Toward China's Low Carbon Society

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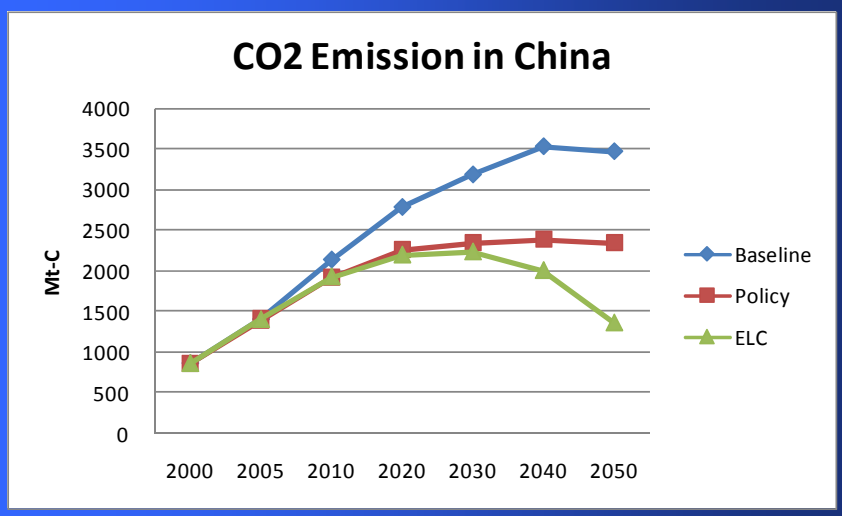
ERI, China



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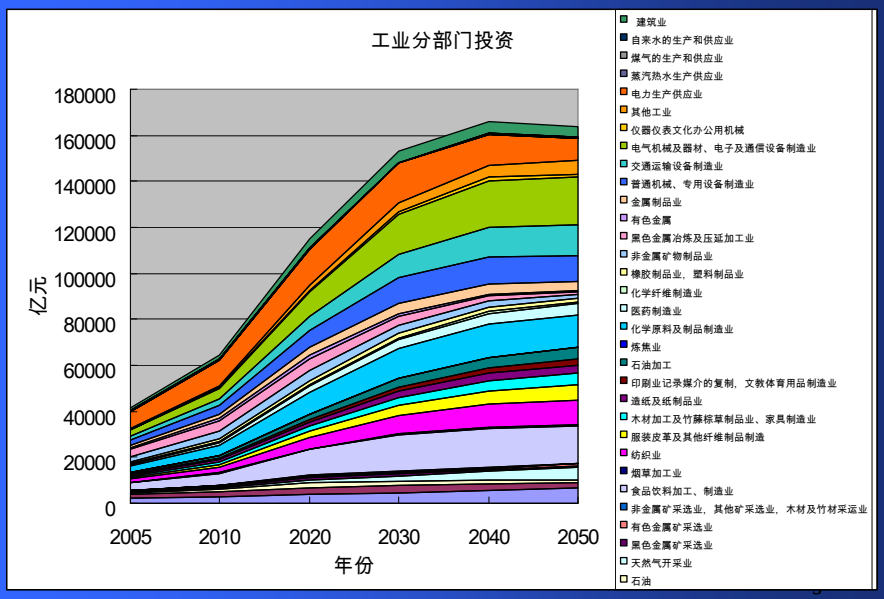
Investment by industrial sectors



Products output in major sectors, Low Carbon and ELC

	Unit	2005	2020	2030	2040	2050
Steel	Million ton	355	610	570	440	360
Cement	Million ton	1060	1600	1600	1200	900
Glass	Million cases	399	650	690	670	580
Copper	Million ton	2.6	7	7	6.5	4.6
Ammonia	Million ton	8.51	16	16	15	12
Ethylene	Million ton	5.1	7.2	7	6.5	5.5
Soda Ash	Million ton	14.67	23	24.5	23.5	22
Casutic	Million ton	12.64	24	25	25	24
Paper	Million ton	62.05	110	115	120	120
Fertilize	Million ton	52.2	61	61	61	61
Aluminum	Million ton	7.56	34	36	36	33
Paper	Million ton	46.3	50	50	50	45
Calcium c	Million ton	8.5	10	8	7	4

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Unit energy use for key products, LCS Scenario

