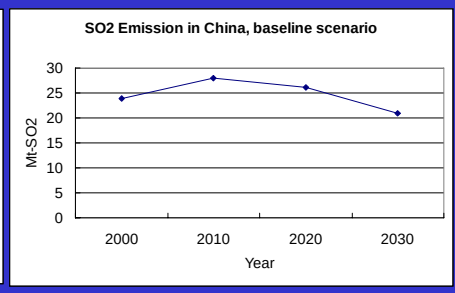
So far there is no specific climate change policies in China, undergoing work includes:

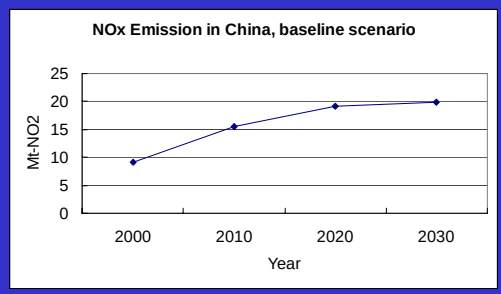
- Climate Change Strategy of China
- National Programs on Climate Change: the White Book, will be officially released in 24 April.


Final Energy Demand
3000
2500
2000
1500
1000
500
0
Mtce
2000
2010
2020
2030
年份
Electricity
Heat
Gas
Liquid
Solid


Primary Energy Demand in China: Baseline
5000
4000
3000
2000
1000
0
Mtce
2000
2010
2020
2030
Year
Biomass
Primary Electricity
N.Gas
Oil
Coal





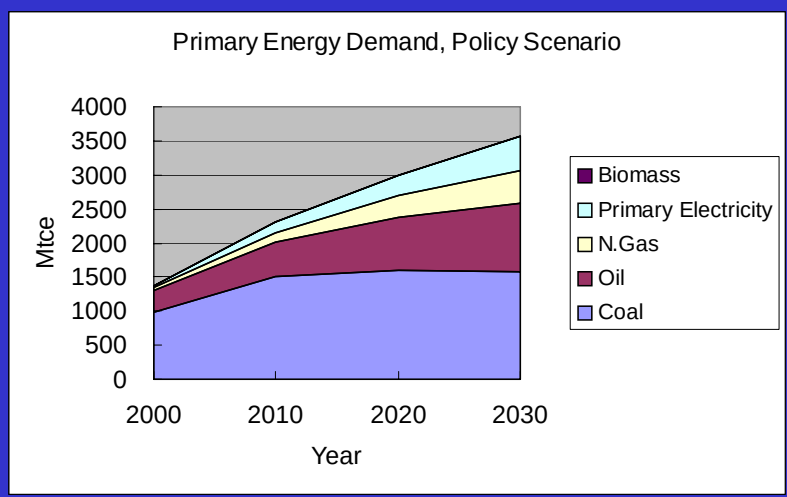


Options for Policy Scenario

Policy options	Explanation
Technology promotion policy	End use technology efficiency increase by using new technologies
Energy efficiency standard for buildings	New buildings reach 75% increase standard in 2030
Renewable energy development policy	Promote use of renewable energy(subsidy for wind power, biomass power generation; government supporting village biogas supply system)
Energy tax	Introduce vehicle tax by 2005, and energy tax by 2015
Public transport policies	In cities public transport in 2030 will take 10 to 15% higher share than 2000.
Transport Efficiency Improvement	High fuel efficiency vehicles widely used, including hybrid vehicle, compact cars, advanced diesel car
Power Generation Efficiency	Efficiency of coal fired power plants increase to 40% by 2030
Nature Gas Incentive	Enhance natural gas supply, localization of technology to reduce cost
Nuclear power development	National promotion program by setting up target, enhanced government investment, technology development
Energy Intensive Production Policies	Increase export tax, using resource tax
Environment policies	SO2, NOX Emission control, 40% lower in 2020
Recycling Policies	Increase recycling of building material, increase use of recycle chemical materials

Identify efficiency promised technologies: fully used by 2020

Sector	Technologies
Steel Industry	Large size equipment (Coke Oven, Blast furnace, Basic oxygen furnace ,etc.), Equipment of coke dry quenching, Continuous casting machine, TRT Continuous rolling machine, Equipment of coke oven gas, OH gas and BOF gas recovery , DC-electric arc furnace
Chemical Industry	Large size equipment for Chemical Production, Waste Heat Recover System, Ion membrane technology, Existing Technology Improving
Paper Making	Co-generation System, facilities of residue heat utilization, Black liquor recovery system, Continuous distillation system
Textile	Co-generation System, Shuttleless loom, High Speed Printing and Dyeing
Non-ferrous metal	Reverberator furnace, Waste Heat Recover System, QSL for lead and zinc production
Building Materials	dry process rotary kiln with pre-calciner, Electric power generator with residue heat, Colburn process, Hoffman kiln, Tunnel kiln
Machinery	High speed cutting, Electric-hydraulic hammer, Heat Preservation Furnace
Residential	Cooking by gas, Centralized Space Heating System, Energy Saving Electric Appliance, High Efficient Lighting
Service	Centralized Space Heating System, Centralized Cooling Heating System, Co-generation System, Energy Saving Electric Appliance, High Efficient Lighting
Transport	Diesel truck, Low Energy Use Car, Electric Car, Natural Gas Car, Electric Railway Locomotives
Common Use Technology	High Efficiency Boiler, FCB Technology, High Efficiency Electric Motor Speed Adjustable Motor, Centrifugal Electric Fun, Energy Saving Lighting



Profit to develop clean coal technologies

- Increase energy security: self-supply of energy 93% in 2005. In 2030, self supply will be 76% in 2030 in baseline scenario, 77% in policy scenario, with smaller import.
- Fundamental industry in China with large employment: 7.6 million employees in 2004, 7.8million in 2030. Important thing is this is good for low income people to fine opportunity
- Extend economy activities. Taking lead for clean coal technology in the world will bring economy benefit. Three power equipment companies in China is becoming among top manufactures in the world in 2005(largest power capacity suppliers for coal fired power plants), and started to export advanced coal fired power plants.

Profit to develop clean coal technologies(Conti.)

- Very good environment effects. SO2, NOx, PM emission, water pollution will be significantly reduced by using clean coal technologies, also very important for GHG emission reduction. Clean coal technology development will be crucial for government environment target in 11th Five Year Plan
- Contribution to global climate change collaboration. Asia-Pacific Partnership on Clean Development and Climate, China-EU Partnership on Climate Change have component of clean coal technology collaboration

For China: domestic policies

- Need integrated policy package, rather then energy and climate change policies
- Economy activities are more important then energy and climate change mitigation policies

Technologies: China can do something

- Clean coal technologies: getting to be large manufacture country, but very slow progress in IGCC etc. Hopefully this will be changed with the new Science and Technology Development Strategy
- Biomass utilization technologies: bio-gasification, ethanol production technologies, bio-diesel

Technologies: International collaboration is important

- Demand from development, local environment, Climate Change, technology is crucial for large scale mitigation
- Working earlier to get correct infrastructure constructed
- Who can play the role? WB, UN, APP, Private?
- Domestic energy and environment policies are much consistent with climate change mitigation policies,

International actions: China's involvement

- Emission target is important, but actions are much more important
- Negotiation on commits will get much political concerning and need long time
- China is taking largest energy conservation/renewable/nuclear campaign in the world
- This could be included in climate change regime and be encouraged
- Need to establish international technology R&D collaboration framework, research centers/research program