# Energy Transition in China in a 2 degree global target

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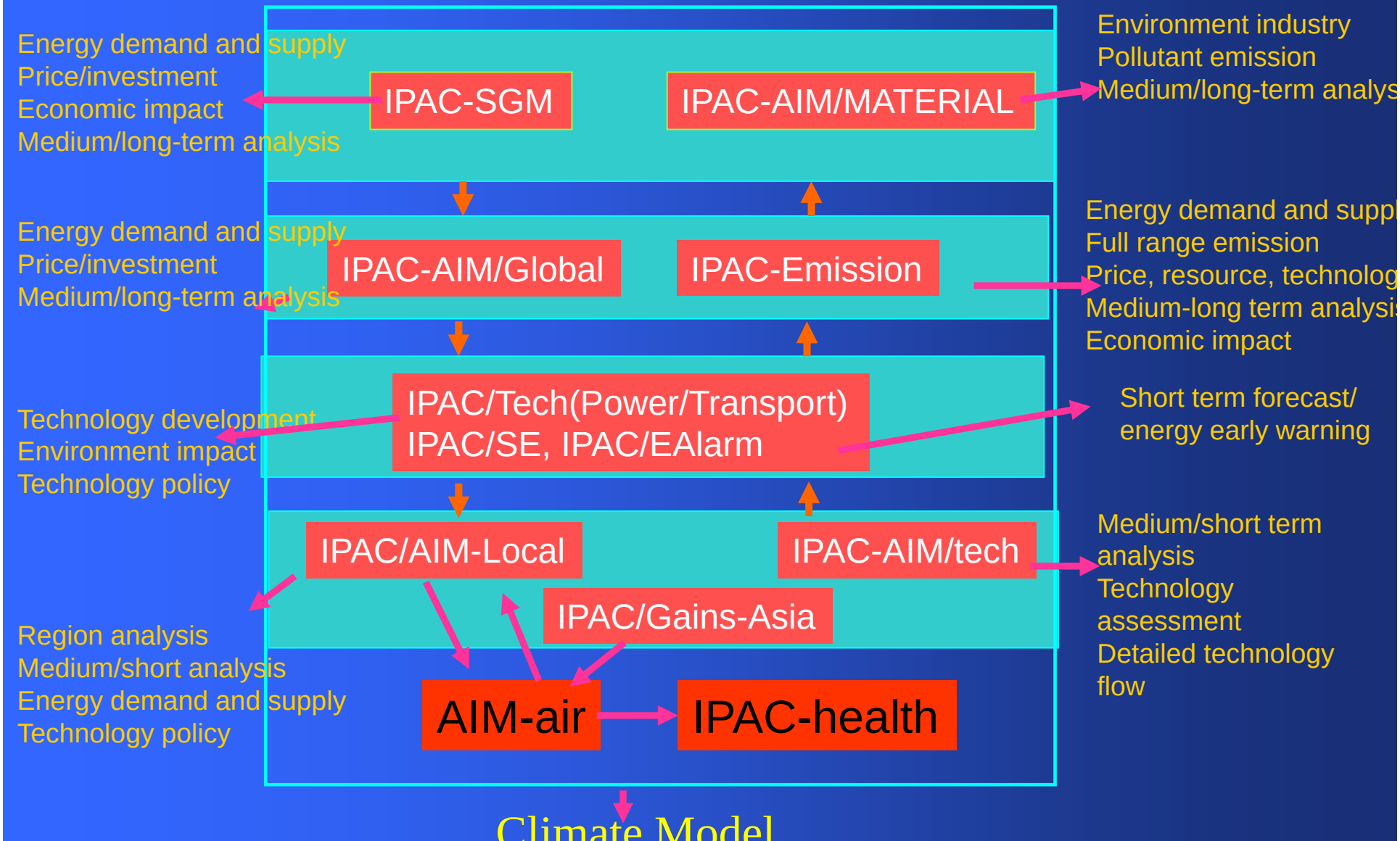
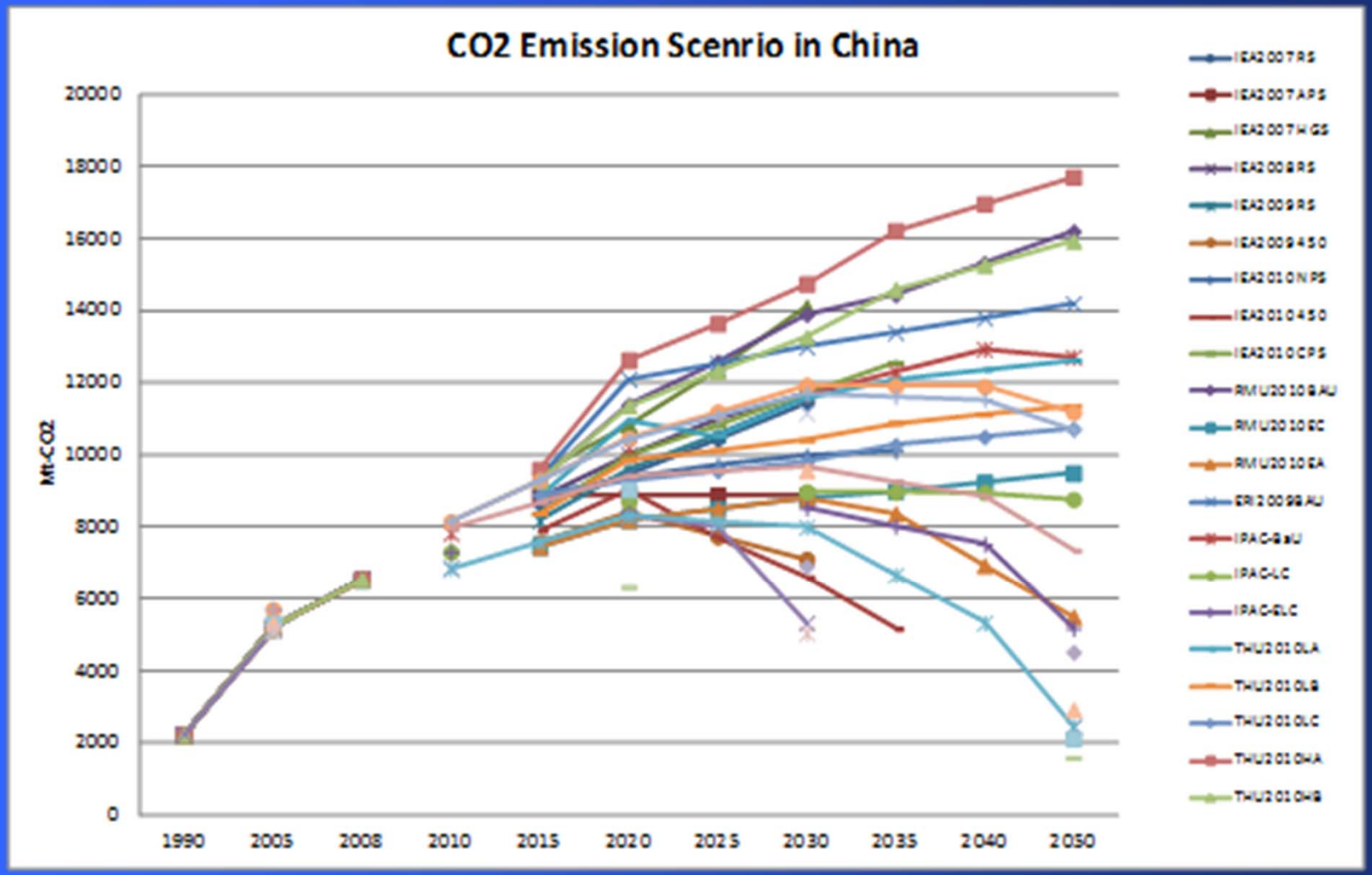
# *Framework of Integrated Policy Model for China (IPAC)*

