China's Low Carbon Scenario under global 2 degree target

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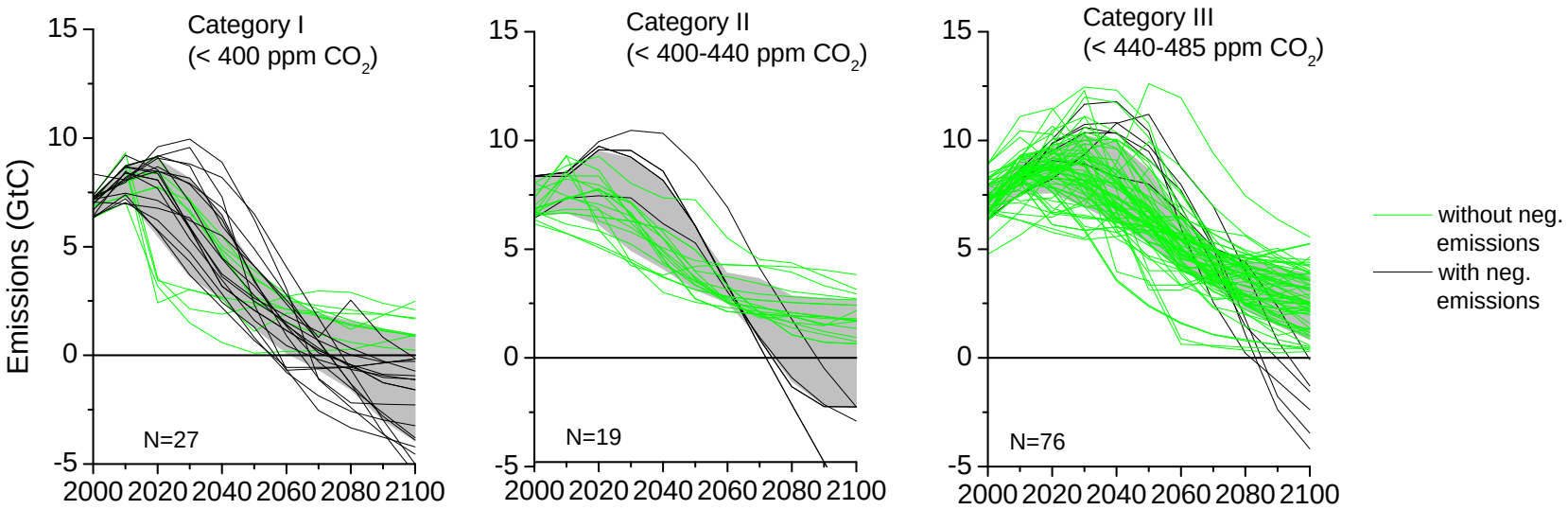
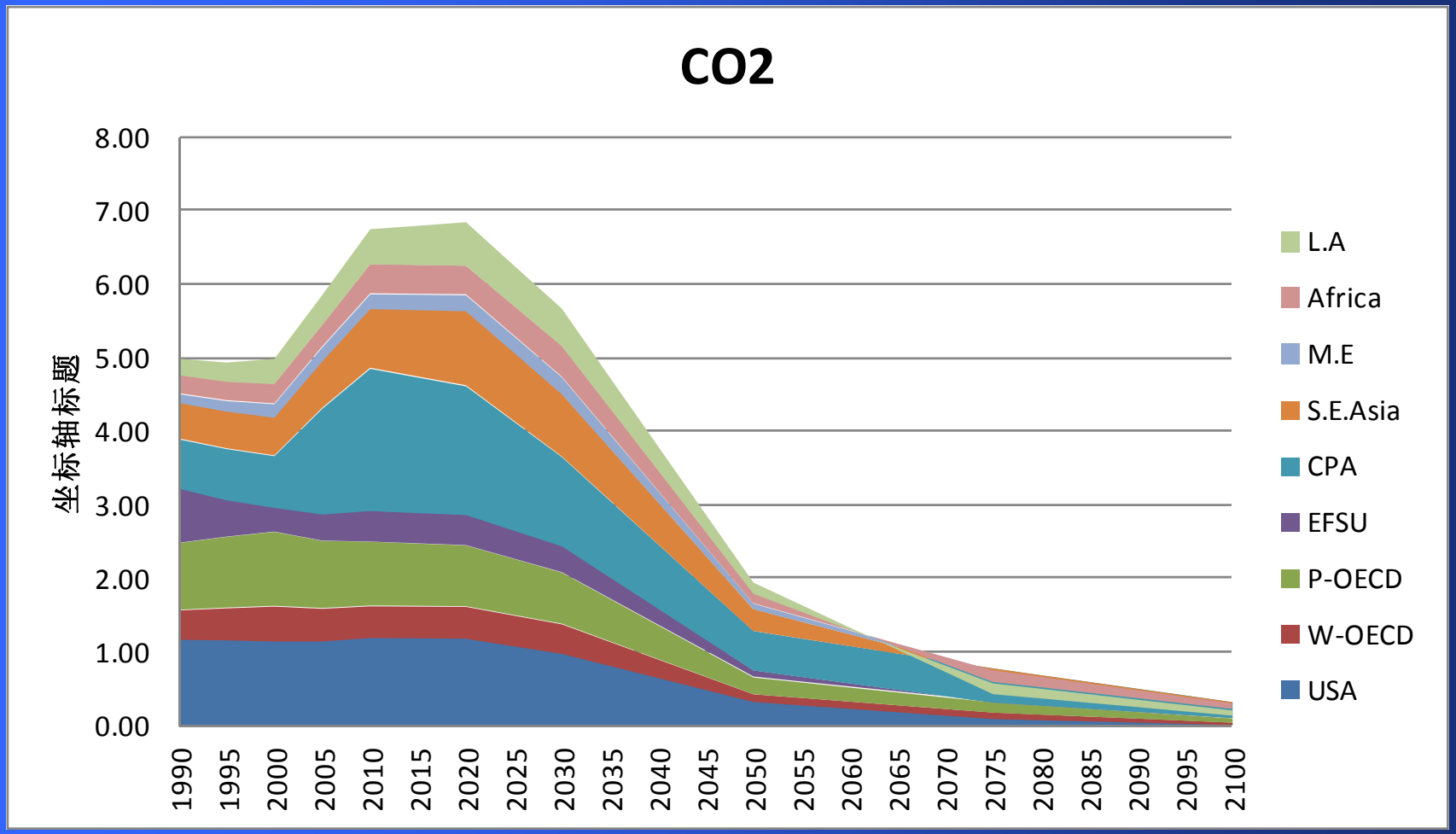
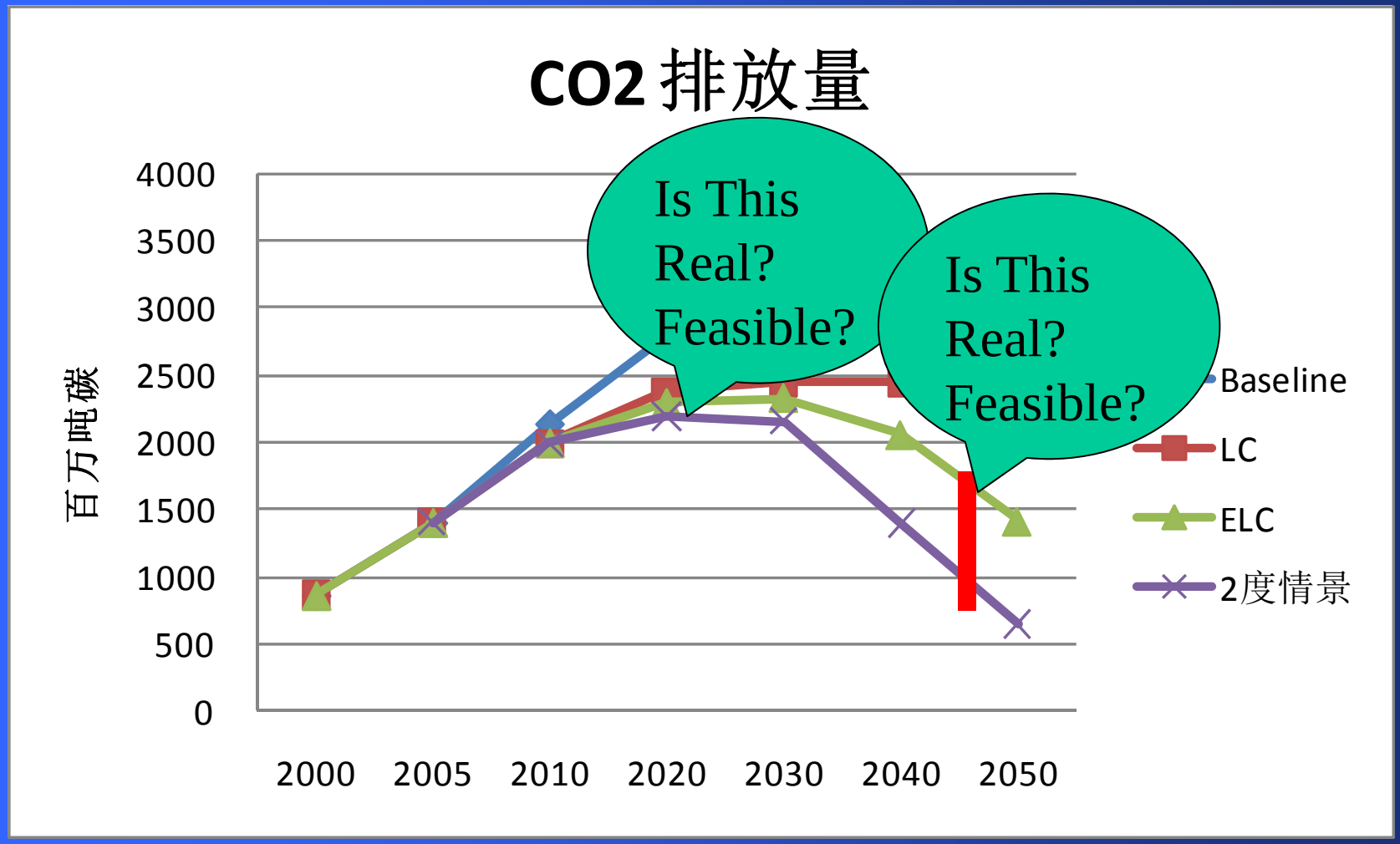
Keyword: Transition – mitigation to reach some climate change targets




