

Proposal on future cooperation with ETSAP under G8 +5

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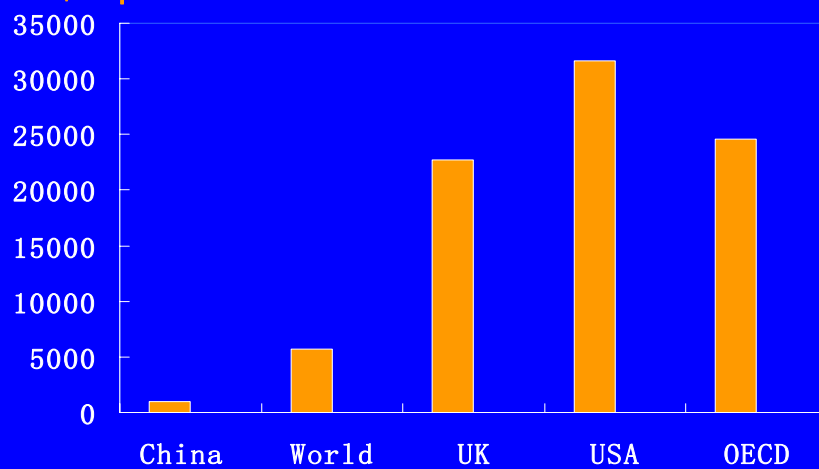
Outline

- **Current energy situation in China**
- **Challenges facing China energy**
- **MARKAL modeling activities**
- **Proposal on future cooperation with ETSAP under G8 +5**

Current energy situation

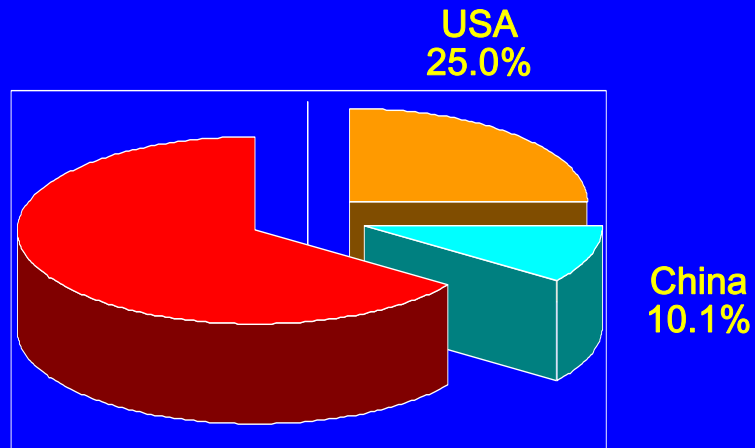
Per Capita GDP Less Than 1/5 World Average