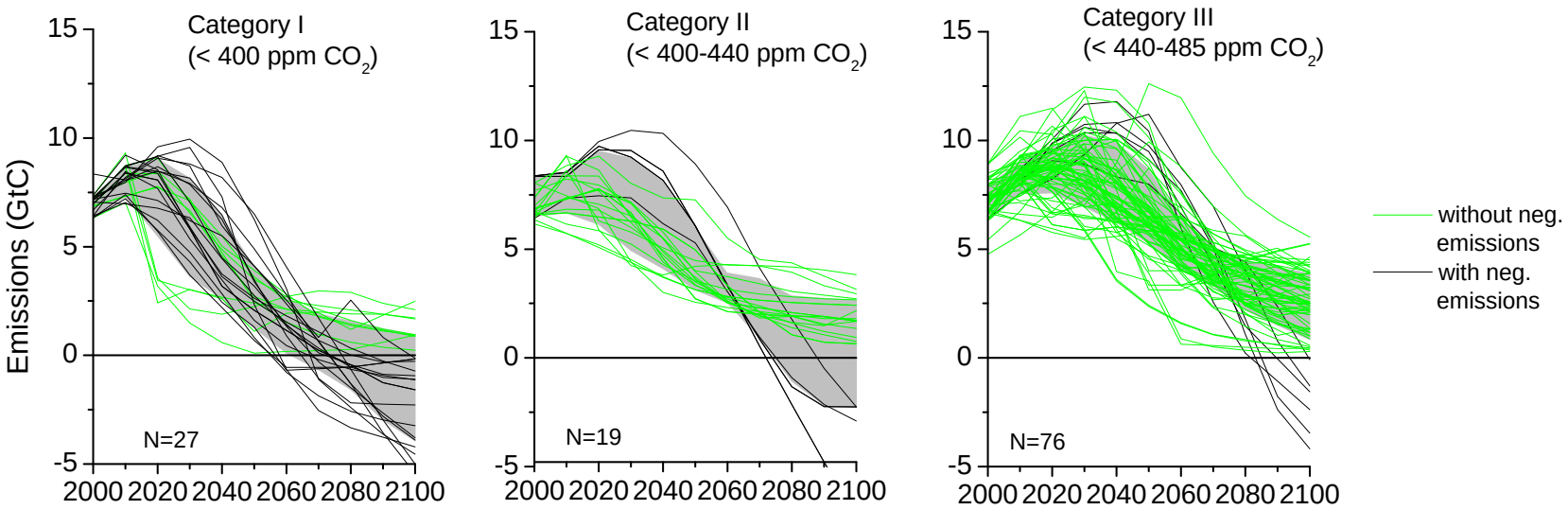


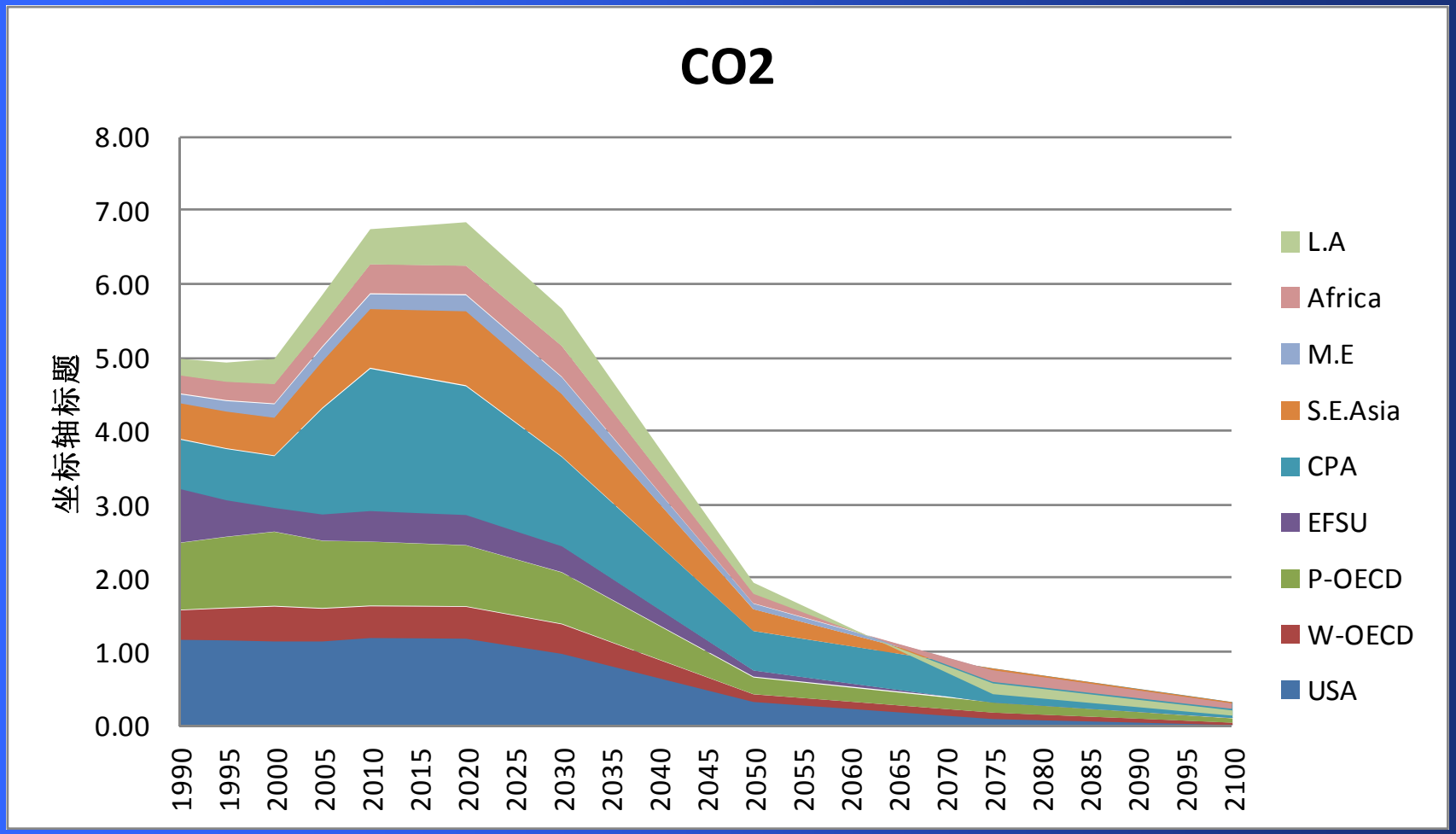

ERI, China

# Review for recent CO2 emission scenarios

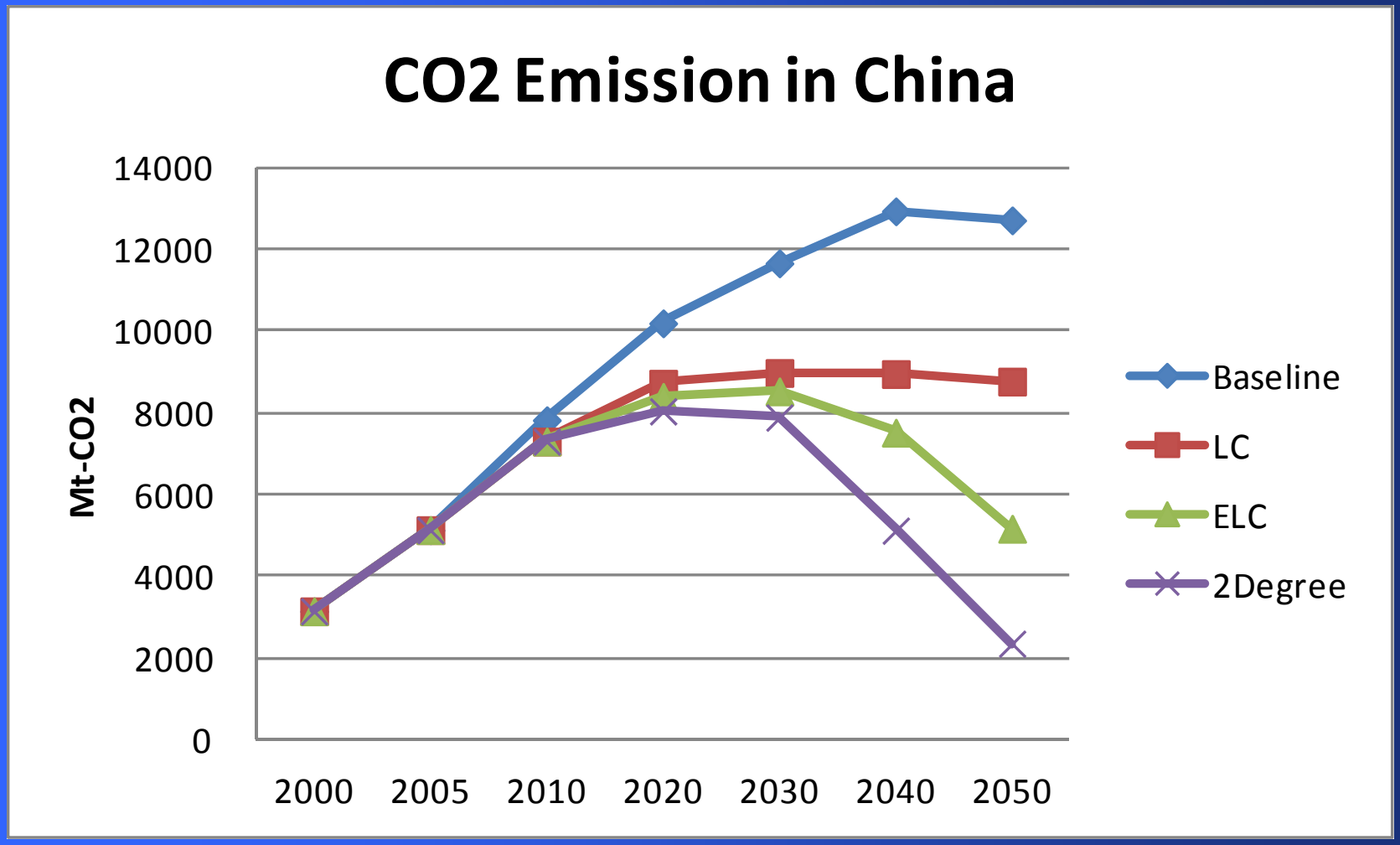


# Keyword: Transition – mitigation to reach some climate change targets




CO2