	Unit	2005	2020	2030	2040	2050
Steel	Kgce/t	760	650	564	554	545
Cement	Kgce/t	132	101	86	81	77
Glass	Kgce/Weight Cases	24	18	14.5	13.8	13.1
Brick	Kgce/万块	685	466	433	421	408
Ammonia	Kgce/t	1645	1328	1189	1141	1096
Ethylene	Kgce/t	1092	796	713	693	672
Soda Ash	Kgce/t	340	310	290	284	279
Caustic	Kgce/t	1410	990	890	868	851
Calcium carbide	Kgce/t	1482	1304	1215	1201	1193
Copper	Kgce/t	1273	1063	931	877	827
Aluminum	kWh/t	14320	12870	12170	11923	11877
Paper	Kgce/t	1047	840	761	721	686
Electricity fossil fuel	Gce/kWh	350	305	287	274	264

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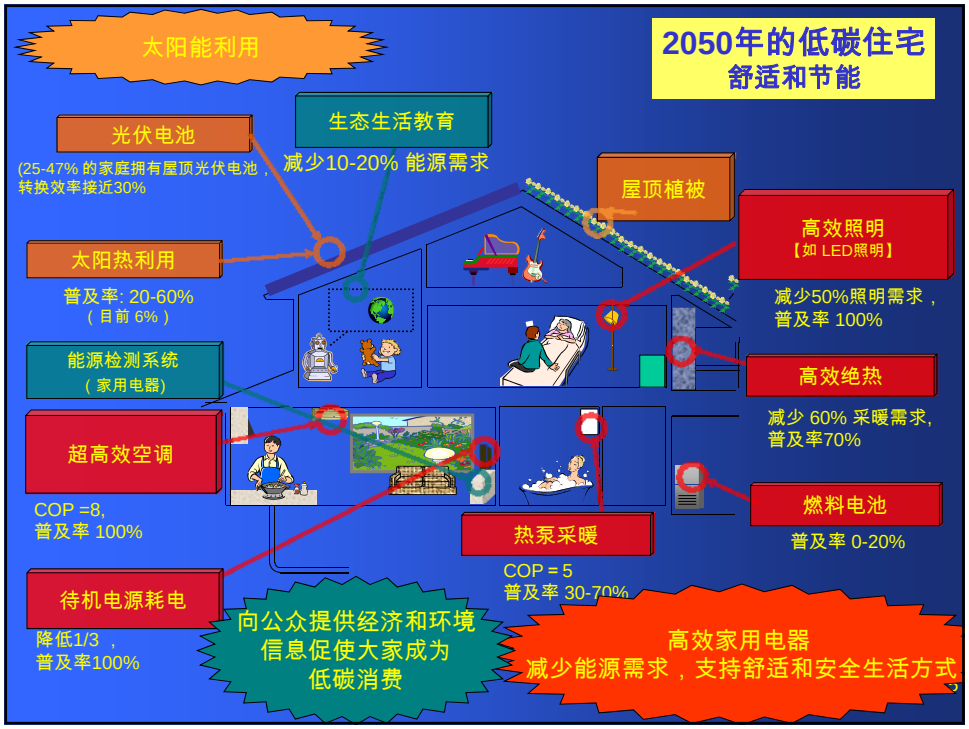

Transport, Low carbon scenario

		2005	2010	2020	2030	2040	2050
Family car ownership, per 100HH	Urban	3.37	14	36	65	77	78
	Rural	0.08	0.2	8	38	70	90
Family car annual travel distance, km		9500	9500	9300	8635	8300	7480
Average engin size of family cars, litter		1.7	1.6	1.6	1.6	1.5	1.4
Fuel efficiency of car, L/100km		9.2	8.9	7.1	5.9	4.8	4.1
Share of MRT in total traffic volume, %		0.011	0.016	0.025	0.046	0.1	0.21
Share of Biofuel, %		1.10%	1.30%	4.1%	7.70%	12%	13%
Share of electric car, %		0%	0.12%	3.2%	6.80%	12.5%	19.8%
Share of fuel cell car, %		0%	0%	0.80%	1.60%	4.70%	7.90%