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


CO2 排放量
百万吨碳
4000
3500
3000
2500
2000
1500
1000
500
0
2000
2005
2010
2020
2030
2040
2050
Is This Real? Feasible?
Is This Real? Feasible?
Baseline
LC
ELC
2度情景

Go much behind the pictures

Present in detail for key factors

Join modeling forums/workshops/projects

Make study on key factors: economy structure change, carbon pricing, roadmap for new technologies, CCS etc.

Make data transparency

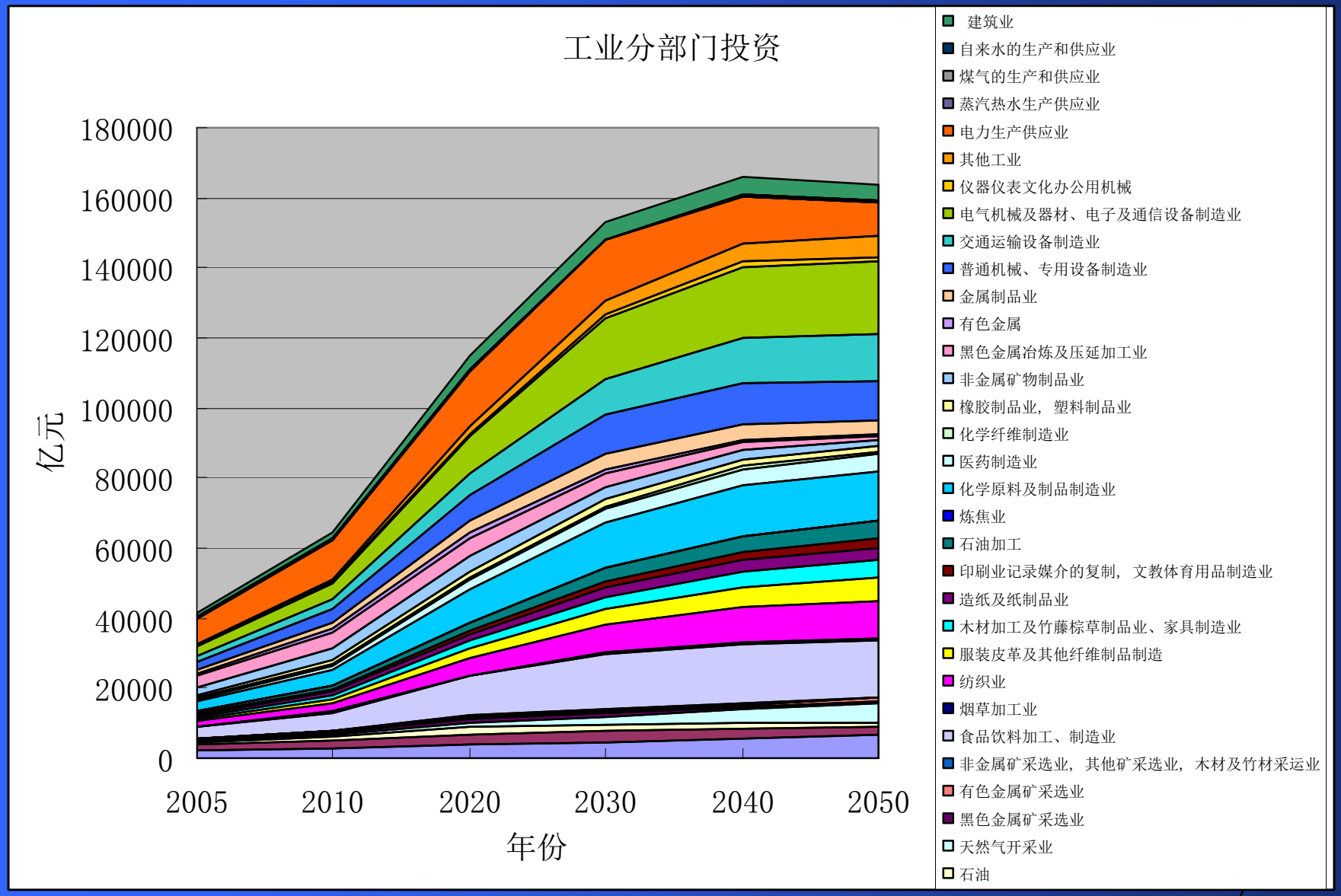
Publication/public available

Keep a good modeling research team for long time

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

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

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
Casutic	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

2050年的低碳住宅
舒适和节能

太阳能利用

光伏电池

(25-47% 的家庭拥有屋顶光伏电池，转换效率接近30%

生态生活教育

减少10-20% 能源需求

屋顶植被

高效照明
【如 LED照明】

减少50%照明需求，普及率 100%

太阳热利用

普及率: 20-60%
（目前 6%）

能源检测系统
（家用电器)