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
坐标轴标题
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
2055
2060
2065
2070
2075
2080
2085
2090
2095
2100
L.A
Africa
M.E
S.E.Asia
CPA
EFSU
P-OECD
W-OECD
USA

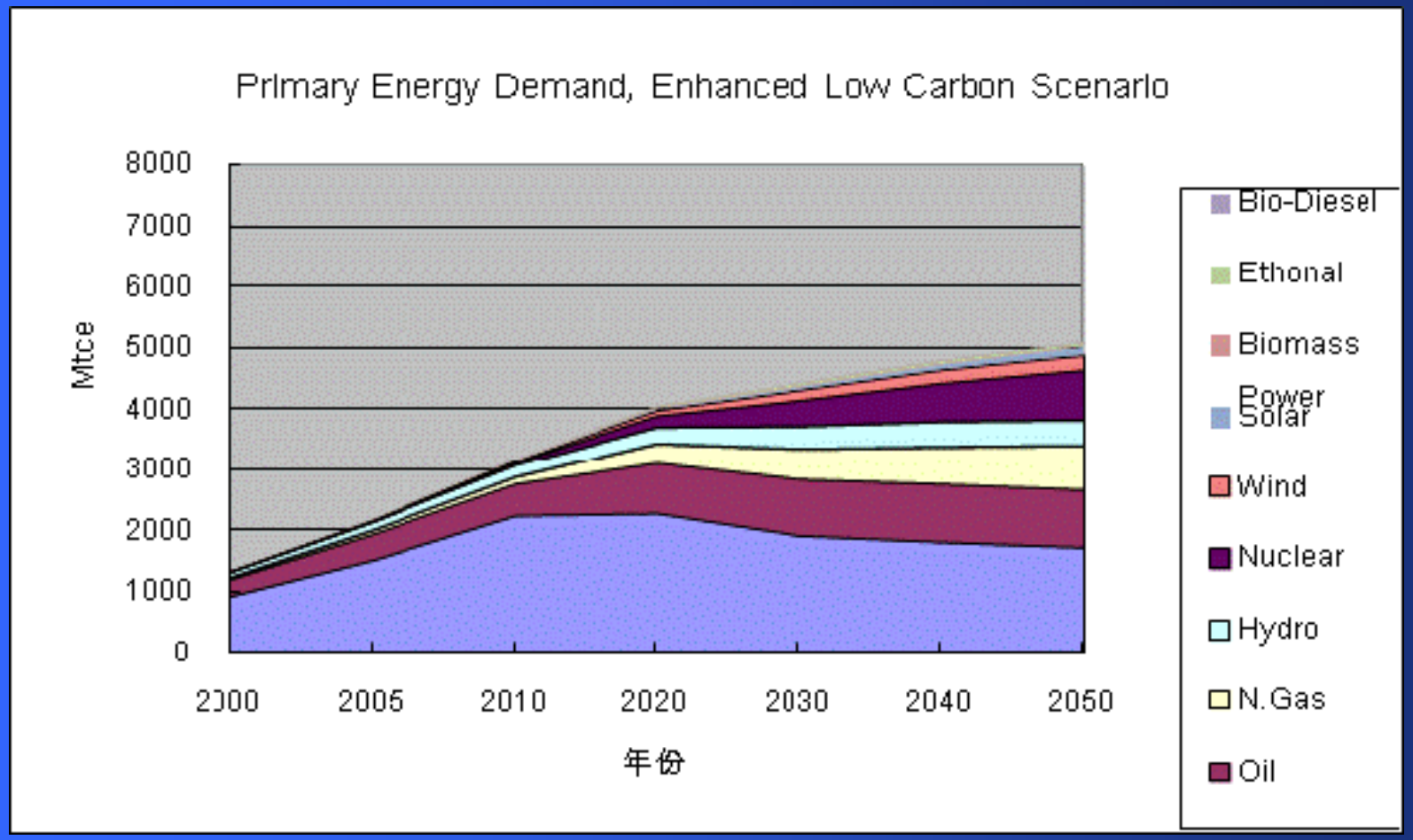
# Transformation: CO2 emission, a rapid change