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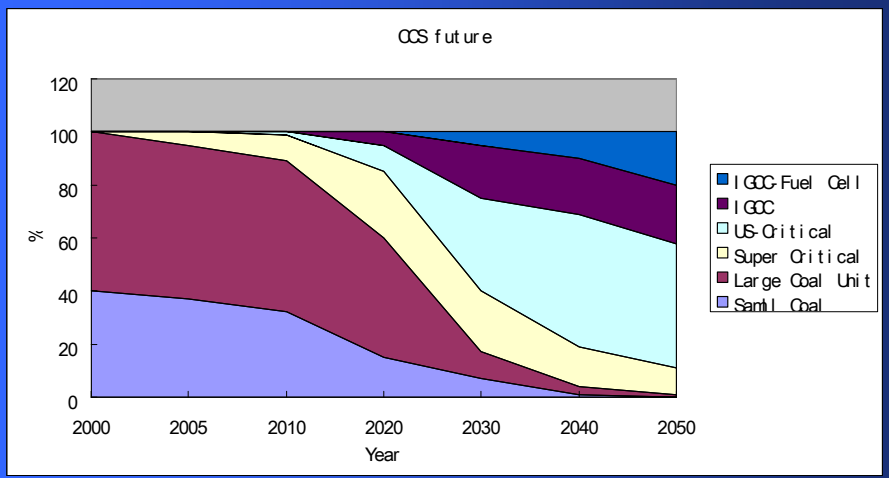