高效绝热

减少 60% 采暖需求，普及率70%

超高效空调

COP =8,
普及率 100%

燃料电池

普及率 0-20%

热泵采暖

COP＝5
普及率 30-70%

待机电源耗电

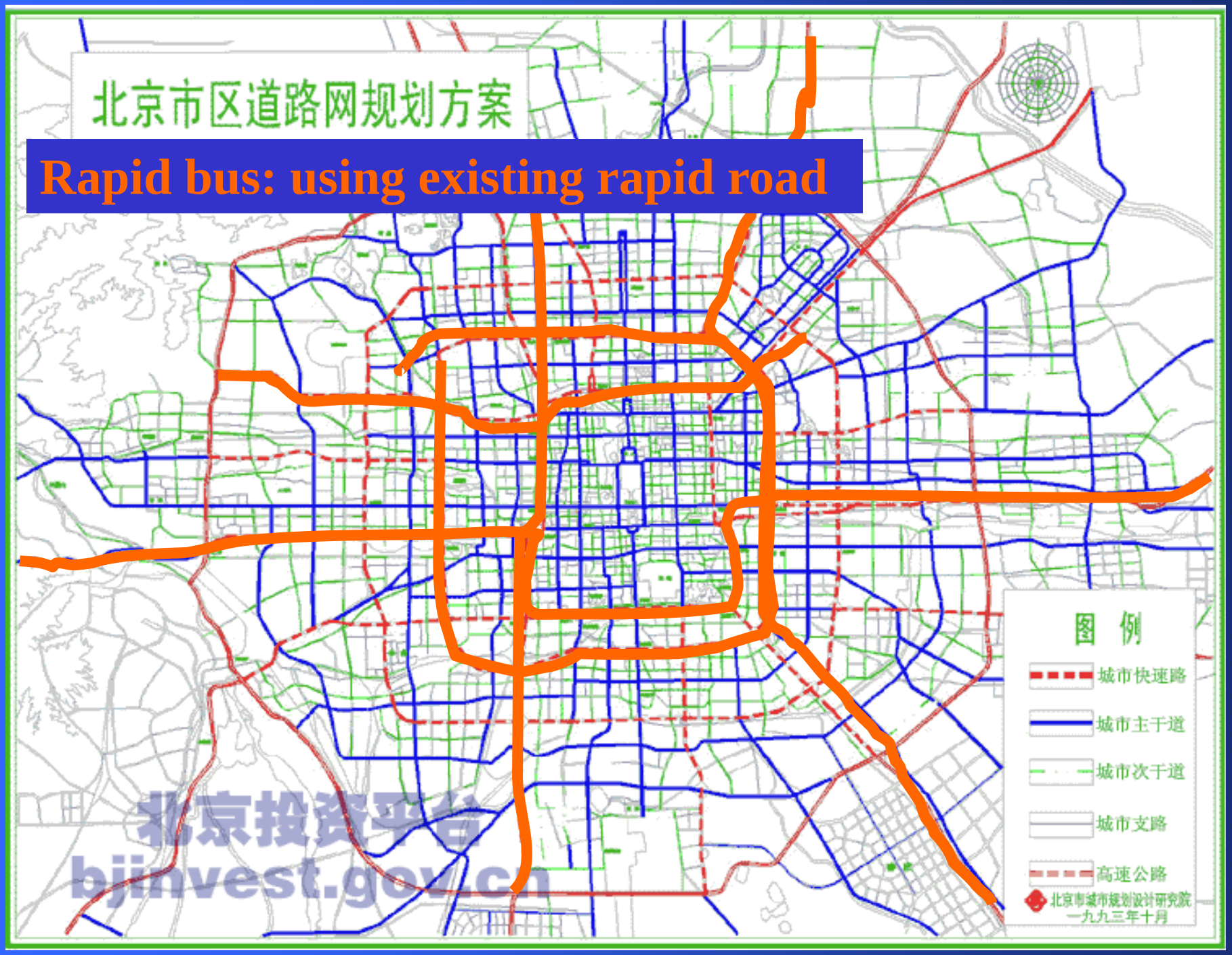
降低1/3，
普及率100%

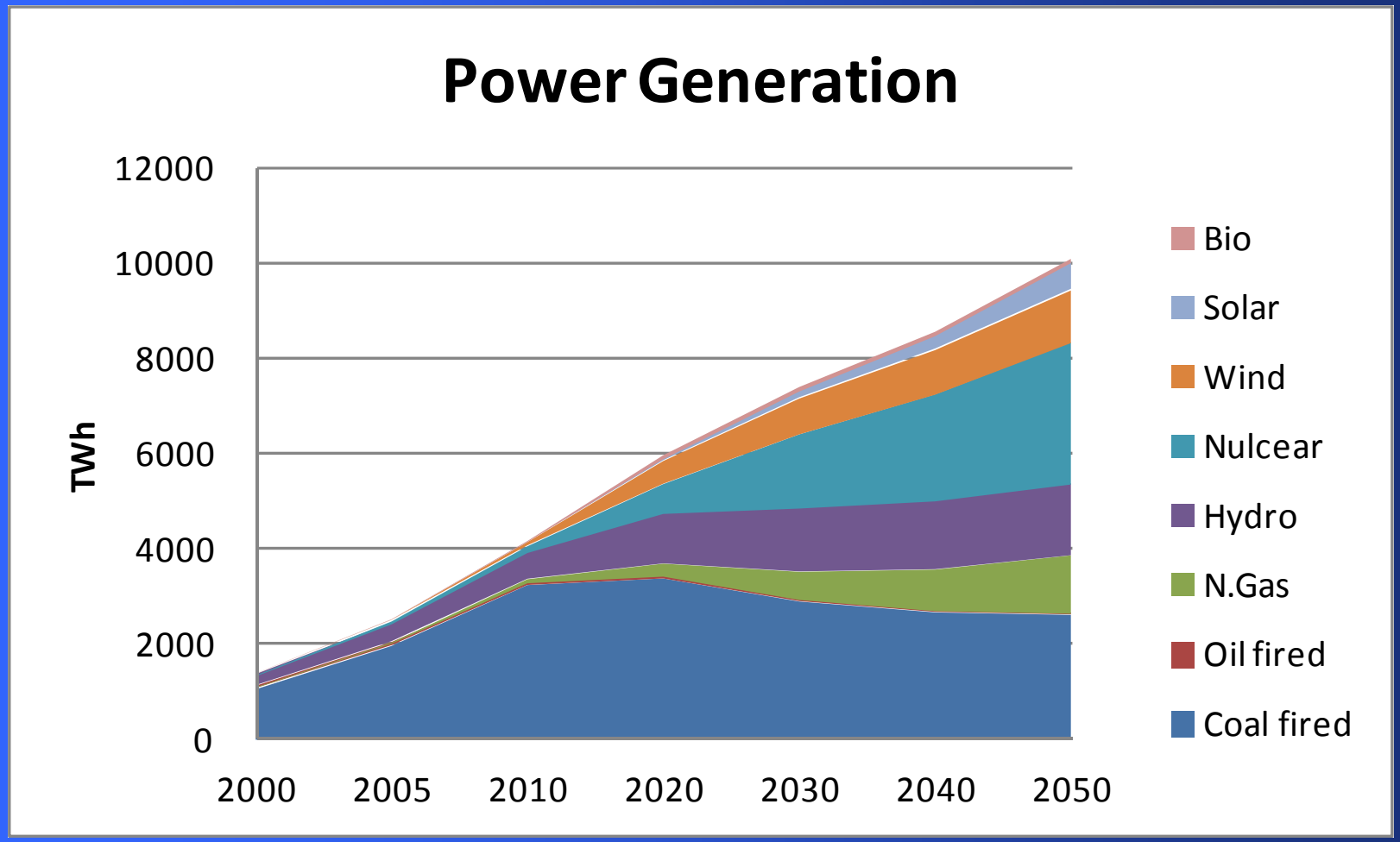
向公众提供经济和环境信息促使大家成为低碳消费

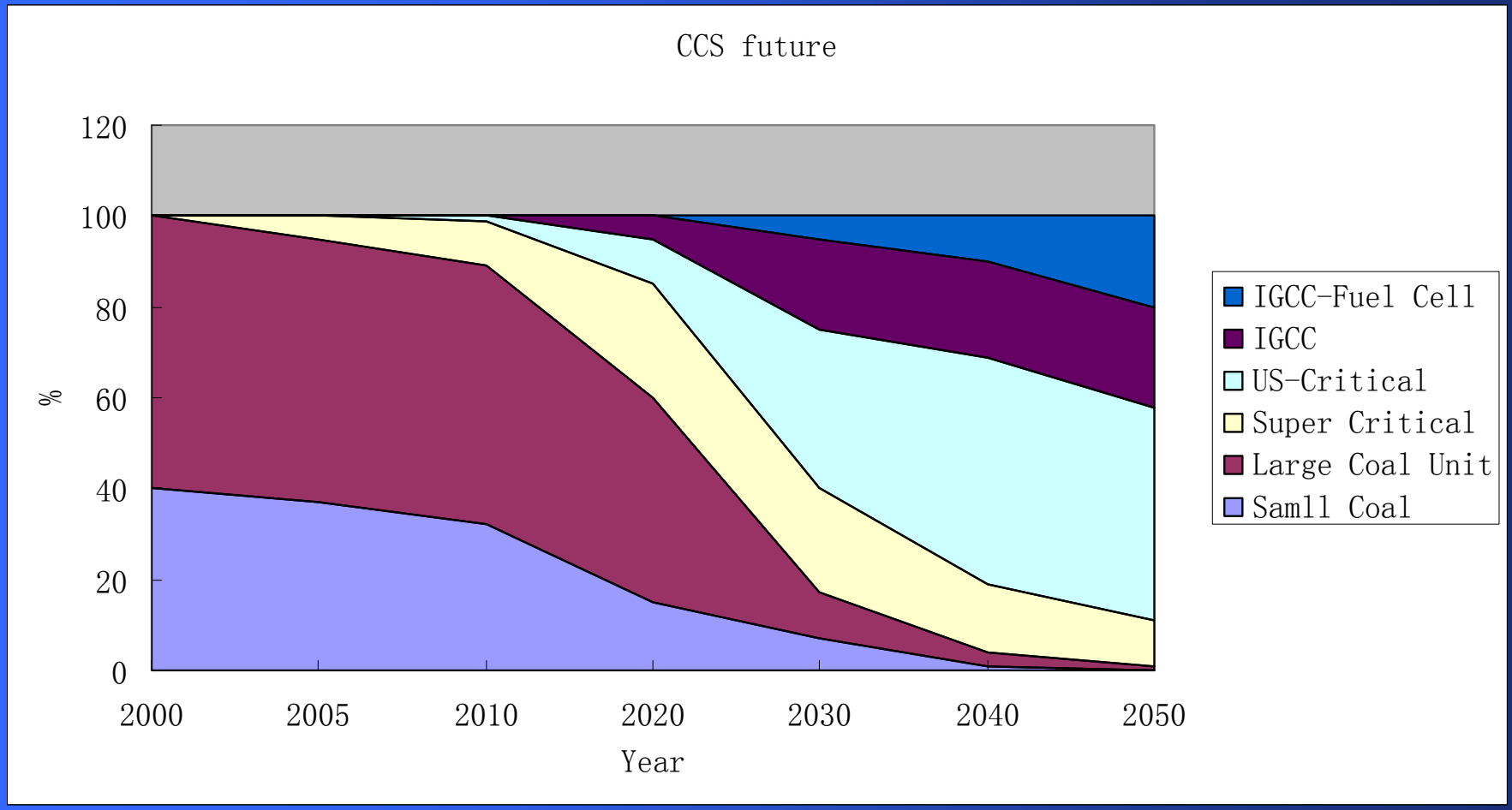
高效家用电器
减少能源需求，支持舒适和安全生活方式

Transport, Low carbon scenario

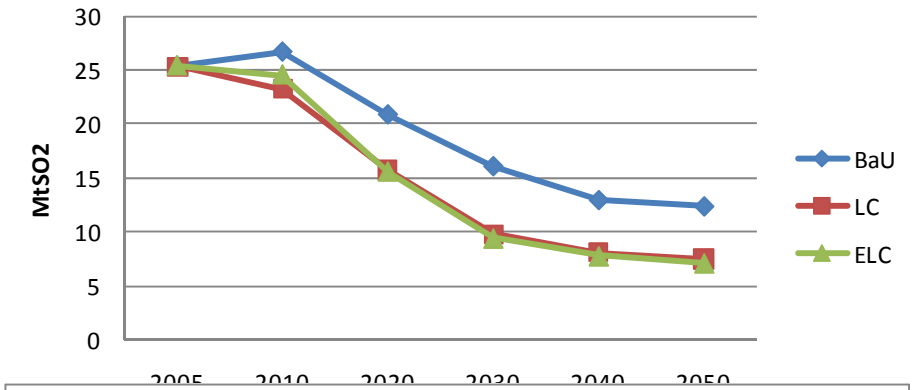
		2005	2010	2020	2030	2040	2050
Family car ownership, per 100HH	Urban	3.37	14	36	65	77	78
	Rural	0.08	0.2	8	38	70	90
Family car annual travel distance, km		9500	9500	9300	8635	8300	7480
Average engin size of family cars, litter		1.7	1.6	1.6	1.6	1.5	1.4
Fuel efficiency of car, L/100km		9.2	8.9	7.1	5.9	4.8	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%


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

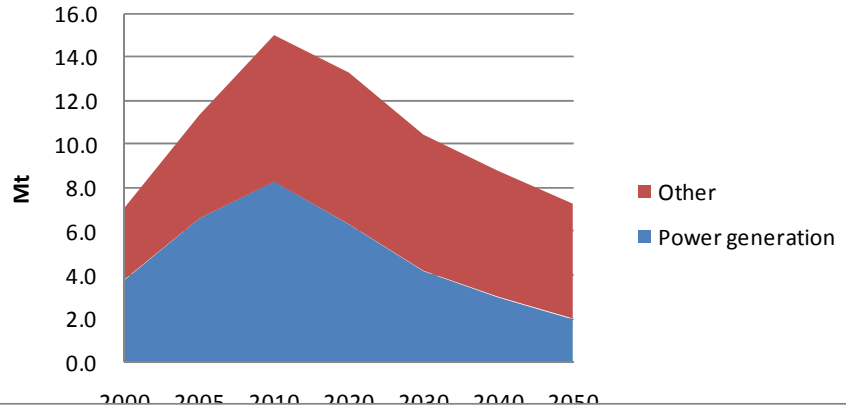

Power Generation
12000
10000
8000
6000
4000
2000
0
TWh
2000
2005
2010
2020
2030
2040
2050
Bio
Solar
Wind
Nulcear
Hydro
N.Gas
Oil fired
Coal fired


CCS future
120
100
80
60
40
20
0
%
2000
2005
2010
2020
2030
2040
2050
Year
IGCC-Fuel Cell
IGCC
US-Critical
Super Critical
Large Coal Unit
Saml Coal

