

Low Carbon Future

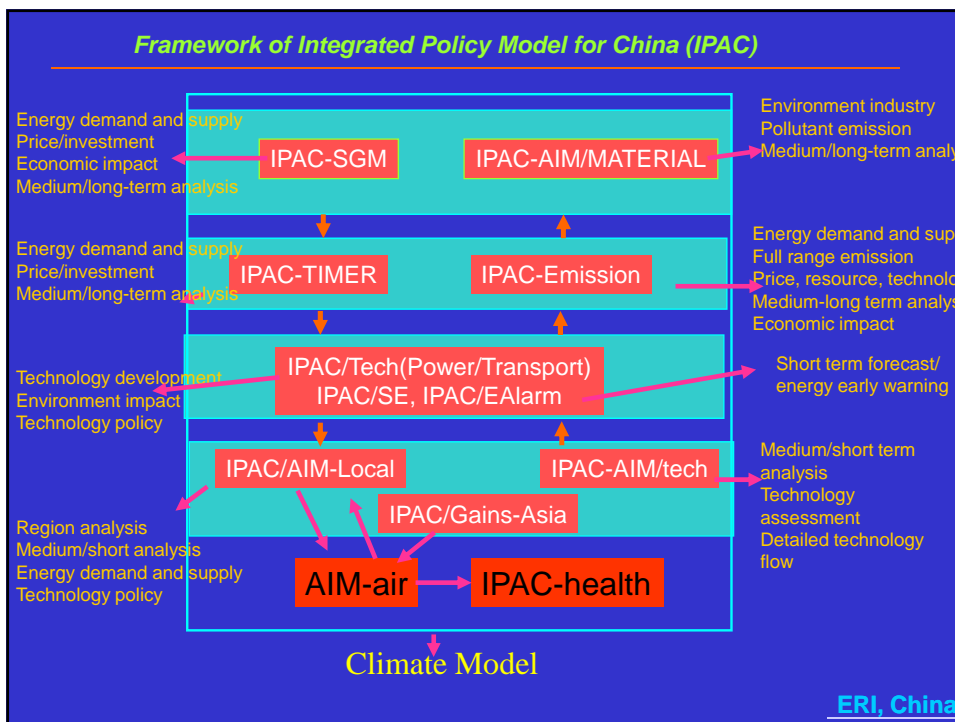
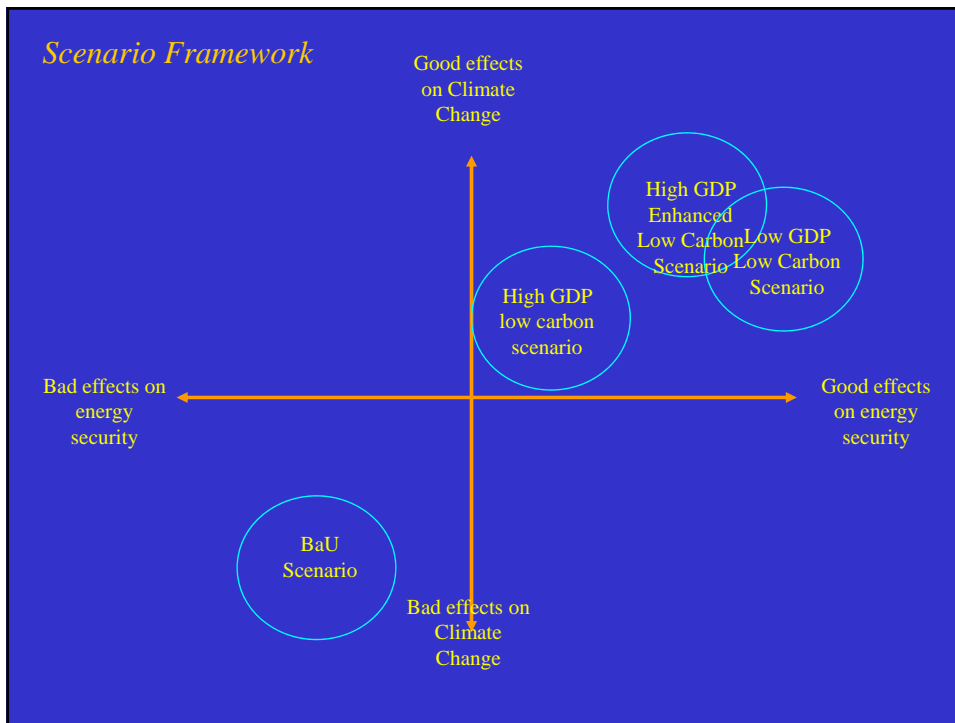
Energy and Emission Scenario up to 2050 for China