95US\$/capita



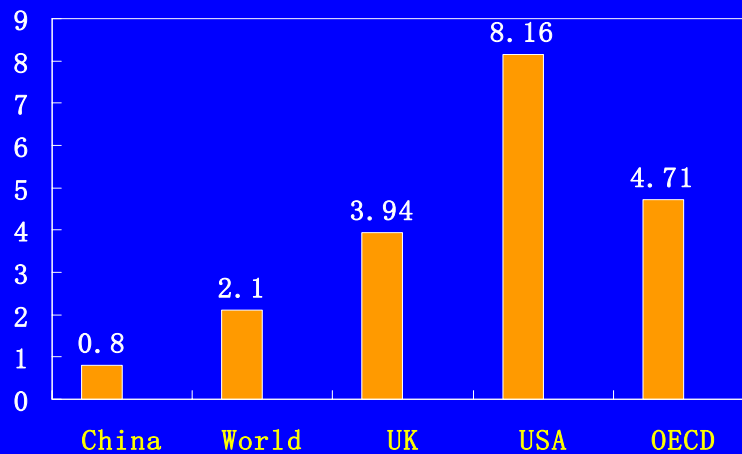
2002

Primary Energy Consumption 10% of the World Total



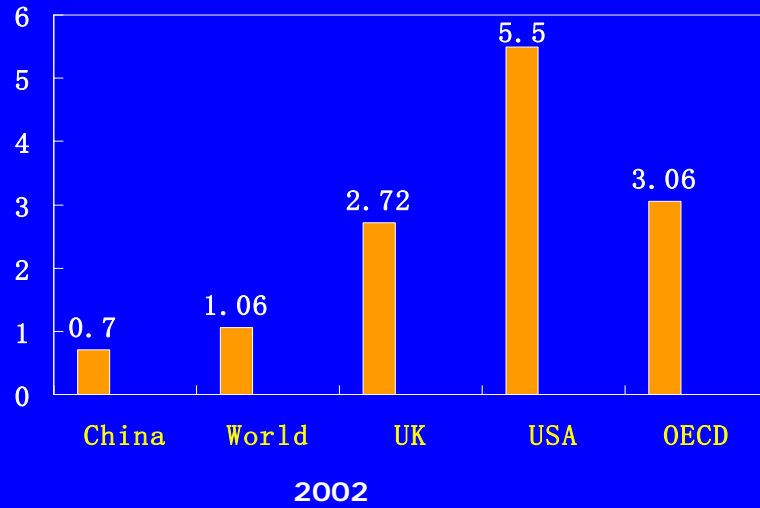
1037 Mtoe of China in 2002

Energy Consumption Per Capita Less Than Half of World Average toe/capita

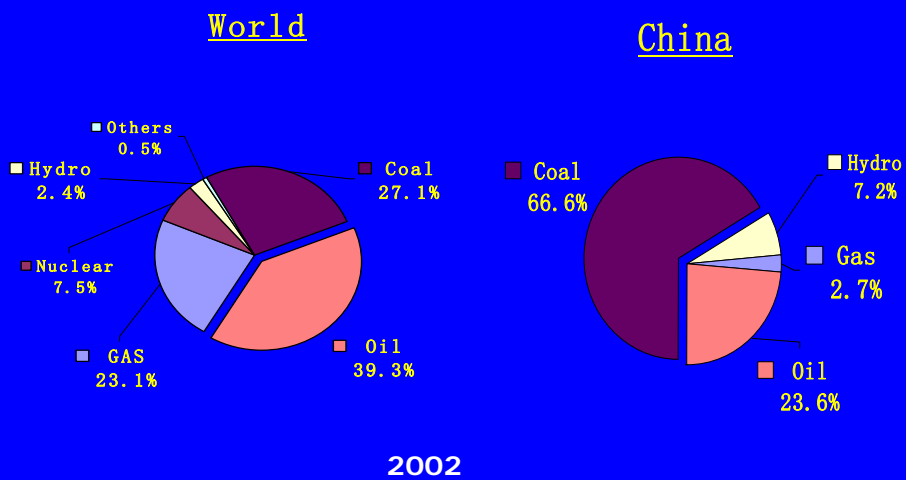


2002

CO₂ Emission Per Capita only 66% of World Average tC/capita

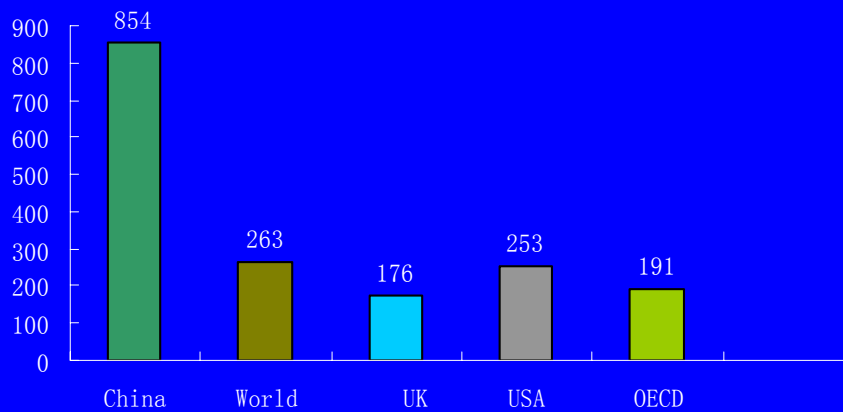


Coal-Dominated Primary Energy in China



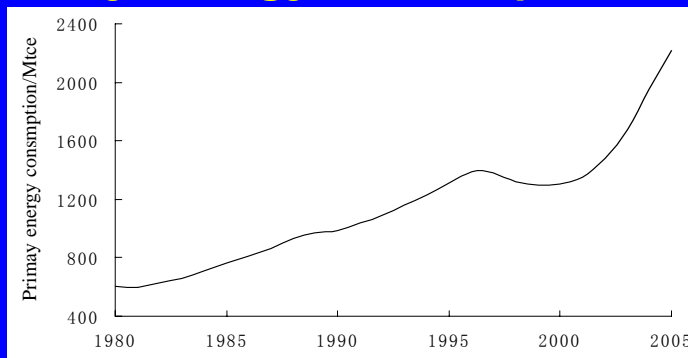
High Energy Intensity

toe/95MUS\$



2002

Primary energy consumption trends



- 1978 – 1984: low increasing of energy consumption due to decreasing proportion of secondary industry
- 1985 – 1991: accelerating increasing of energy consumption due the light industry expansion
- 1992 – 2000: energy consumption increasing fluctuation
- 2001– 2005: accelerating increasing of energy consumption due to over growth of chemical and heavy industries

The Energy Production and Consumption in 2005

- *Per capita GDP* : 1730 US\$
- *Total energy* :

<i>production</i>	2120 Mtce
<i>consumption</i>	2220 Mtce
- *Oil* :

<i>production</i>	181 Mt