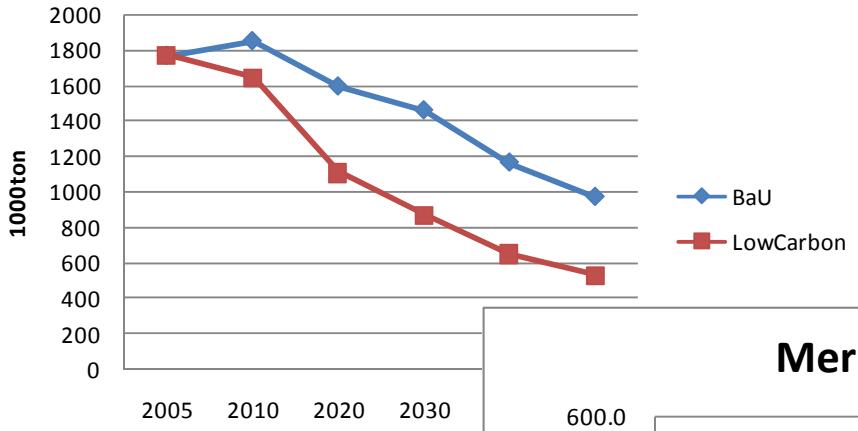
SO2 Emission



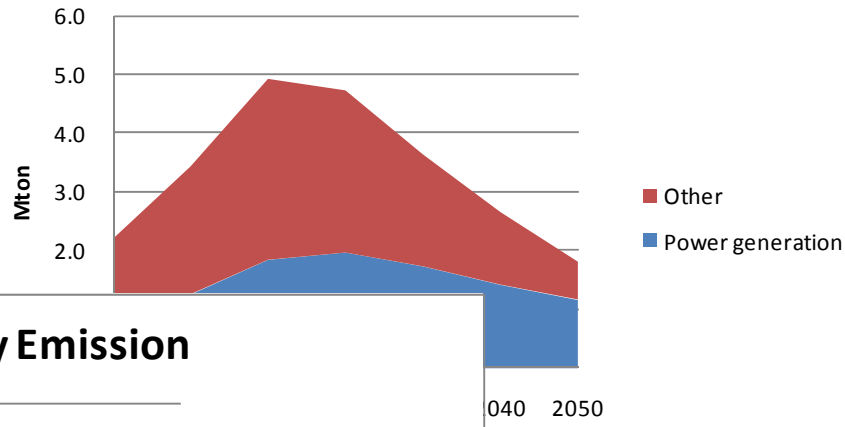
NOx Emission in China, ELC scenario



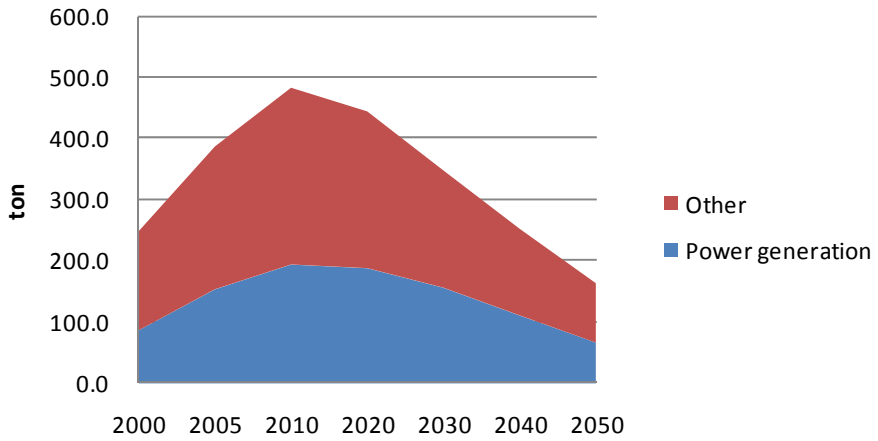
Black Carbon Emission in China



PM2.5 Emission



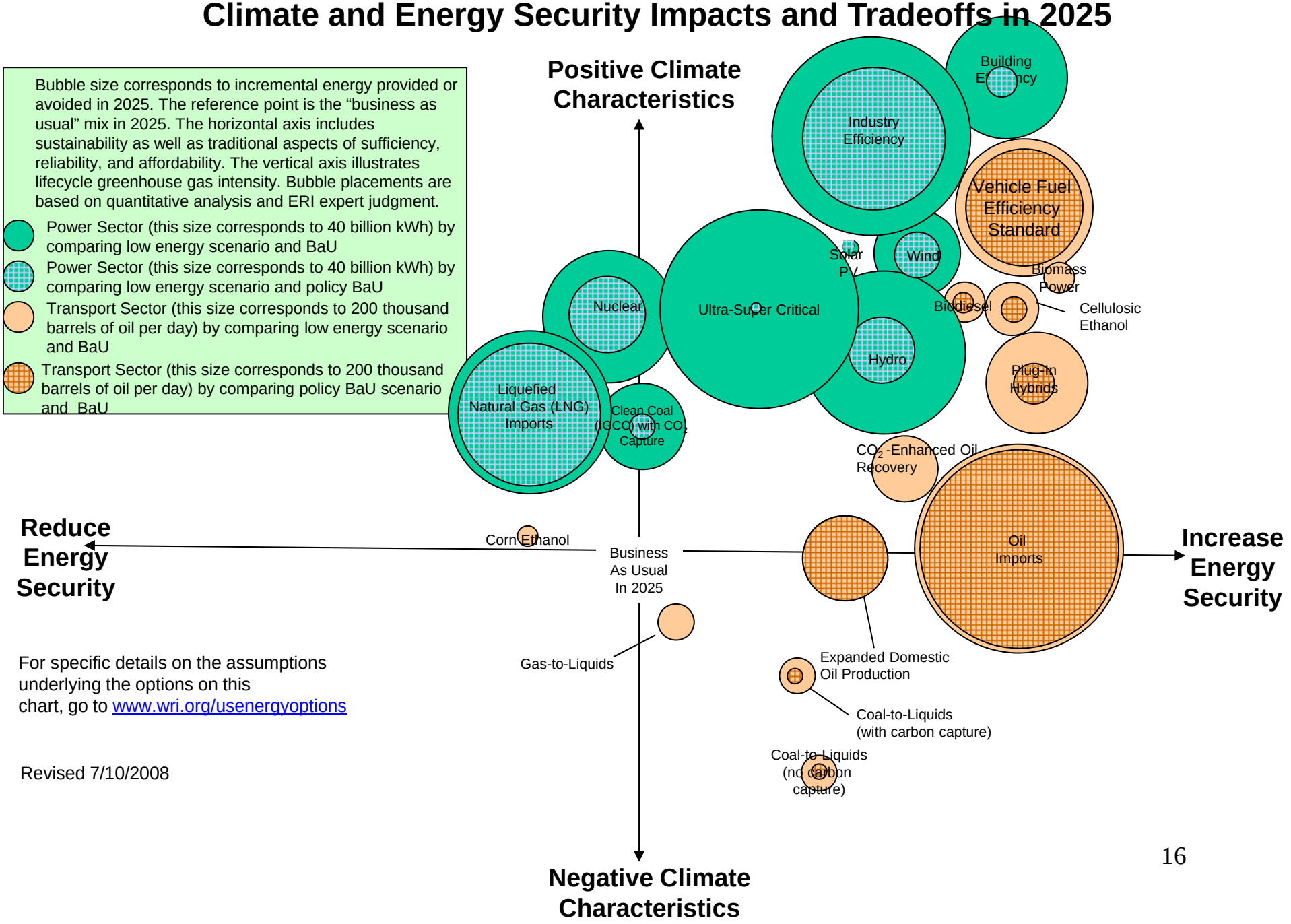
Mercury Emission



A Snapshot of Selected China Energy Options Today: Climate and Energy Security Impacts and Tradeoffs in 2025

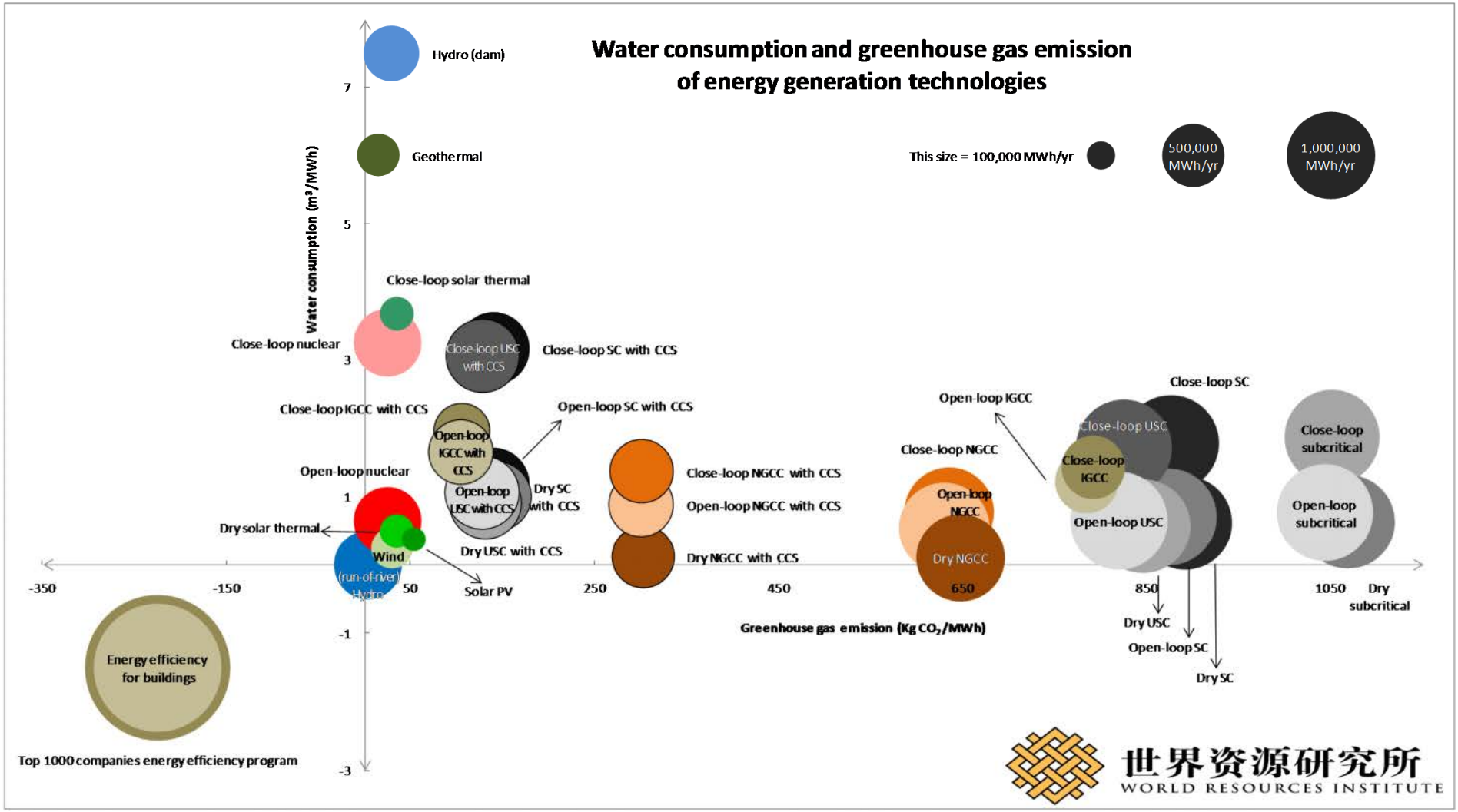
Bubble size corresponds to incremental energy provided or avoided in 2025. The reference point is the "business as usual" mix in 2025. The horizontal axis includes sustainability as well as traditional aspects of sufficiency, reliability, and affordability. The vertical axis illustrates lifecycle greenhouse 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