Jiang Kejun
Energy Research Institute

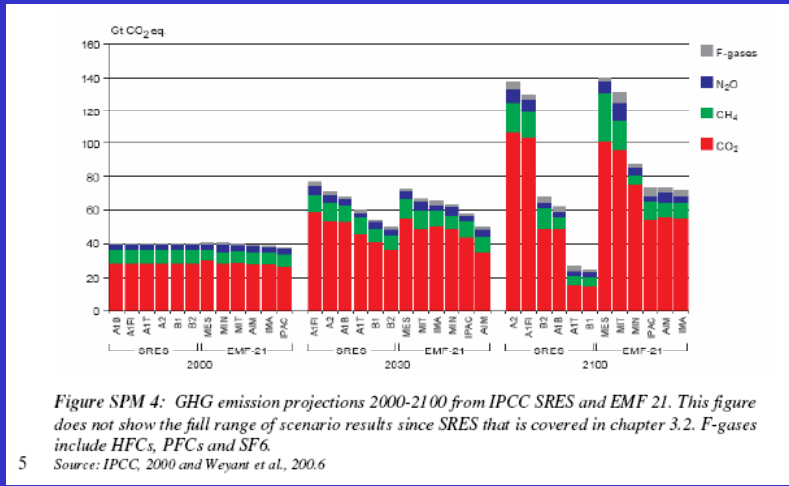
IGES-ERI Policy Dialogue
Towards a Sustainable, Low-Carbon Asia:
Policies and international collaborations
Sep.22-23, Beijing

Low Carbon Future: our vision

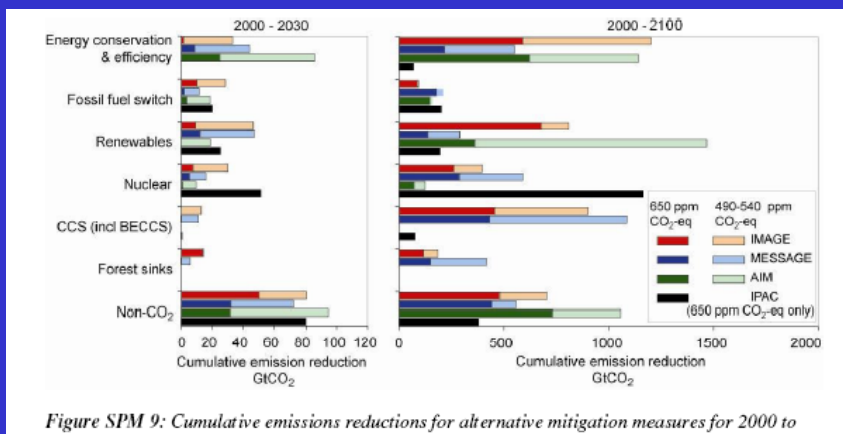
- Low carbon/GHG emission
- Comfortable life/high welfare
- Green/eco-friendly development
- Well developed transport system with focus on easy walking/bicycle
- Environment friendly life style
- Promote economy development