<i>consumption</i>	300 Mt
- *Natural gas*: 50 Bm³
- *Electricity*: 2475 TWh
- *CO₂ emission*: 1462 Mt-C

Main indicators

- *GDP Growth*

1990-2001	9.7%
2002-2005	9.6%
- *Primary energy consumption*

1990-2001	3.4%
2002-2005	14.5%
- *Electricity consumption*

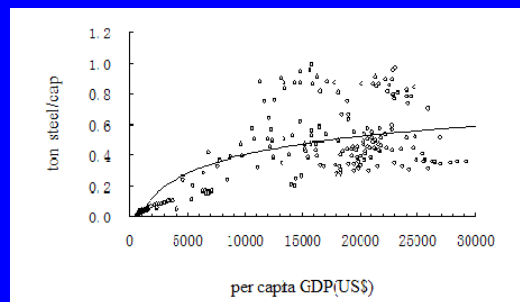
1990-2001	8.4%
2002-2005	14.7%
- *Energy elasticity*

1990-2001	0.35
2002-2005	1.51
- *Electricity elasticity*

1990-2001	0.86
2002-2005	1.53

Factors Causing Fast Increase of Primary Energy Consumption

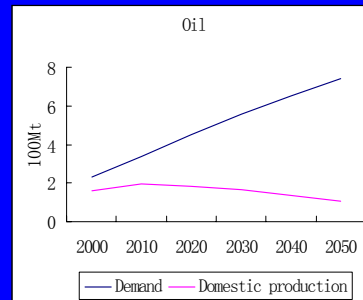
- Upgrade of consumption structure
shift to car and housing
- Urbanization
1% average annual increase rate
- Over growth of heavy and chemical industries



Challenges Facing China Energy

Energy Security

- The per capita energy reserves of China are much low, especially for the oil and natural gas. The per capita reserves of coal, oil and natural gas only about 86%, 20% and 5.1% of world average level, respectively.
- Oil will reach the peak production around 200Mt in 2020, after then the production will decrease.
- 60% oil and 40% natural gas in 2020 will depend on import.