For specific details on the assumptions underlying the options on this chart, go to www.wri.org/usenergyoptions

Revised 7/10/2008


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 USC with CCS
Dry SC with CCS
Dry solar thermal
Wind
(run-of-river) Hydro
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 SC
Close-loop USC
Close-loop IGCC
Open-loop NGCC
Dry NGCC
Open-loop USC
Close-loop subcritical
Open-loop subcritical
Dry subcritical
Dry USC
Open-loop SC
Dry SC
Energy efficiency for buildings
Top 1000 companies energy efficiency program
7
5
3
1
-1
-3
-350
-150
50
250
450
650
850
1050
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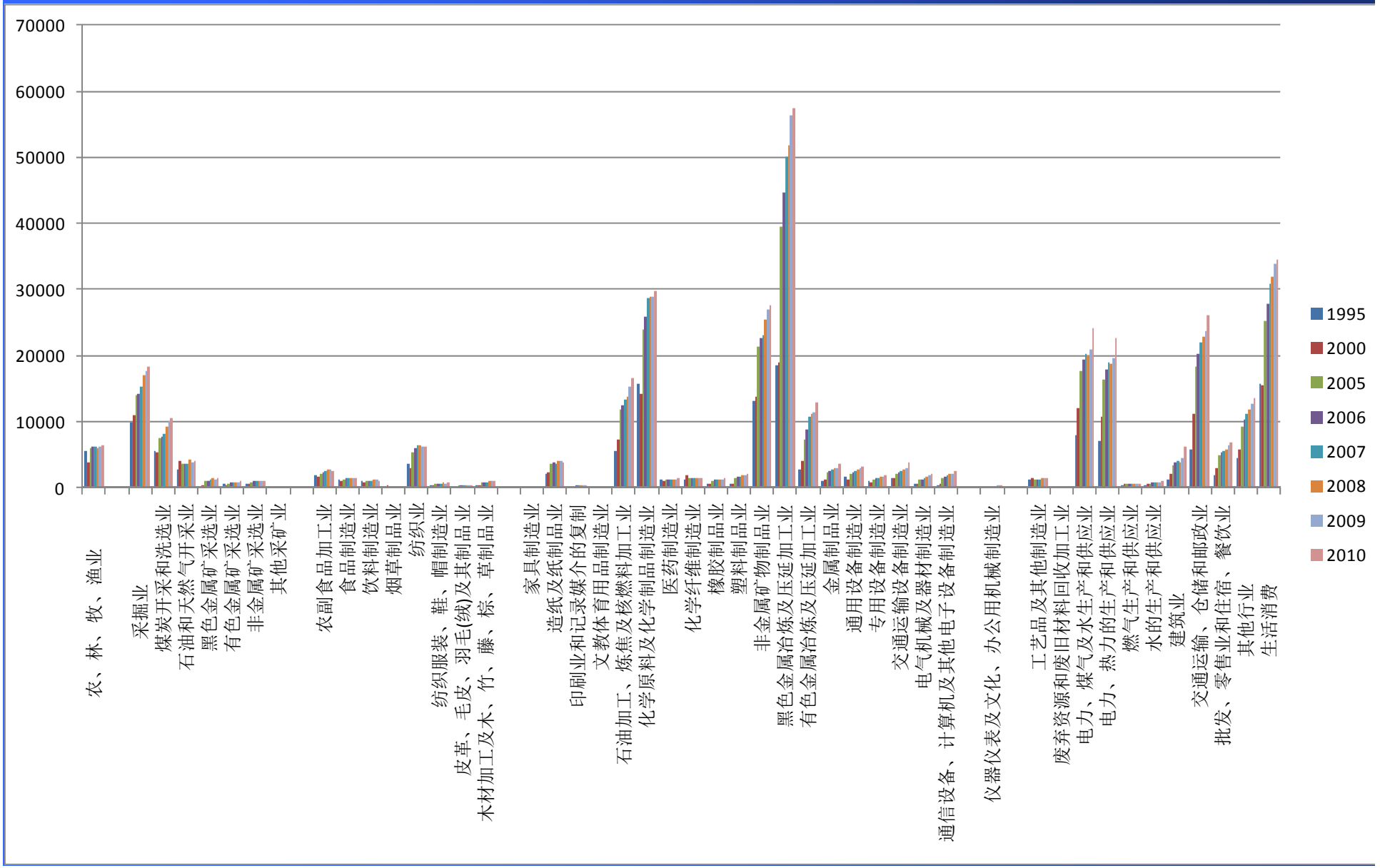
28 key technologies in the enhanced low carbon scenario in China