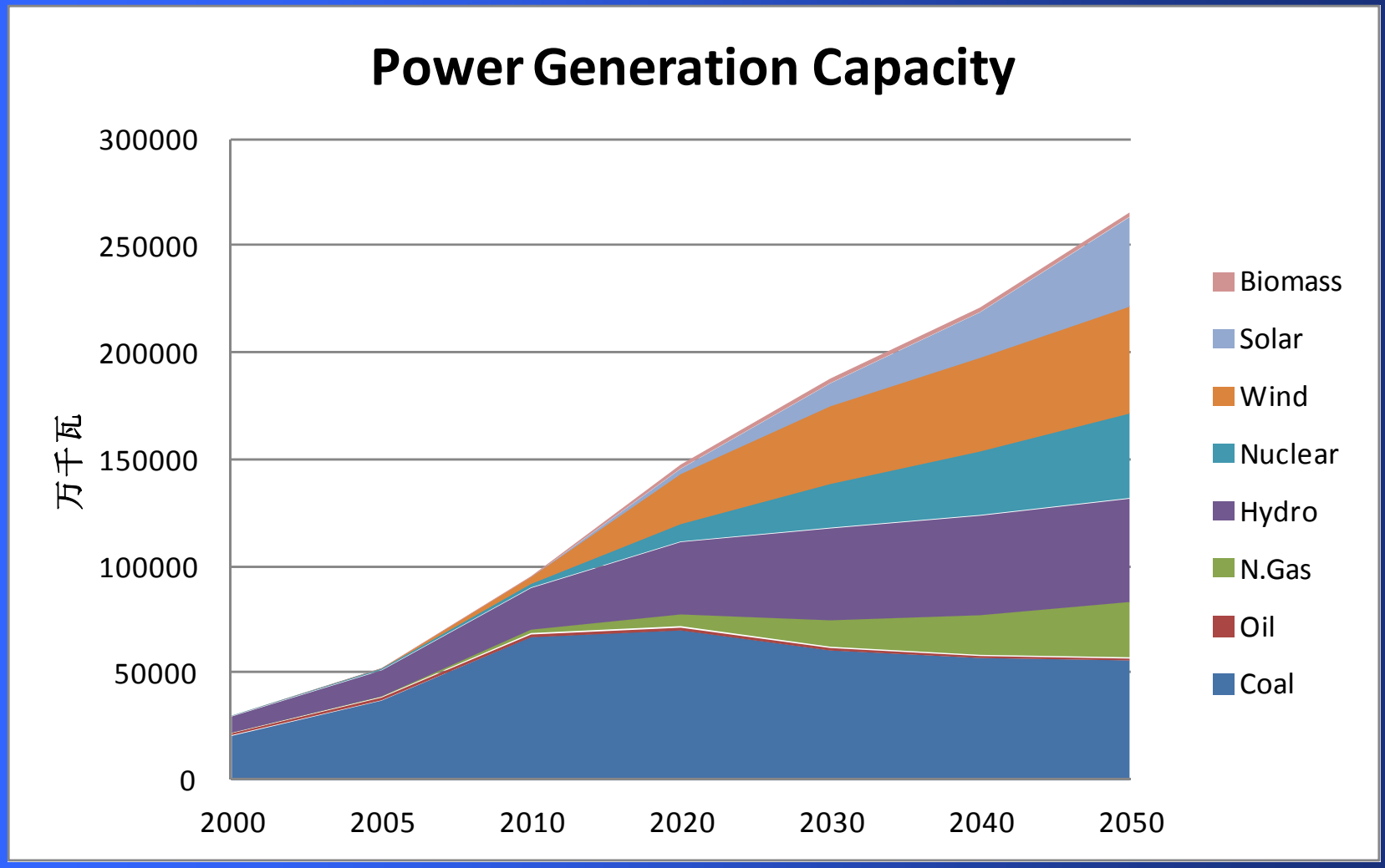
# What's the future of China's low carbon policy: key factors

- Economic structure optimization policies
- Energy efficiency policies
- Renewable energy/nuclear power generation oriented policies
- CCS
- Low carbon consumption/ lifestyle
- Land use emission reduction policies: so far relatively poor
- Climate change target: China is key part of that
- Can we pay for it? Cost and benefit