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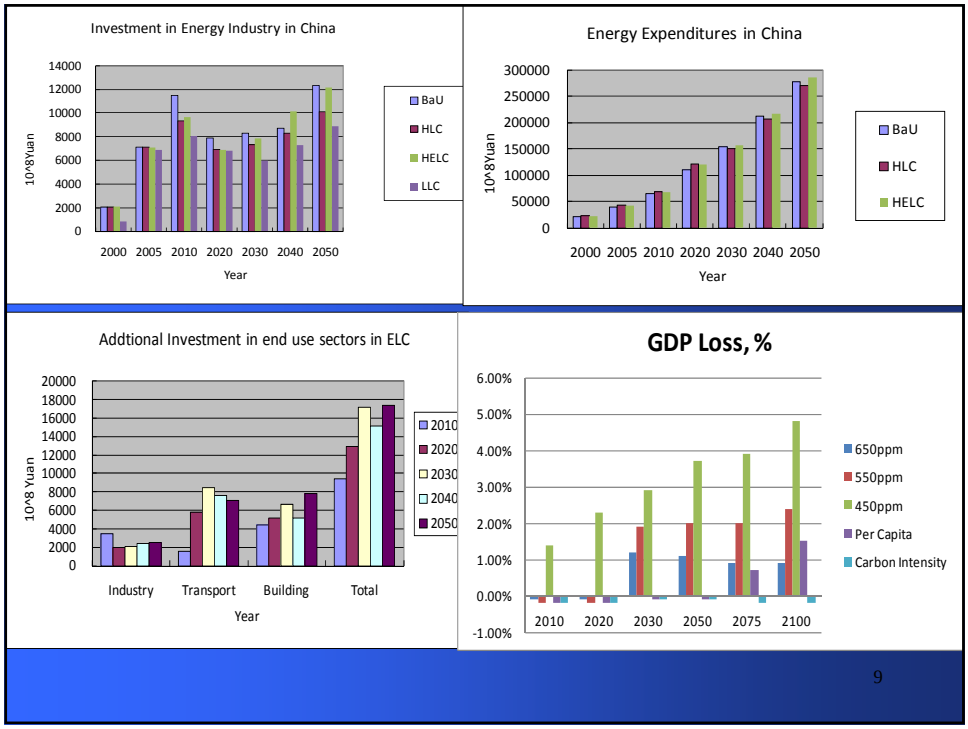
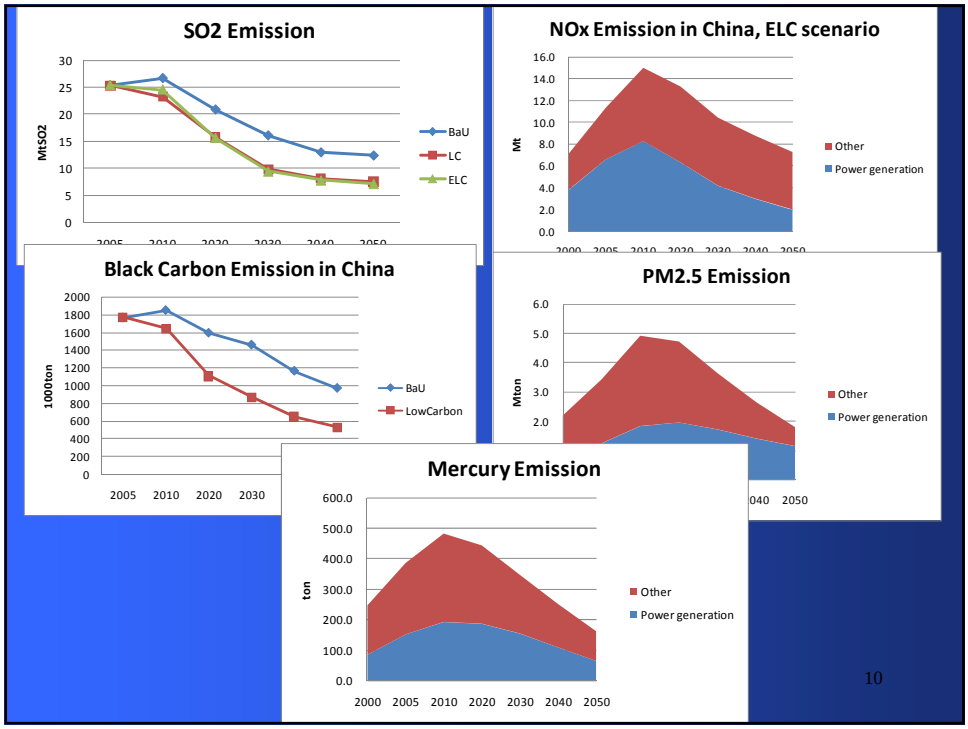
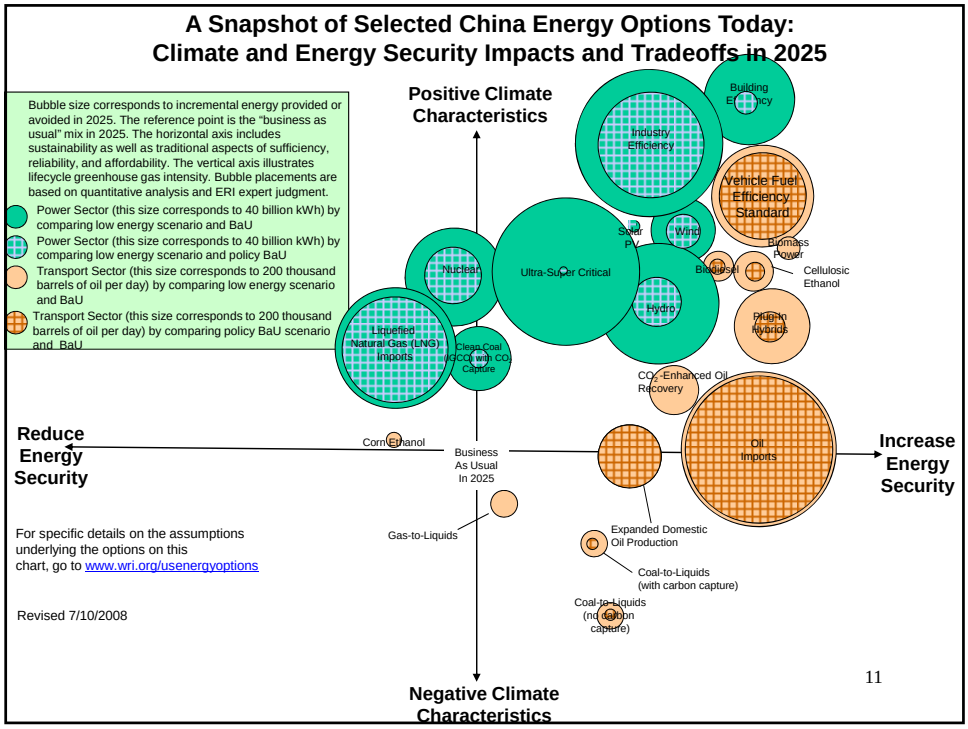

Investment in Energy Industry in China
10^8Yuan
Year
BaU
HLC
HELC
LLC
Energy Expenditures in China
10^8Yuan
Year
BaU
HLC
HELC
Addtional Investment in end use sectors in ELC
10^8 Yuan
Industry
Transport
Building
Total
Year
2010
2020
2030
2040
2050
GDP Loss, %
650ppm
550ppm
450ppm
Per Capita
Carbon Intensity
9