Energy Efficiency Improvement

- The energy consumption intensity of GDP of China in 2002 was 3.2 times of world average level and 4.5 times of OECD average attributed to as high as 51% industrial proportion in GDP and low value added for most products, and low energy efficiency.
- The specific energy consumption for most energy intensive products are 20-50% higher than that of the industrialized countries.

Environmental Protection

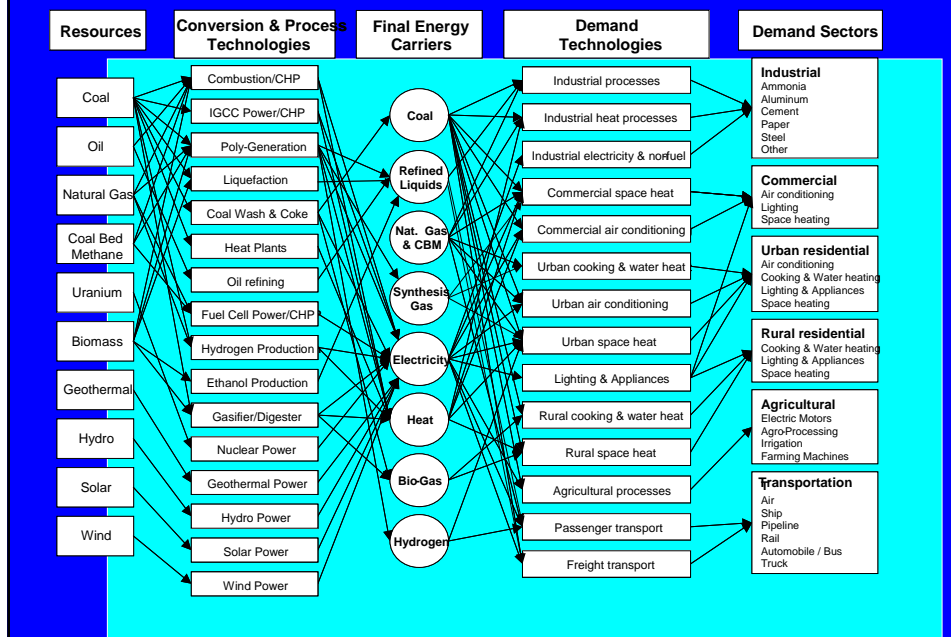
- **Largest SO₂ emission**
- **Second largest CO₂ emission**
- **Only 1/3 cities meet the national second grade standard for air quality**
- **Acid rain area accounts for around 30% of the national area**

MARKAL modeling activities

Main MARKAL modeling activities in Tsinghua

- First China MARKAL model developed in 1999-2000.
- Model updated to include more advanced technologies (2001-2003)
- Energy service demand updated (2003-2005)
- Linked the model with MACRO to simulate the impact of carbon emission reduction on China (2001-2004)
- Introduced elastic demand into the model (2004)
- CCS included into the model to assess its potential role on China's future carbon emission reduction (2005-)
- Western China MARKAL model (2004-2006)
- Beijing MARKAL modeling (2005-)