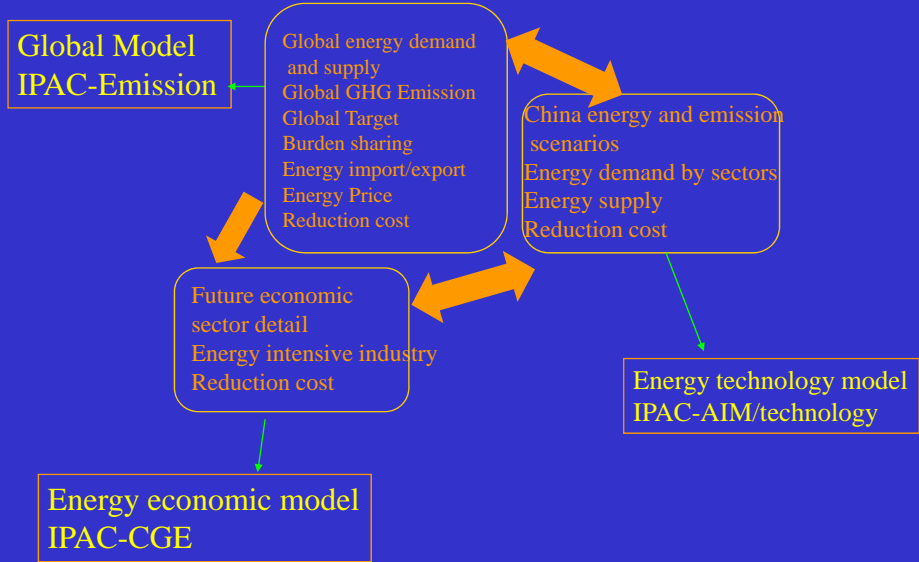
There are many publication on IPAC



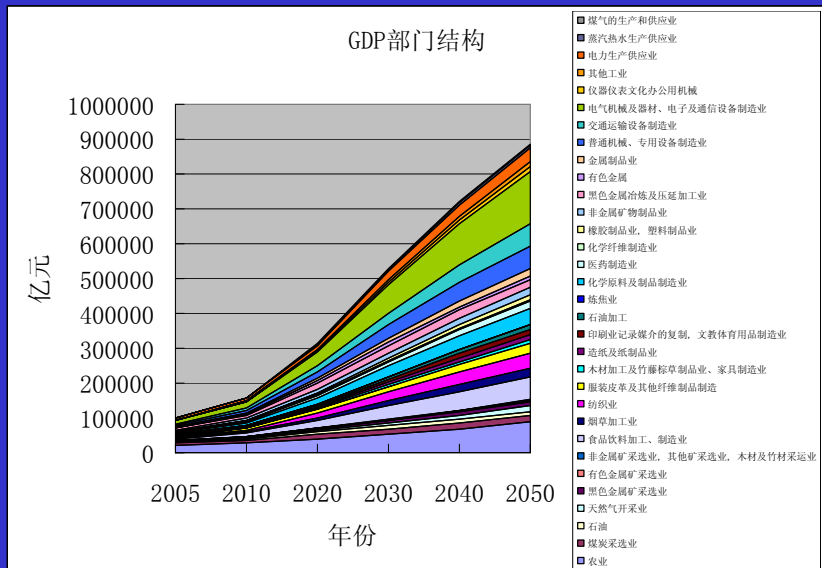
There are many publication on IPAC: IPCC TAR, AR4