SO2 Emission
MtSO2
BaU
LC
ELC
NOx Emission in China, ELC scenario
Mt
Other
Power generation
Black Carbon Emission in China
1000ton
BaU
LowCarbon
PM2.5 Emission
Mton
Other
Power generation
Mercury Emission
ton
Other
Power generation
10


A Snapshot of Selected China Energy Options Today:
Climate and Energy Security Impacts and Tradeoffs in 2025
Bubble size corresponds to incremental energy provided or avoided in 2025. The reference point is the "business as usual" mix in 2025. The horizontal axis includes sustainability as well as traditional aspects of sufficiency, reliability, and affordability. The vertical axis illustrates lifecycle greenhouse gas intensity. Bubble placements are based on quantitative analysis and ERI expert judgment.
Power Sector (this size corresponds to 40 billion kWh) by comparing low energy scenario and BaU
Power Sector (this size corresponds to 40 billion kWh) by comparing low energy scenario and policy BaU
Transport Sector (this size corresponds to 200 thousand barrels of oil per day) by comparing low energy scenario and BaU
Transport Sector (this size corresponds to 200 thousand barrels of oil per day) by comparing policy BaU scenario and BaU
Positive Climate Characteristics
Building Efficiency
Industry Efficiency
Vehicle Fuel Efficiency Standard
Solar PV
Wind
Biomass Power
Biodiesel
Cellulosic Ethanol
Nuclear
Ultra-Super Critical
Hydro
Plug-in Hybrids
Liquefied Natural Gas (LNG) Imports
Clean Coal IGCC with CO2 Capture
CO2-Enhanced Oil Recovery
Reduce Energy Security
Corn Ethanol
Business As Usual In 2025
Oil Imports
Increase Energy Security
Gas-to-Liquids
Expanded Domestic Oil Production
Coal-to-Liquids (with carbon capture)
Coal-to-Liquids (no carbon capture)
For specific details on the assumptions underlying the options on this chart, go to www.wri.org/usenergyoptions
Revised 7/10/2008
Negative Climate Characteristics
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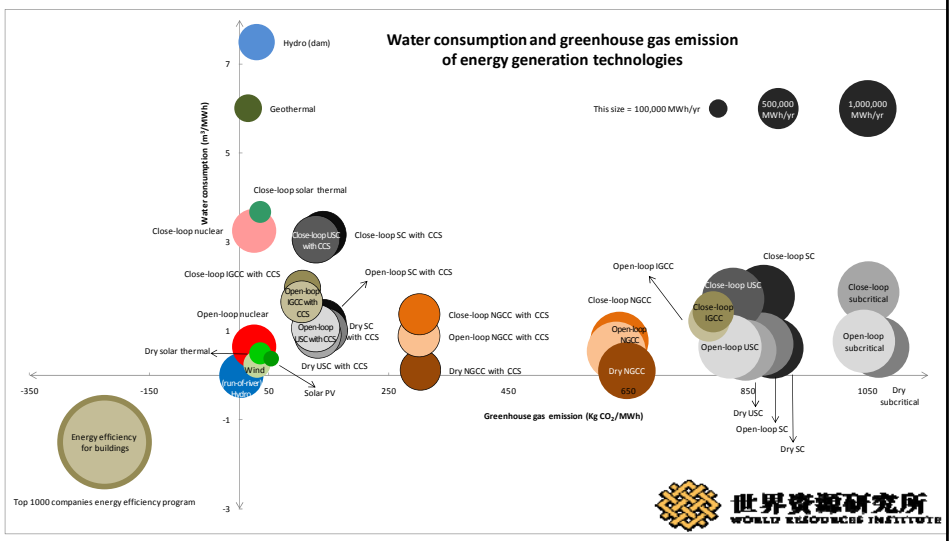
Water consumption and greenhouse gas emission of energy generation technologies
This size = 100,000 MWh/yr
500,000 MWh/yr
1,000,000 MWh/yr
Water consumption (m³/MWh)
Greenhouse gas emission (Kg CO2/MWh)
Hydro (dam)
Geothermal
Close-loop solar thermal
Close-loop nuclear
Close-loop USC with CCS
Close-loop SC with CCS
Close-loop IGCC with CCS
Open-loop SC with CCS
Open-loop IGCC with CCS
Open-loop nuclear
Open-loop SC with CCS
Dry SC with CCS
Dry solar thermal
Wind
Dry USC with CCS
Solar PV
Close-loop NGCC with CCS
Open-loop NGCC with CCS
Dry NGCC with CCS
Open-loop IGCC
Close-loop NGCC
Close-loop USC
Close-loop IGCC
Close-loop SC
Close-loop subcritical
Open-loop USC
Open-loop subcritical
Dry NGCC
Dry USC
Open-loop SC
Dry SC
Dry subcritical
Energy efficiency for buildings
Top 1000 companies energy efficiency program
世界资源研究所
WORLD RESOURCES INSTITUTE
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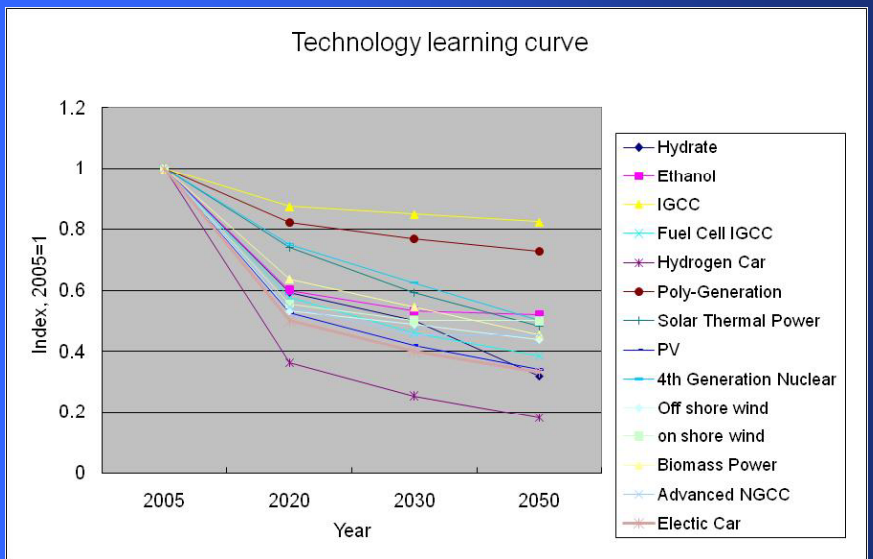
28 key technologies in the enhanced low carbon scenario in China