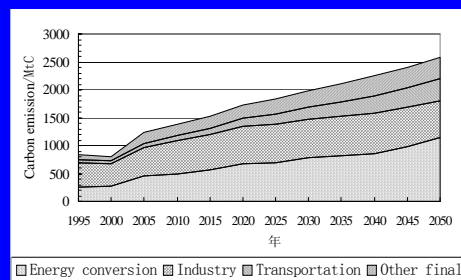
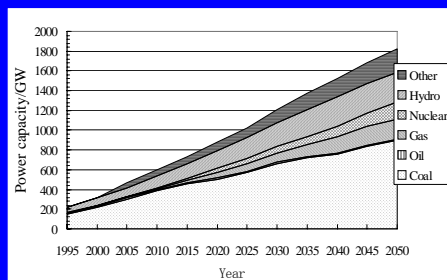
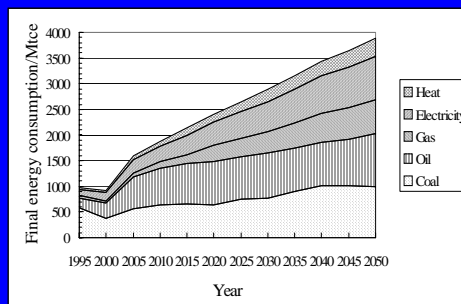
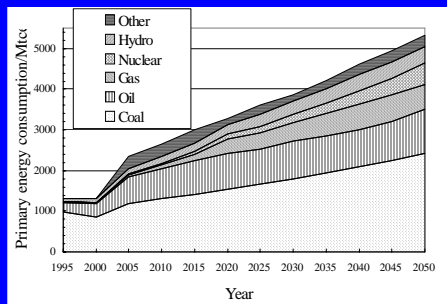
Simplified RES for China MARKAL



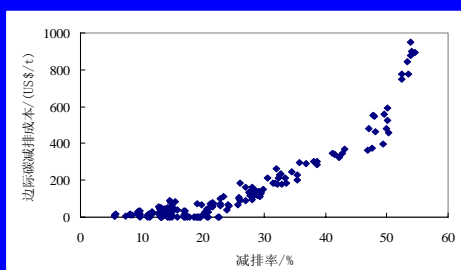
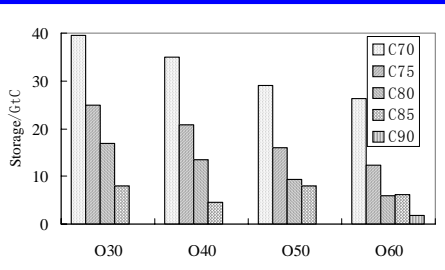
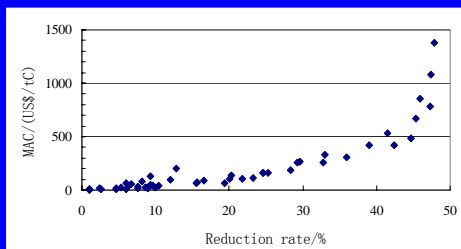
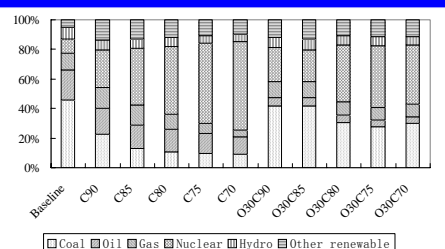
Application of the models

- Future energy development scenarios and sustainable energy strategies study
- Carbon mitigation strategies study
- Carbon mitigation costs...
- Energy sustainable development, Energy Policy, Energy

Reference scenario



Potential role of CCS



**Proposal on future cooperation
with ETSAP under G8 +5**

(1) Participation in ETSAP

- **Attend ETSAP meetings**
- **Use of ETSAP modeling tools**
- **Contribute to ETSAP modeling tools improvement with an emphasis on adaptation of the models to DCs on the basis of their data availability, different situations (e.g. market + planning) and etc.**
- **Joint research activities**

(2) National/regional model improvement

- **Capacity building (e.g. MARKAL training in Beijing this April by Gary)**
- **Energy service demand projection**
- **Model improvement (in particular, advanced technologies)**
- **Not only consider CO₂ from energy but also CO₂ from industry, and other GHGs**
- **Regionalize national model**

(3) Involvement into global model development/improvement

- Current global models are mainly developed by the experts in developed countries with little involvement of experts from DCs
- Contribute to global model development/improvement with more reasonable assumptions for DCs through cooperation to let the results be easier to understand, to interpret, and to be used by experts/policy makers in DCs
- Enable DCs to use the global models to study future scenarios, GHG mitigation strategies, and international cooperation mechanisms etc.