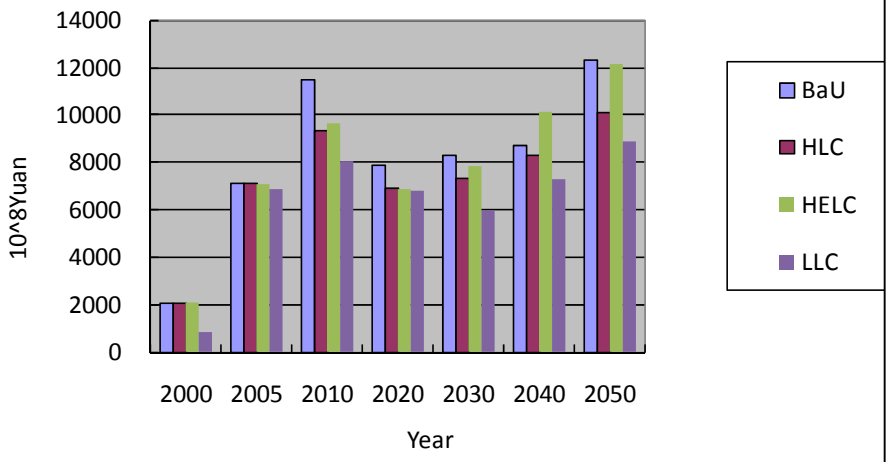
No.	Sector	Technology	Description	Note
1	Industry technology	High energy efficiency equipment	High efficiency furnace, kiln, waste heat recovery system, high efficiency process technologies, advanced electric motor	Nearly in market
2		New manufacture process technology for cement and steel		
3		CCS	In 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		4^{th} 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		

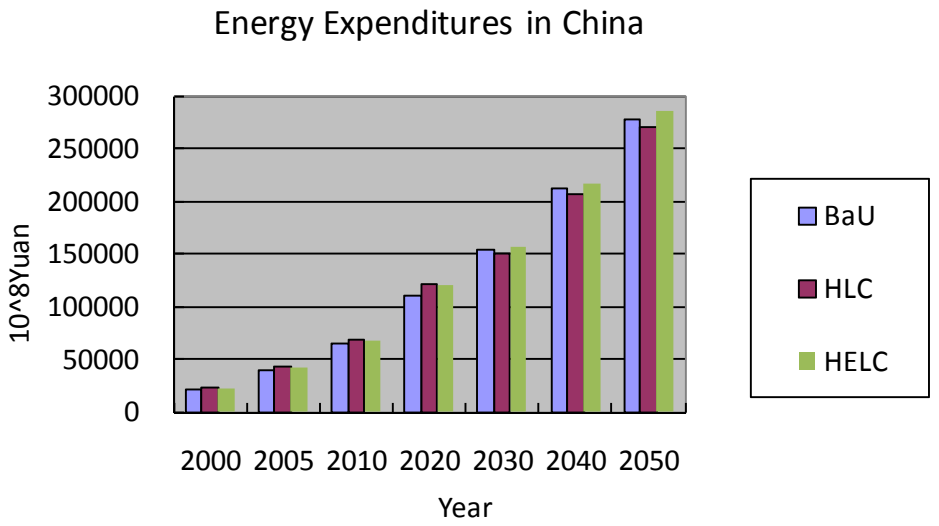
Can we do it: Peak before 2025?

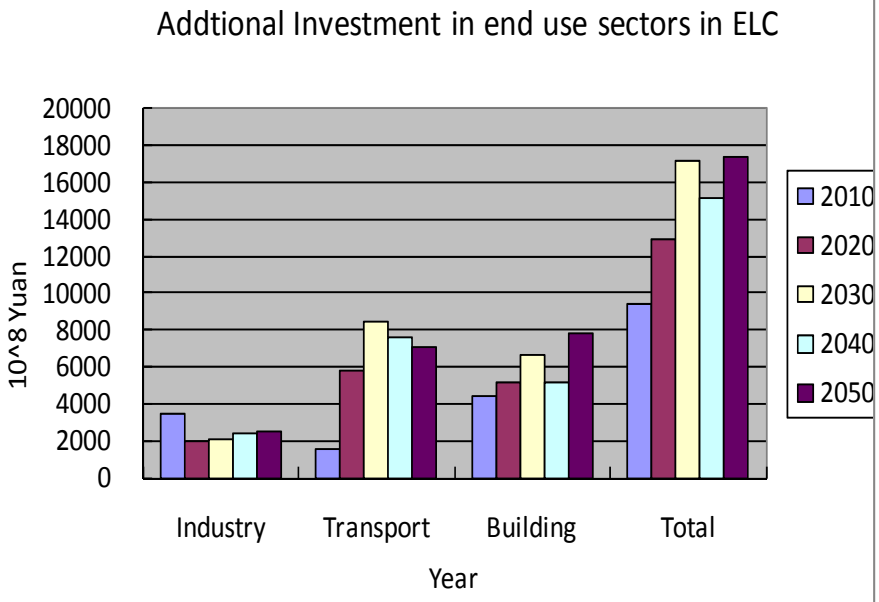
- Economic structure will change soon, pushing by policy or wait until market decide(this will cause big problem for low capacity utilization)
- Technology is ready
- Economic ability is getting much stronger to pay for low carbon development
- Global target need us move faster
- Low carbon development is getting to be a main stream in China

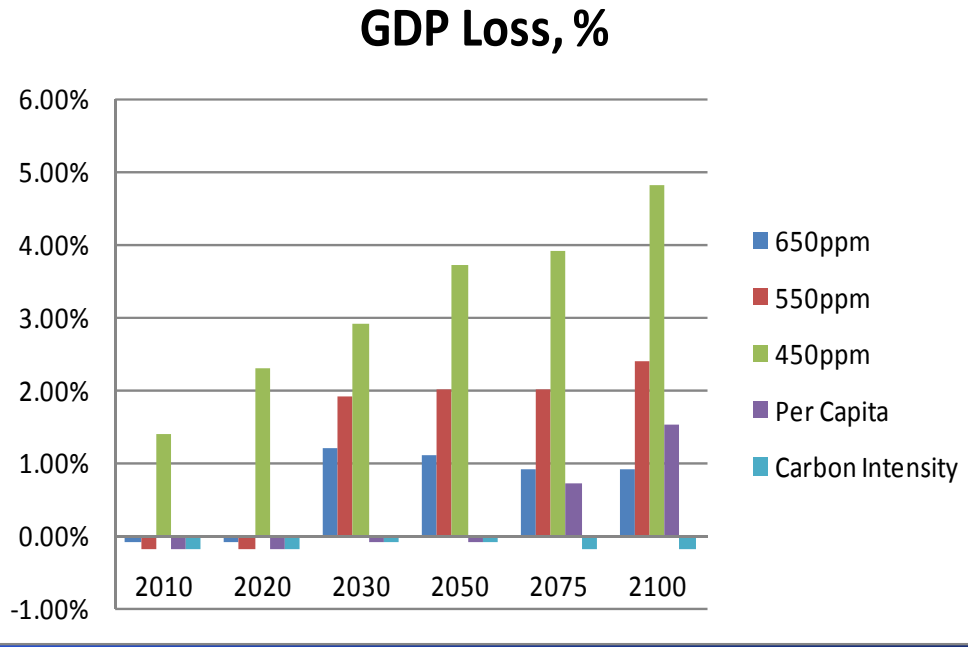
分部门能源消费量, Energy demand by sector, 1995-2010