No.	Sector	Technology	Description	Note
1	Industry technology	High energy efficiency equipment	High efficiency furnace, kiln, waste heat recovery system, high efficiency process technologies, advanced electric motor	Nearly in market
2		New manufacture process technology for cement and steel		
3		CCS	In cement, steel making, refinery, ethylene manufacture	
4	Transport	Super high efficiency diesel vehicle	Advanced diesel hybrid engine	
5		Electric car		
6		Fuel cell car		
7		High efficiency aircraft	30% higher energy efficiency	
8		Bio-fuel aircraft		
9	Building	Super high efficiency air-conditioner	With COP>7	
10		LED lighting		
11		In house renewable energy system	Solar PV/Wind/Solar hot water and space heating	
12		Heat pumps		Mature
13		High isolation building		Mature
14		High efficiency electric appliance		Mature before 2030
15	Power generation	IGCC/Poly-Generation	With efficiency above 55%	
16		IGCC/Fuel cell	With efficiency above 60%	
17		On shore Wind		Mature
18		Off shore wind		Mature before 2020
19		Solar PV		
20		Solar Thermal		
21		4th Generation Nuclear		
22		Advanced NGCC	With efficiency above 65%	
23		Biomass IGCC		
24		CCS in power generation		
25	Alternative fuels	Second generation bio-ethanol		
26		Bio-diesel	Vehicles, ships, vessels	
27	Grid	Smart grid		
28	Circulating tecnologies	Recycle, reuse, reducing material use		



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Policy roadmap: Super high efficiency air conditioner