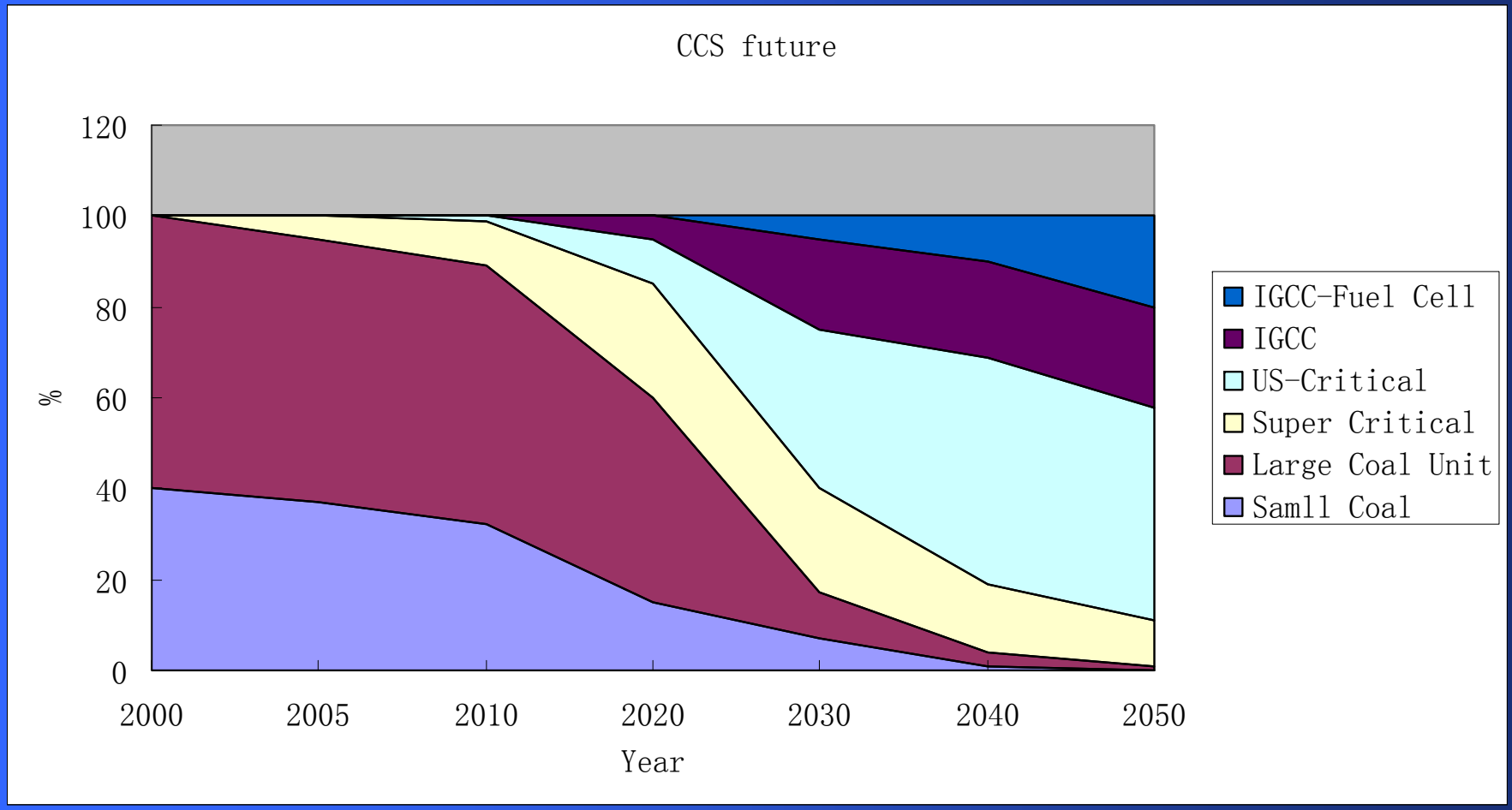
# Transformation: Energy System

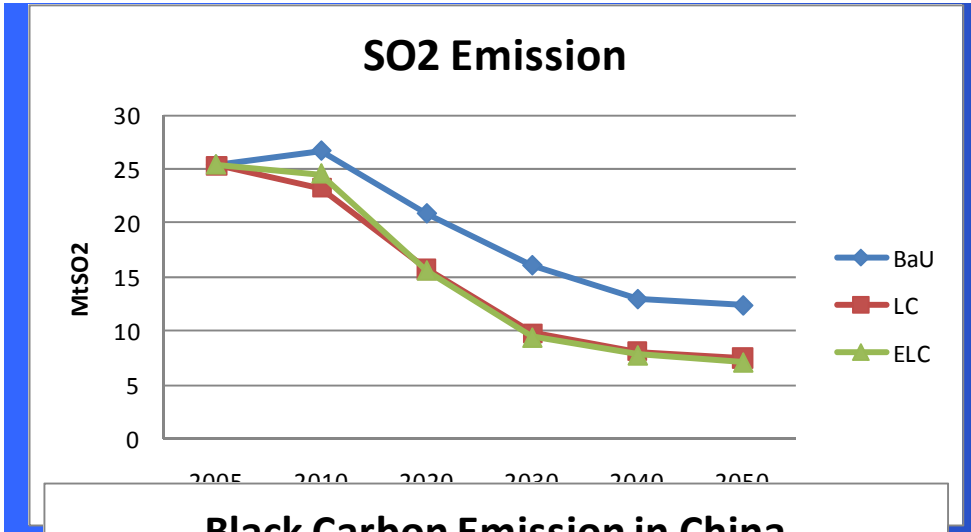


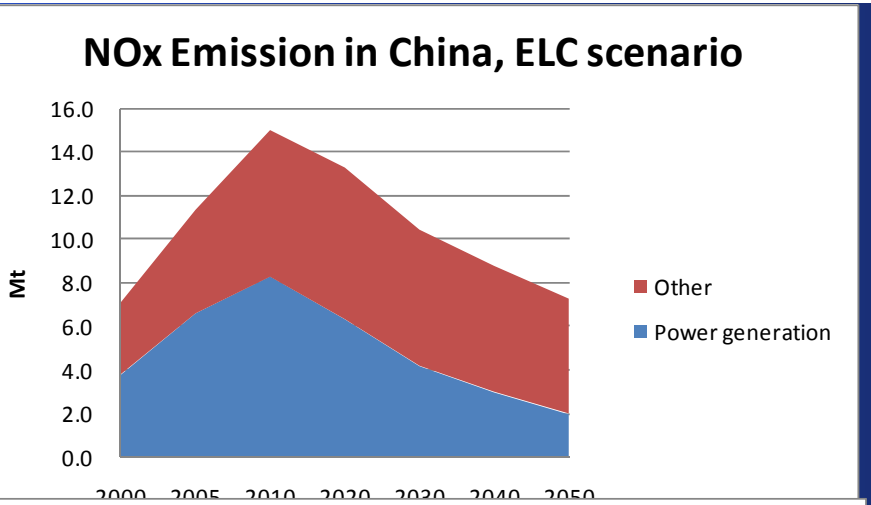
# Transformation: Power generation

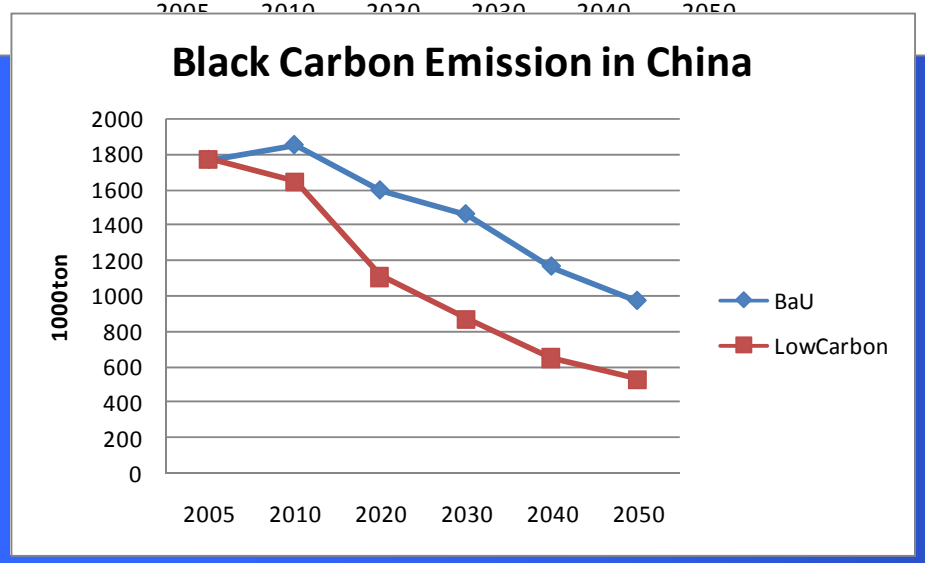


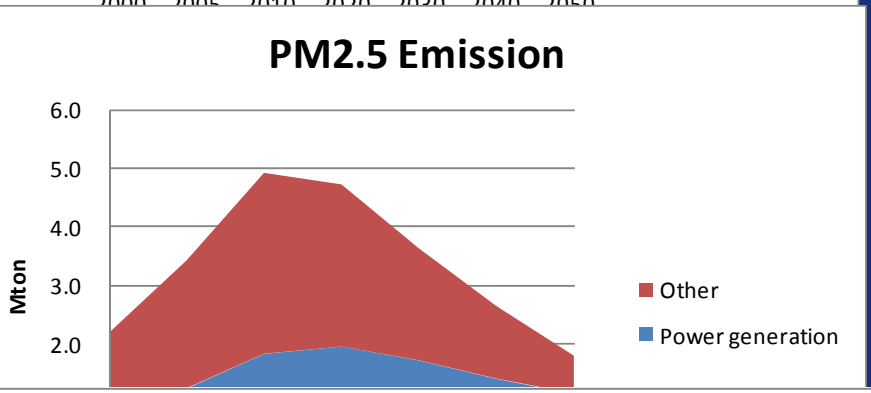
# Transformation: CCS

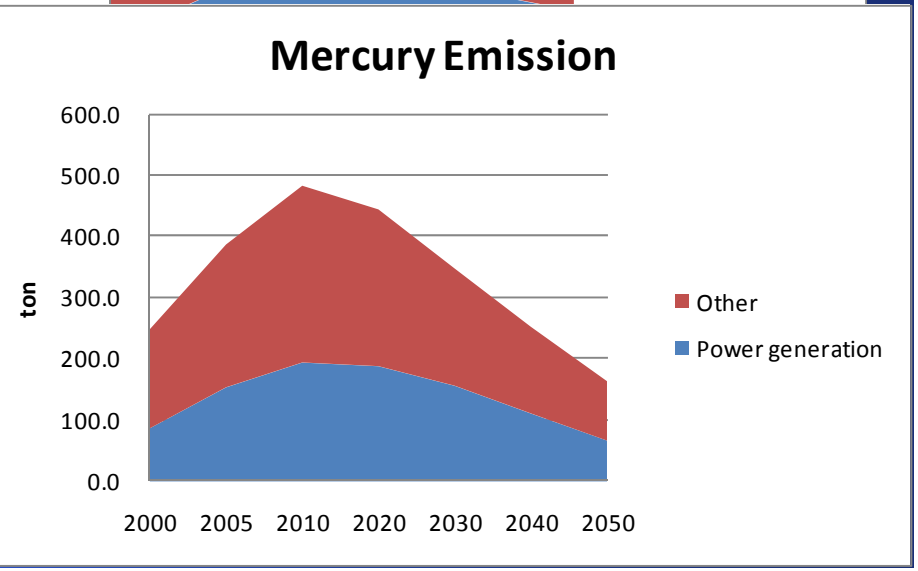





# Transformation: Air pollution

# Challenges for short term energy system in China

- We are in a rapid change period, energy system need to response right now.
- But it is difficult to make change due to inertia. It could happen in decades in other countries, but maybe 5 to 10 years in China
- Coal peak before 2015? Coal fired power plant peak by 2013?
- Much more natural gas demand
- Energy pricing should be higher, and need public to accept(public education)
- There are still more space for new policies
- It could be a big movement in China’s energy system, all aspects