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

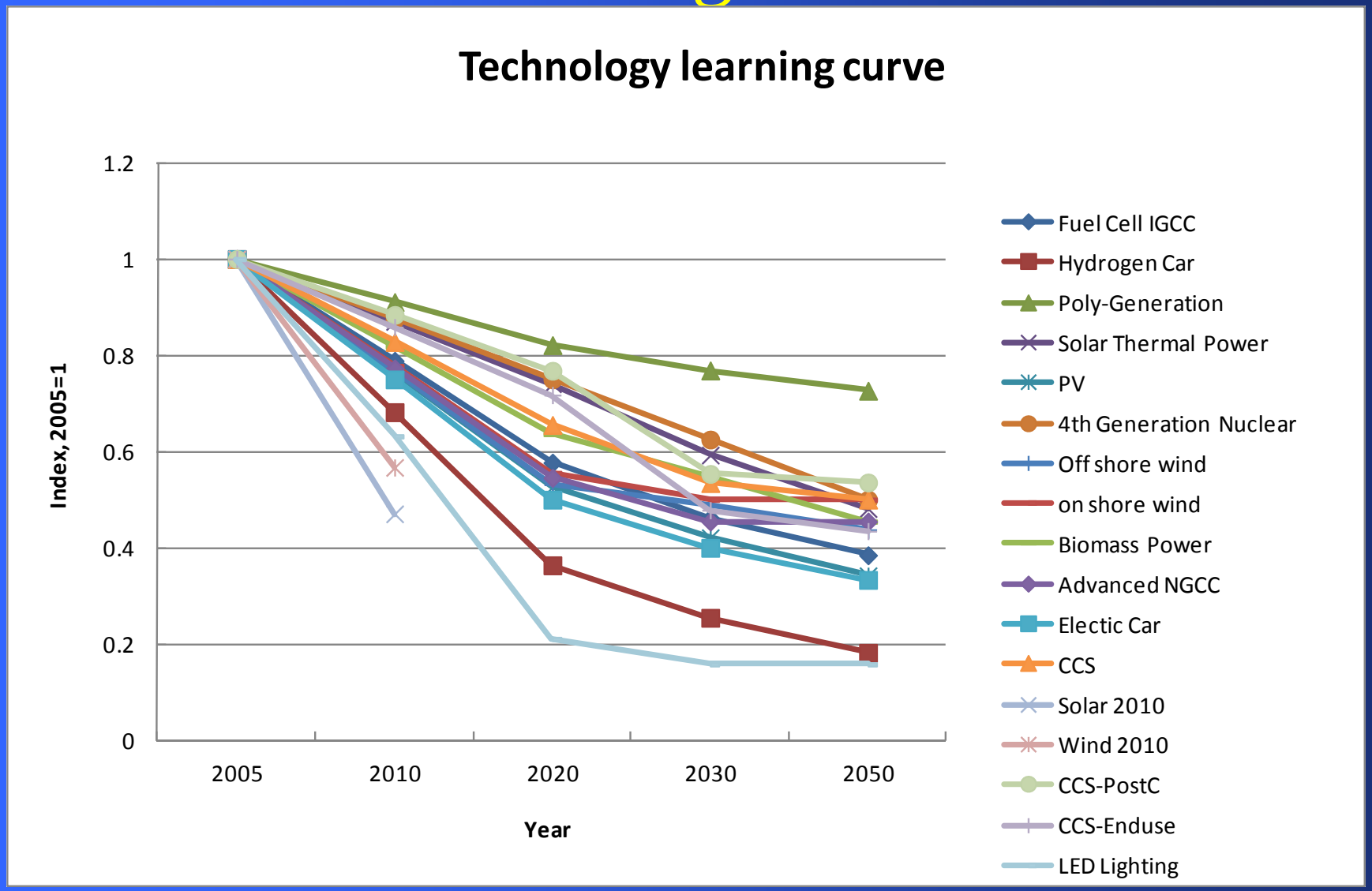

Addtional Investment in end use sectors in ELC
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
10^8 Yuan
Industry
Transport
Building
Total
Year
2010
2020
2030
2040
2050


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

Good News: Rapid GDP growth could provide strong support

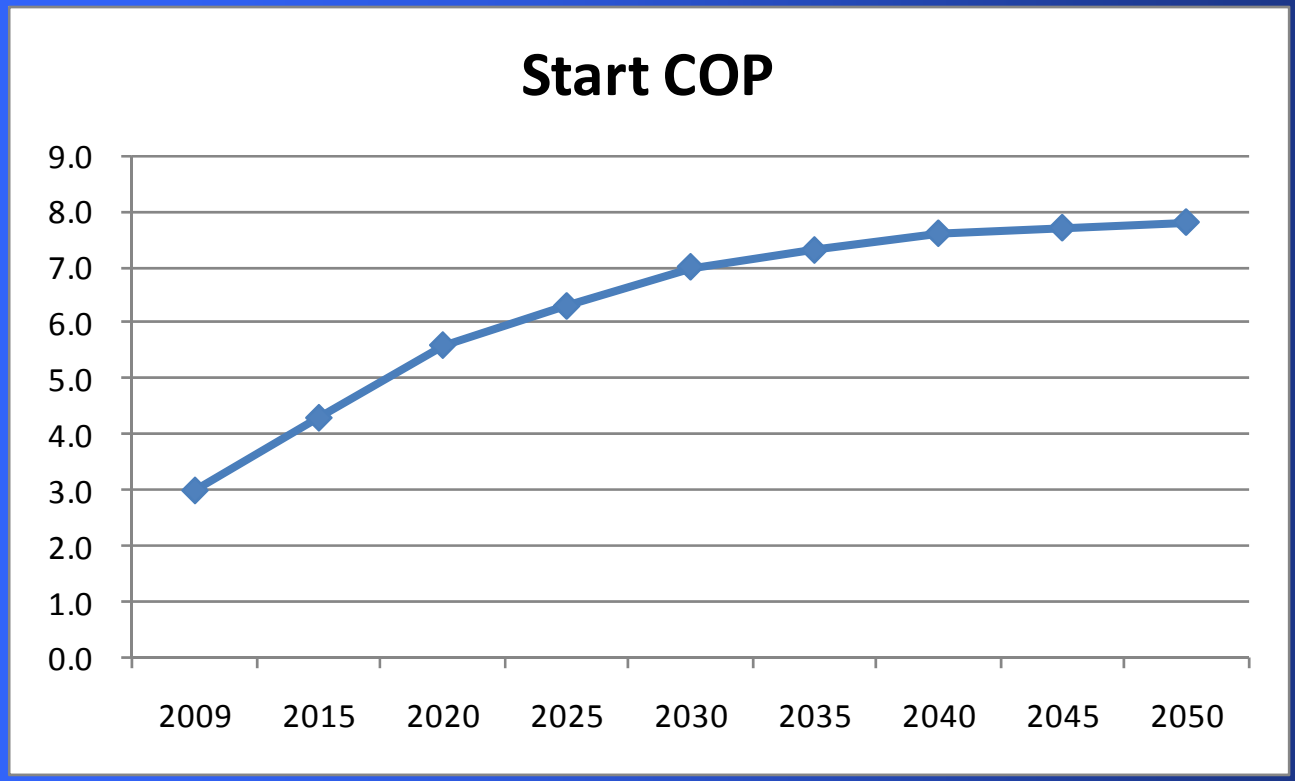
- By 2015, GDP in China could reach 75trillion Yuan(in current value)
- Newly added accumulated GDP is 450 Trillion Yuan
- Cumulated GDP is 860 Trillion Yuan
- All the investment need in all modeling study is much small

What is the role of technologies in the mitigation?