- Efficiency Standard: COP, MEPS
- Government Planning
- Subsidy

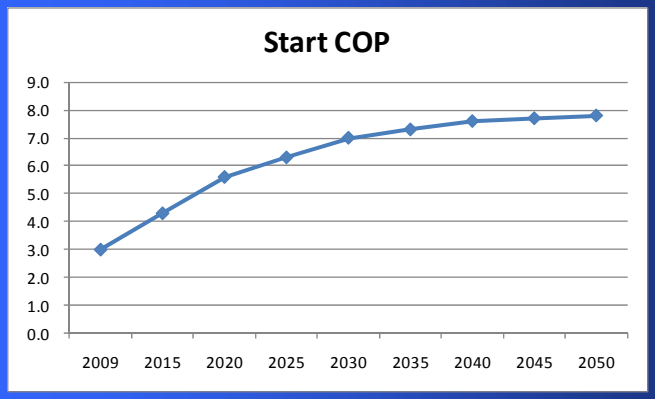

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Table 4. Major policies announced recently

Classification	Policies
Administration	Establishing energy conservation and emission reduction steering group chaired by Prime Minister (June 2006); Distributing targets to each province (September 2006)
Overall National Policies	Synthesizing Working Program for Energy Conservation and Emission Reduction (June 2007); Revised Energy Conservation Law (October 2007); Integrated Resource Utilization Guidance (January 2007); Guidance for Accelerating Energy Conservation Service Industry (2008); Guidance Catalog for industry structure change (annual)
Monitoring	Implementation Program of Energy Intensity Per GDP Statistic Index System (Nov. 2007), Implementation Program of Unit Energy Use Per GDP Exam (Nov. 2007), Implementation Program of Unit Energy Use Per GDP Monitoring (Nov. 2007)
Pricing/Financing	Differentiating energy prices for key energy-intensive industries
Standardization	Second catalog of energy efficiency labeling for consumer products (Sep. 2006); Third catalog of energy efficiency labeling for consumer products (January 2008)
Industry	1000 large energy users monitoring program by national government (April 2006); extending provincial large energy user monitoring program (April 2006); closure of small-size industry in energy intensive sectors including cement, steel, non-ferrous, chemistry etc. (June 2006); approval for new projects based on energy efficiency standard (January 2007)
Transport	Light Vehicle Fuel Efficiency Standard (Sep. 2007)
Buildings	11th Five Year Plan for Energy Conservation in Buildings (February 2006); Building Efficiency Standard Implementation (June 2007)
Power generation	Closure of small power plants (January 2007), regulation for newly installed coal-fired power plants to be most advanced power plants

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Recent Policy Progress under consideration

- Pilot phase low carbon cities and provinces: 8 cities and 5 provinces
- Carbon tax: under discussion
- Domestic Emission trading: 6 pilot provinces and cities
- Energy and CO2 targets in 12th Five Year Plan: national and provincial
- Cap on energy demand: national and provincial, under discussion
- Low carbon technology priority list: under preparing

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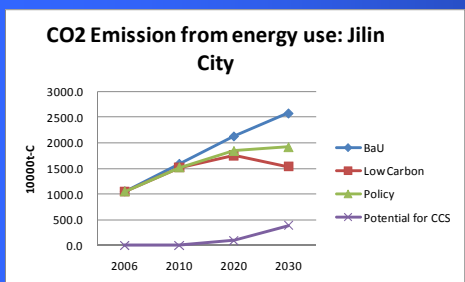