## The expected big changes in energy system in China

- Coal consumption start to decrease, coal industry should be ready for it, and make own long-term strategy: local manufacture, export/import, security, clean coal use.
- Much more natural gas demand, need to work out for the supply
- Much faster progress on renewable energy, both centralized and distributed
- Grid should be reconstructed to support the system
- Energy price increase, to cover energy environment externality.
- Large scale of nuclear in
- Much lower growth rate for energy demand in China

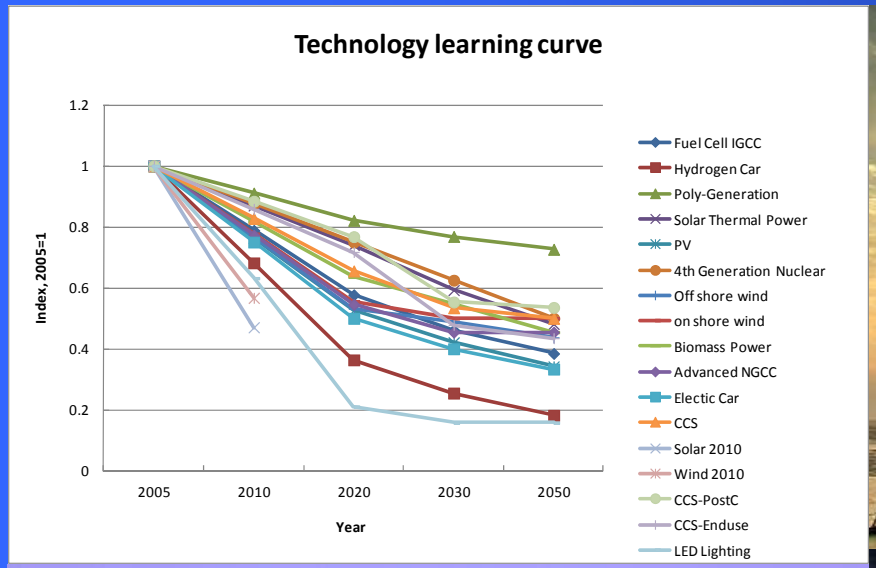
# Renewable Energy

- Renewable Energy Planning 2006: wind 30GW, Solar 2GW by 2020
- 2009 Energy Bureau: Wind 80WG
- 2010 Energy Planning: Wind 150 GW, Solar 20GW by 2020
- 2013, the 12$^{th}$ Five Year Plan: 20GW of solar PV by 2015, 150GW wind
- February 2013, 35GW PV by 2015

- Now: Wind 200GW to 300GW, Solar 50WG to 120 GW

- Based on the conclusion from Chinese Academy for Engineering, grid in China could adopt these renewable energy power generation in short term.