Policy roadmap: Super high efficiency air conditioner

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

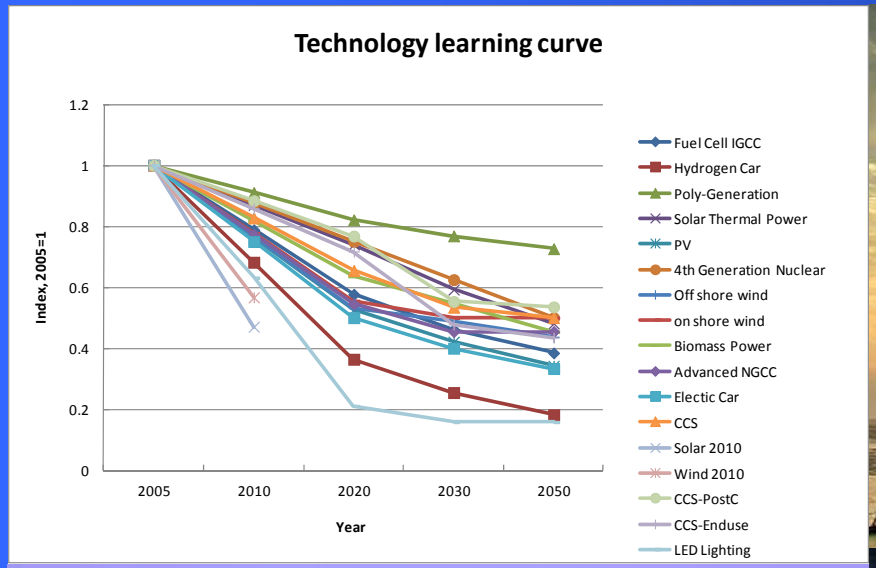


四、影响电动汽车发展的主要制约因素分析

4. Analysis Major Constraints Factors

- 3.3 电动汽车实现经济性的趋势分析 Trend Analysis on EVs

电动汽车与先进汽油和柴油车成本变化趋势分析					
	2006-2010	2011-2015	2016-2020	2021-2025	2026-2030
电动汽车Evs					
电池充满电时总容量kWh	16	24	48	80	112
电力销售价格（元/kWh）	0.48	0.60	0.75	0.94	1.18
单位里程耗电量（kWh/km）	0.18	0.13	0.08	0.08	0.07
单位里程耗电费用（yuan/km）	0.09	0.08	0.06	0.08	0.08
电动汽车燃料成本（yuan/car）	43200	39067	30104	37694	41299
单位电池容量成本(USD/kWh)	750	375	130	75	30
Evs车电池组成本(yuan/car)	80400	60300	41808	40200	22512
电池组寿命（年）	3.6	5	11	22	22
电池组更换次数（set/year)	4.1	2.8	1.4	0.7	0.7
EVs全寿期电池成本（yuan/car）	413256	226728	99503	67938	38045
EVs全寿期电耗和电池总成本（yuan/car）	456456	265795	129607	105632	79345
每年费用（yuan/car）	30430	17720	8640	7042	5290
先进汽油汽车ICE					
汽油销售价格（yuan/liter)	6.6	8.5	10.2	11.0	11.8
柴油销售价格（yuan/liter)	6.4	8.3	9.9	10.6	11.4
单位里程耗汽油（L/km）	0.050	0.039	0.031	0.024	0.020
单位里程耗柴油（L/km）	0.047	0.038	0.030	0.024	0.020
全寿期行驶里程（km)	500000	500000	500000	500000	500000
先进汽油车燃料成本（yuan/car）	165000	167550	158356	133574	117738
先进柴油车燃料成本（yuan/car）	150400	155333	149317	128100	114170
每年费用	11000	11170	10557	8905	7849
比较（Evs车费用－ICE车费用）	291456	98245	-28749	-27941	-38394



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),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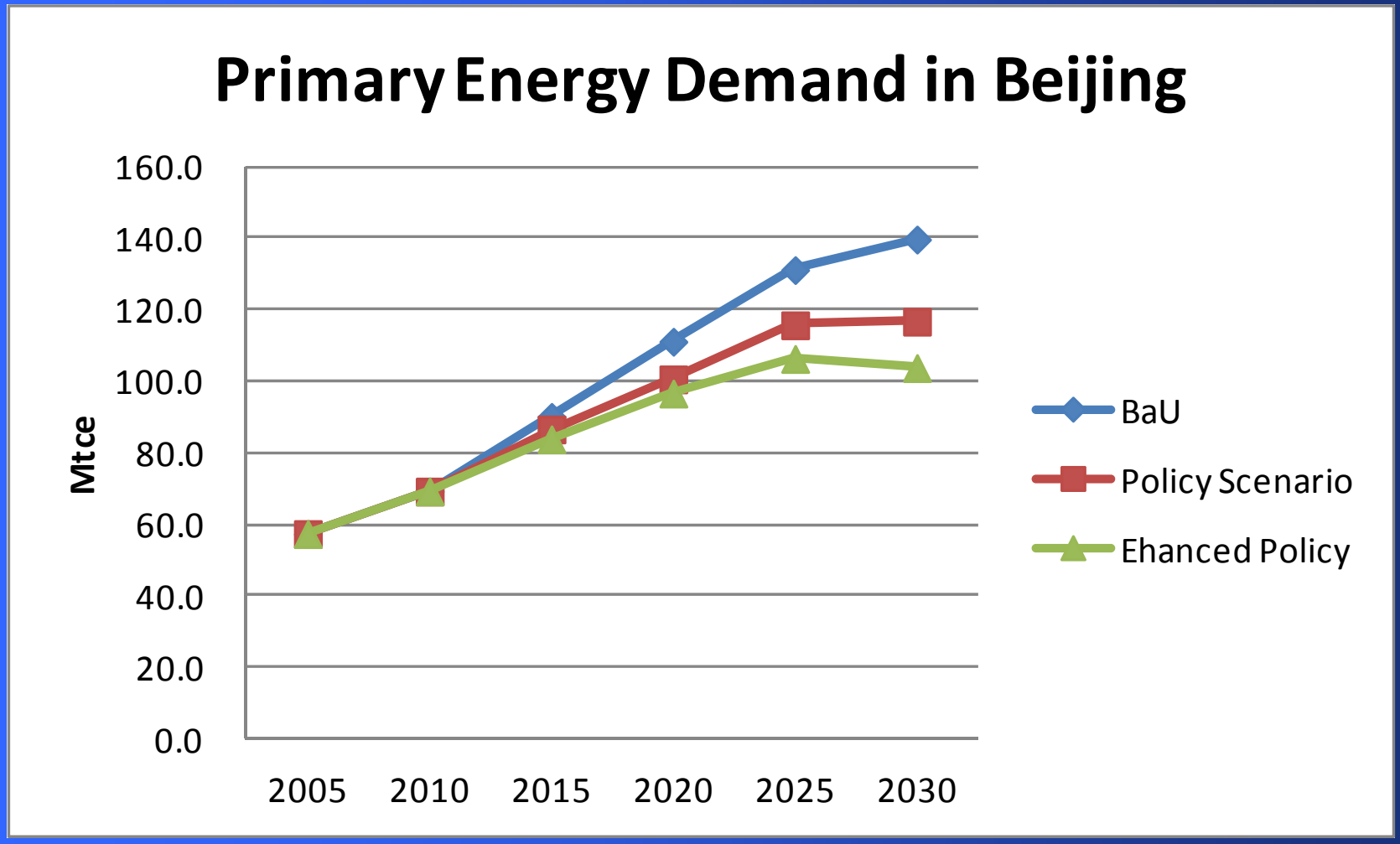
搜索
热门搜索：新一代APU 跑步机 老板烟机 和田新枣 华为Y210 聚焦十八大 诺基亚800
我的京东
去购物车结算
全部商品分类
首页
服装城
迷你挑
团购
夺宝岛
在线游戏
办中银京东卡
全部结果 > "平板电视机"
所有类目
大家电 (313)
相关搜索：平板电视 | 电视机 | 电视 | 液晶电视 | 平板电脑 | 冰箱
"平板电视机" 找到321件相关商品
荣耀四核
热门搜索：新一代APU 跑
全部结果 > "LED平板电视机"
"LED平板电视机" 找到253件相关商品
品牌：京东方（BOE） 夏普（sharp） 长虹（CHANGHONG）
价格：0-2199 2200-3799 3800-
品类：LED背光电视 LCD背光电视
大家电 (253)
平板电视 (248)
家电配件 (5)
推广商品
惊爆价
乐华（ROWA）LED23C310A 23英寸 LED液晶电视 USB+HDMI 液晶显
¥999.00
惊爆价
热卖
排序：相关度 销量 价格 评论数
库存：全国 仅显示有货 商品类型：
灯泡
热门搜索：新一代AP
全部结果 > "灯泡"
"灯泡" 找到1068件相关商品
品牌：飞利浦（Philips） 麦辉（MAWUI） 蒙特丽
价格：0-69 70-199 200-49
灯具 (691)
节能灯 (143)
LED灯 (365)
装饰灯 (15)
台灯 (10)
氛围照明 (13)
吸顶灯 (76)
应急灯/手电 (2)
五金电器 (2)
吊灯 (58)
落地灯 (7)
五金家装 (40)
改装配件 (84)
相关搜索：节能灯泡 | 节能灯 | 灯 | led
排序：相关度 销量 价格
库存：全国 仅显示有货



Peak CO2 emission by 2015, to be a low carbon city by 2030, comparable with Tokyo, and Shanghai, Tianjin are thinking in similar way

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

- Now: Wind 200GW to 250GW, Solar 50WG

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

Natural Gas Scenarios

- In 2010,Natural Gas use 107.2BCM, while 12.2BCM imported.
- In our low carbon scenario: by 2030, 370BCM
- NEA’s planning: 260BCM by 2015/230BCM