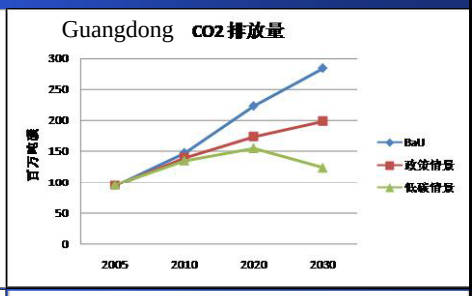

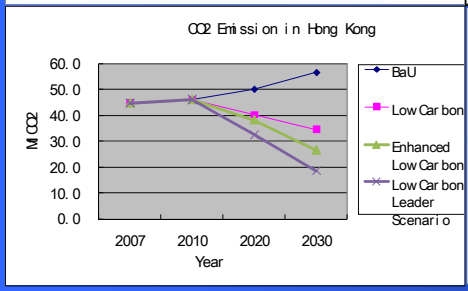

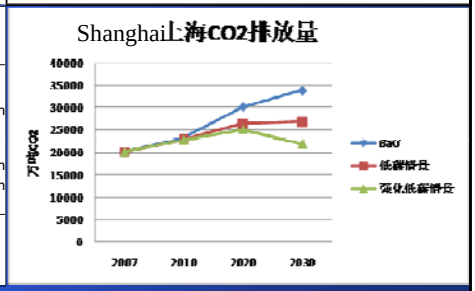

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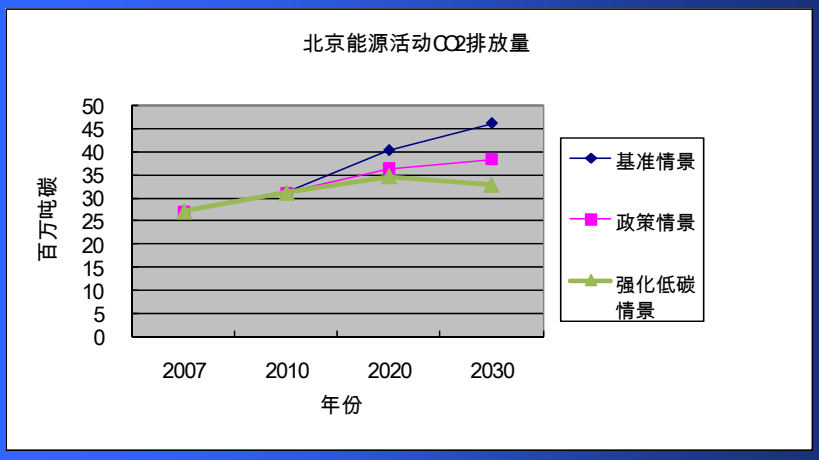
Beijing CO2 emission from energy activities



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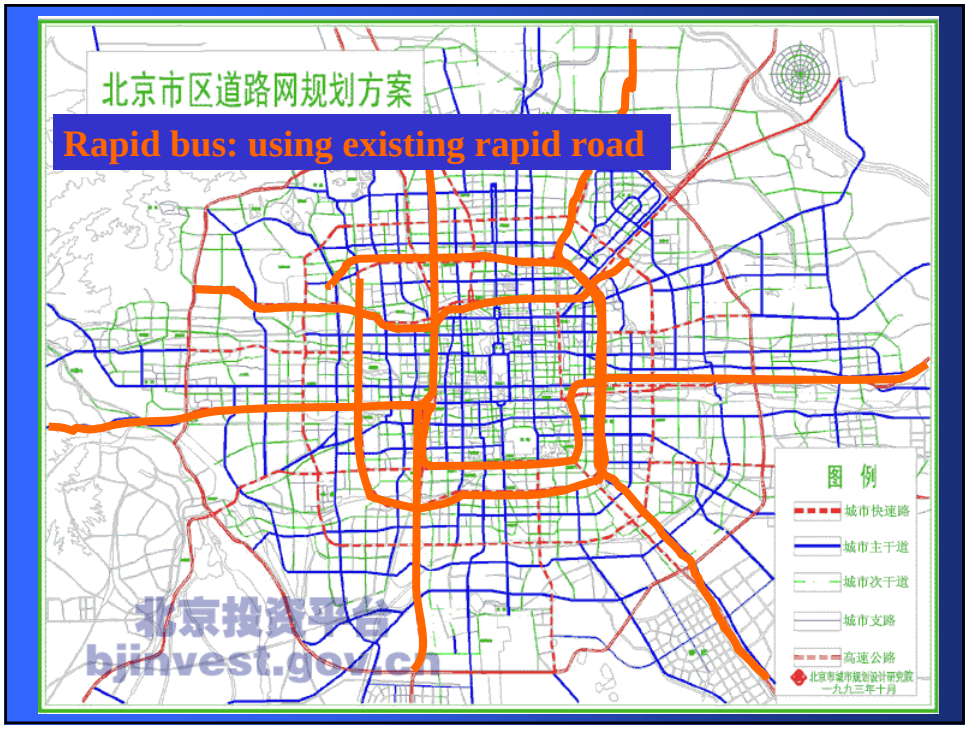
Stockholm: bicycle is coming back


北京市区道路网规划方案
Rapid bus: using existing rapid road
图 例
城市快速路
城市主干道
城市次干道
城市支路
高速公路
北京市城市规划设计研究院
一九九三年十月
北京投资平台
bjinvest.gov.cn

POWER_BOX by Baosteel

2kW wind
10kW Solar PV