# Transformation: Technologies



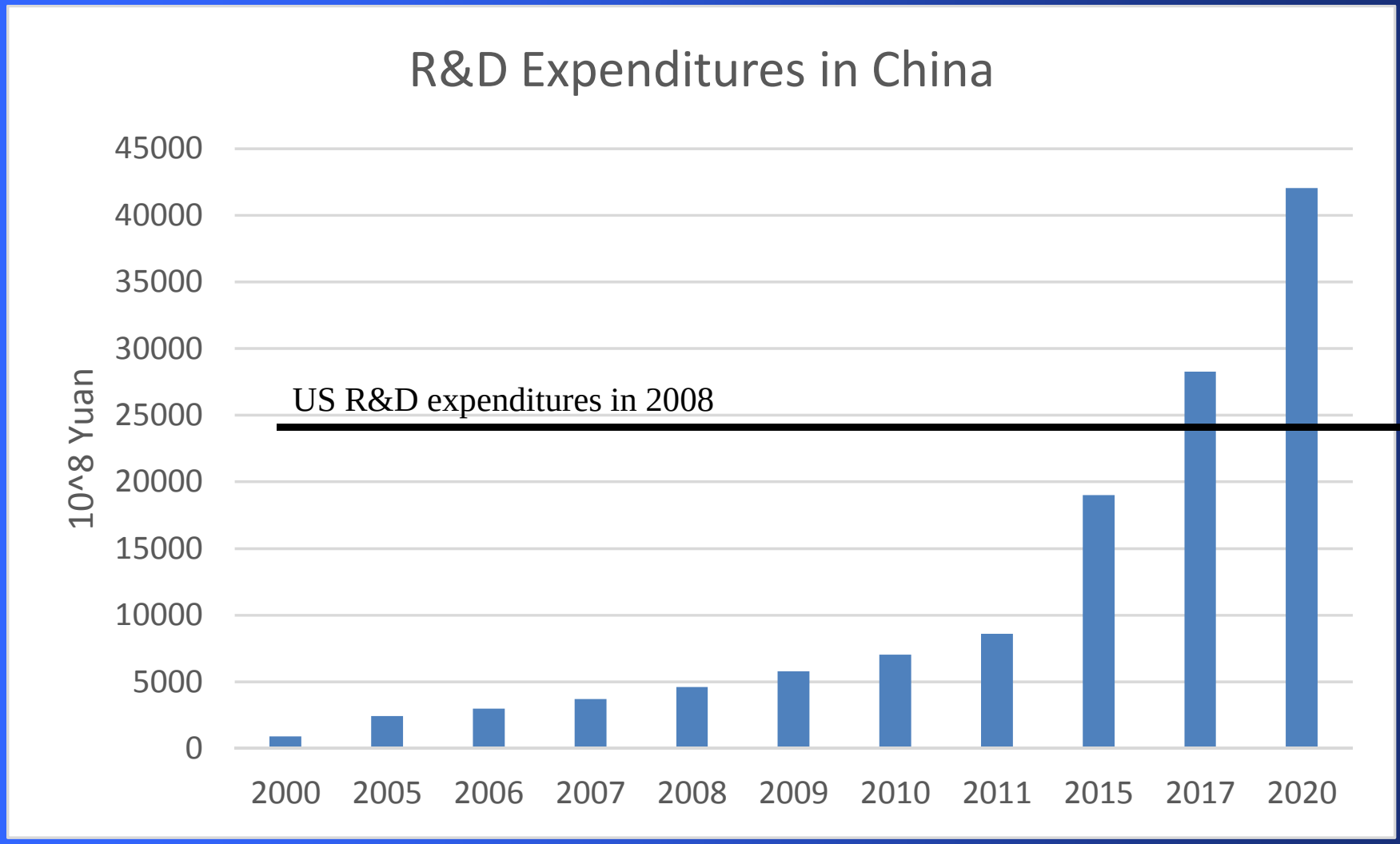


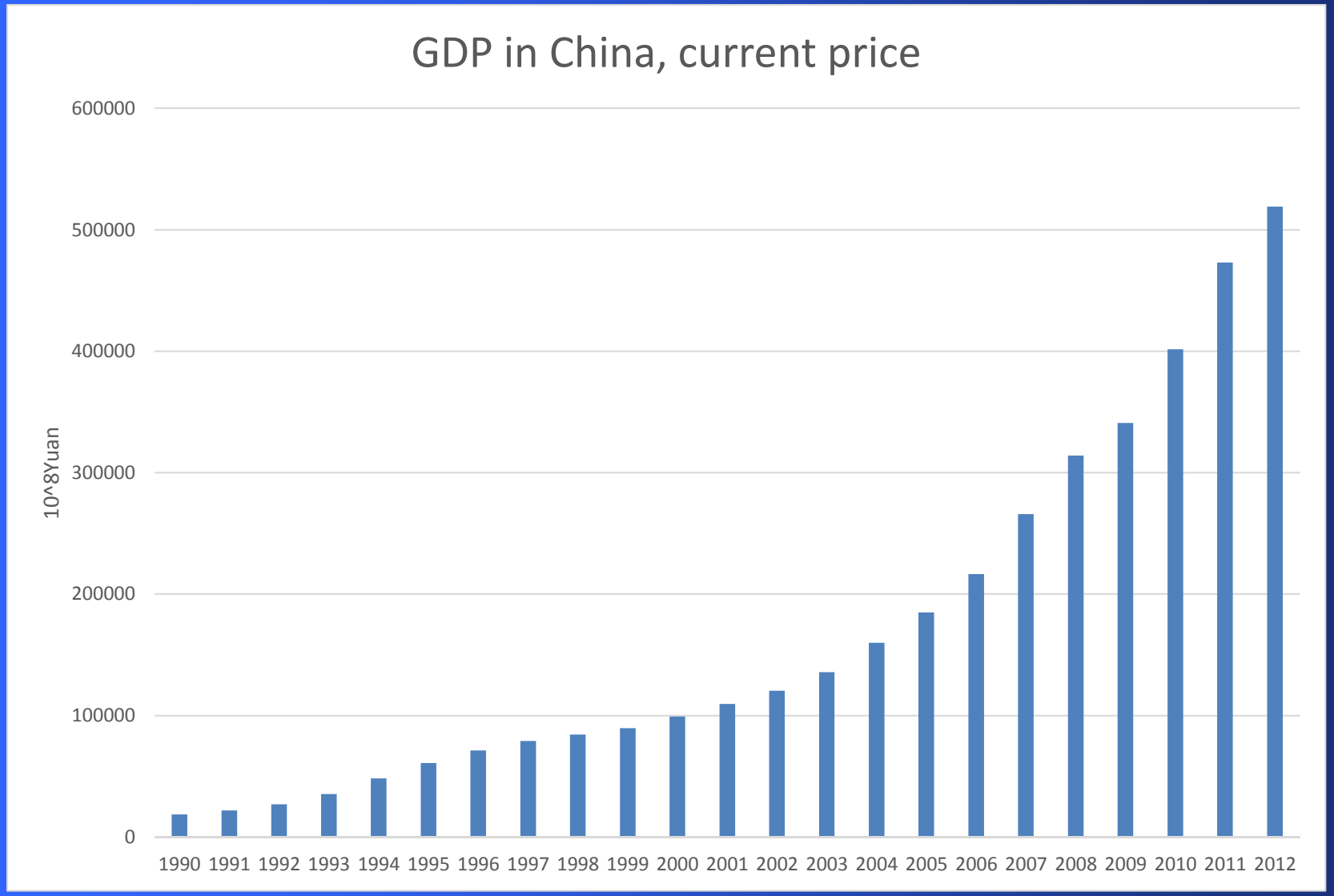
By 2020, Wind 200GW to 250GW, Solar 50WG

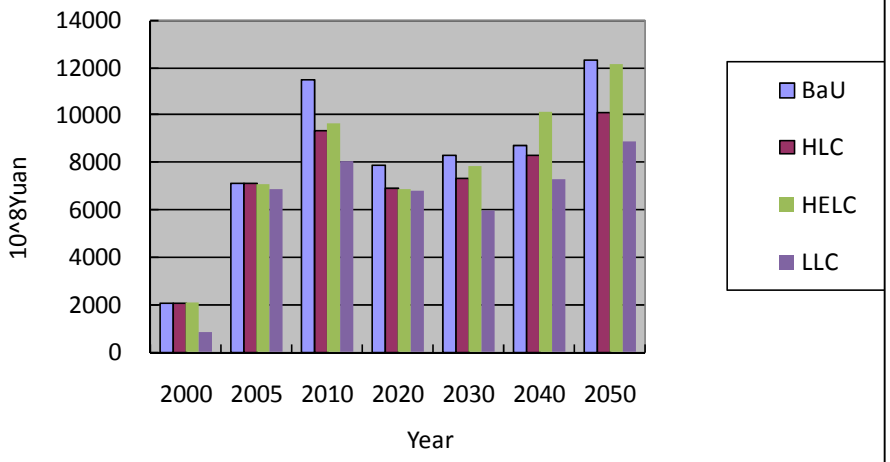
Price: US$38000
Subsidy: US$15000(Shanghai), no need to apply number plate(cost US$10000)
US$18000(Beijing), no need to apply number plate(By Oct. 2012, 1.1 million people apply for 20000number plates per month),

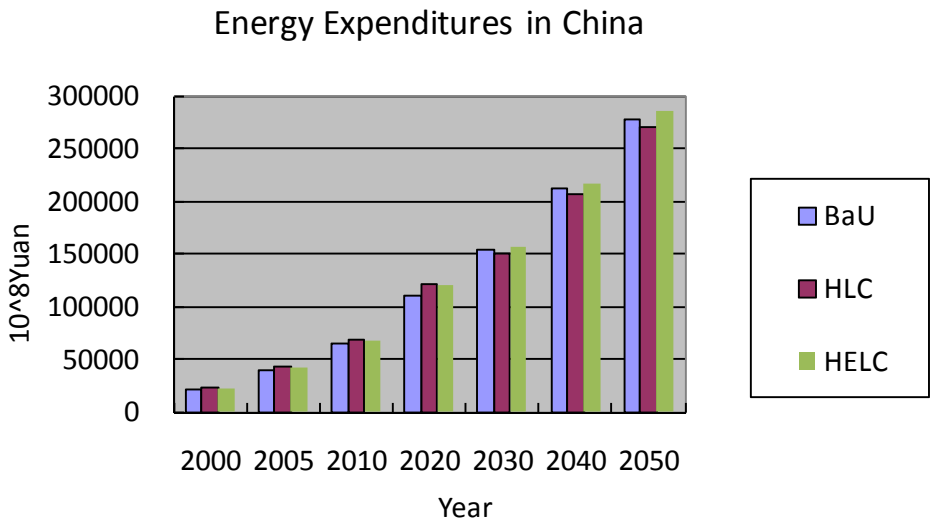
# The New Five Year Plan on Air Pollution Control

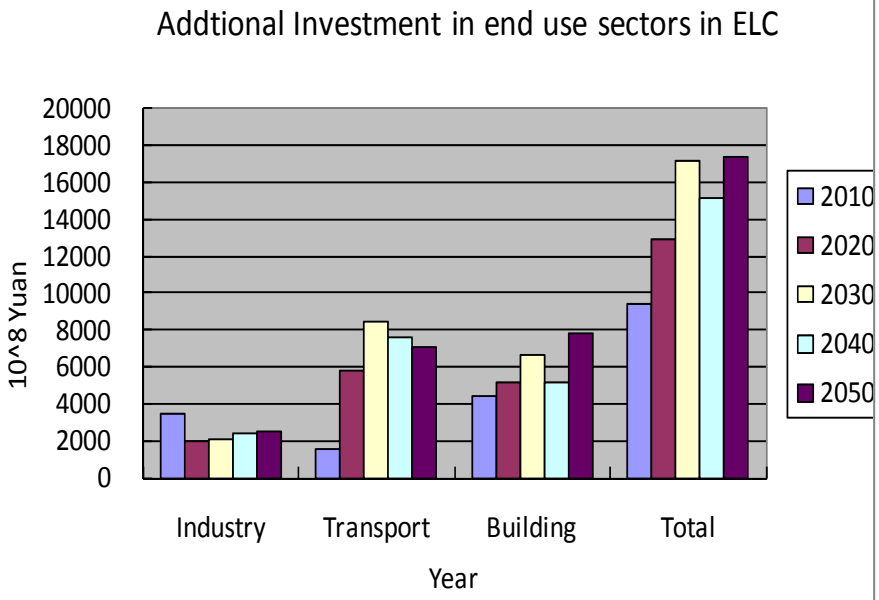
- From 2013 to 2017
- Target: 30% improvement of air pollution
- A package of policies
- In which: reducing coal use in key areas including Beijing-Tianjin-Hebei region, Yangtze Delta Regions, Pearl River Delta Region
- Clean oil supply for vehicle, upgrade emission standard and oil quality
- Regulation on diffusion on high efficiency cars

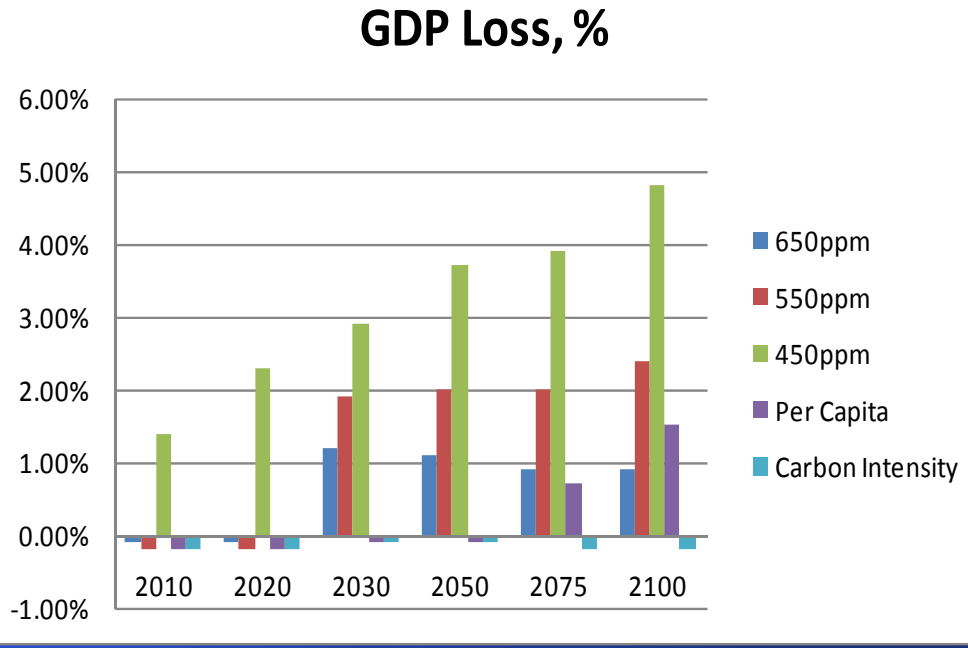

R&D Expenditures in China
10^8 Yuan
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
US R&D expenditures in 2008
2000
2005
2006
2007
2008
2009
2010
2011
2015
2017
2020


GDP in China, current price
600000
500000
400000
300000
200000
100000
0
10^8Yuan
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012


Investment in Energy Industry in China
14000
12000
10000
8000
6000
4000
2000
0
10^8Yuan
2000 2005 2010 2020 2030 2040 2050
Year
BaU
HLC
HELC
LLC


Energy Expenditures in China
300000
250000
200000
150000
100000
50000
0
10^8Yuan
2000 2005 2010 2020 2030 2040 2050
Year
BaU
HLC
HELC


Addtional Investment in end use sectors in ELC
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
10^8 Yuan
Industry
Transport
Building
Total
Year
2010
2020
2030
2040
2050


GDP Loss, %
6.00%
5.00%
4.00%
3.00%
2.00%
1.00%
0.00%
-1.00%
2010
2020
2030
2050
2075
2100
650ppm
550ppm
450ppm
Per Capita
Carbon Intensity