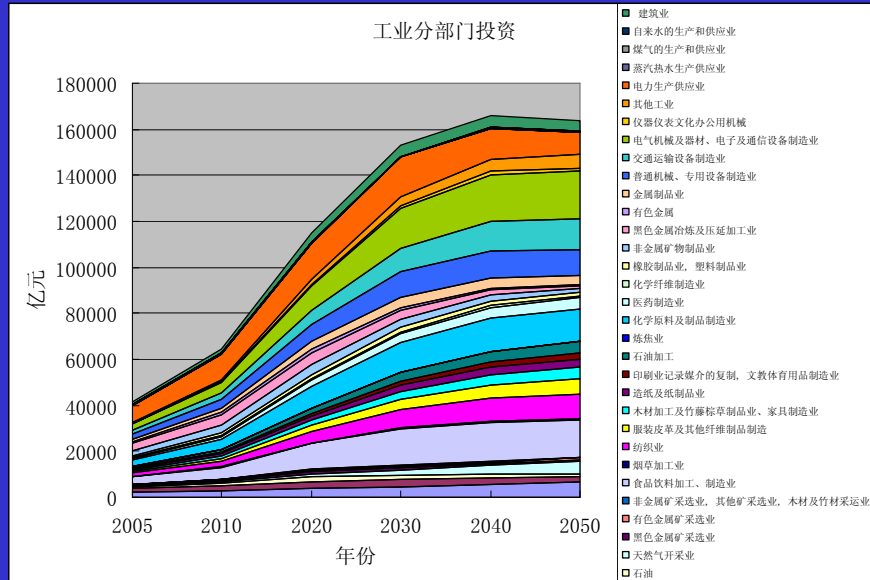
Methodology framework



GDP by industry sectors: What is the meaning of Low Carbon Economy



Investment by industrial sectors



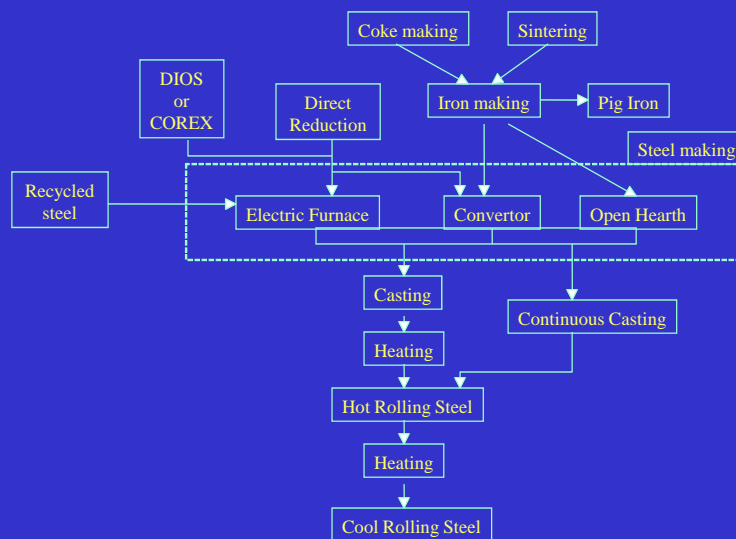
Products output in major sectors, Low Carbon and ELC

	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

Population

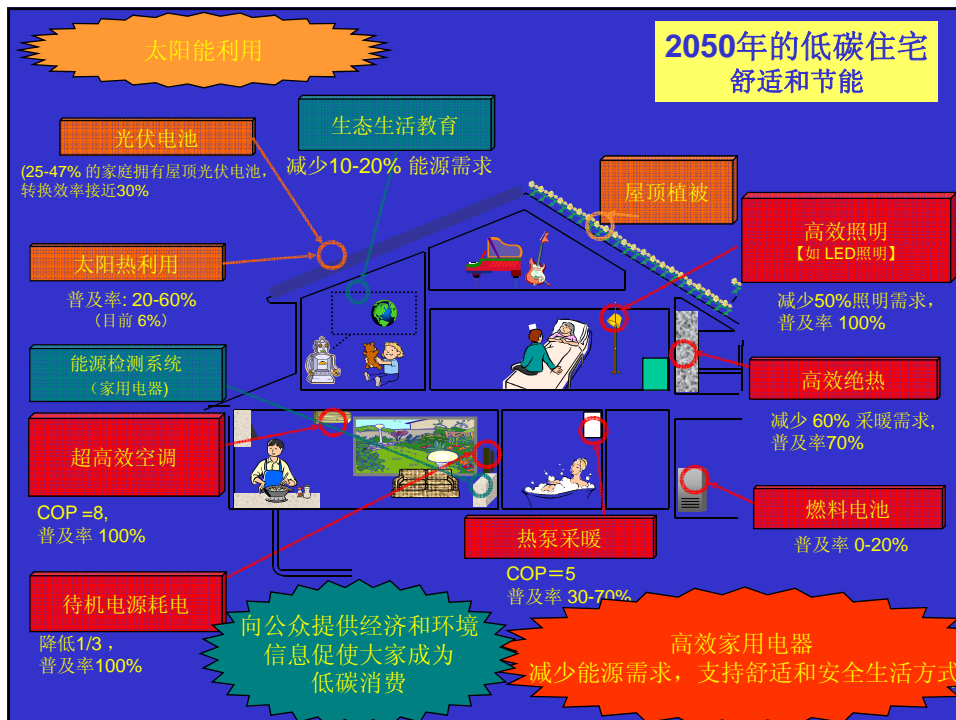
	2005	2010	2020	2030	2040	2050
Population	1307.56	1360.00	1440.00	1470.00	1470.00	1440.00
Urbanization rate	43%	49%	63%	70%	74%	79%
Urban Population	562.12	666.40	907.20	1029.00	1087.80	1137.60
Person per Household	2.96	2.88	2.80	2.75	2.70	2.65
Urban Household	189.91	221.94	288.00	336.76	364.78	380.38
Rural Population	745.44	693.60	532.80	441.00	382.20	302.40
Person per Household	4.08	3.80	3.50	3.40	3.20	3.00
Rural Household	182.71	189.68	181.03	159.97	151.59	144.00

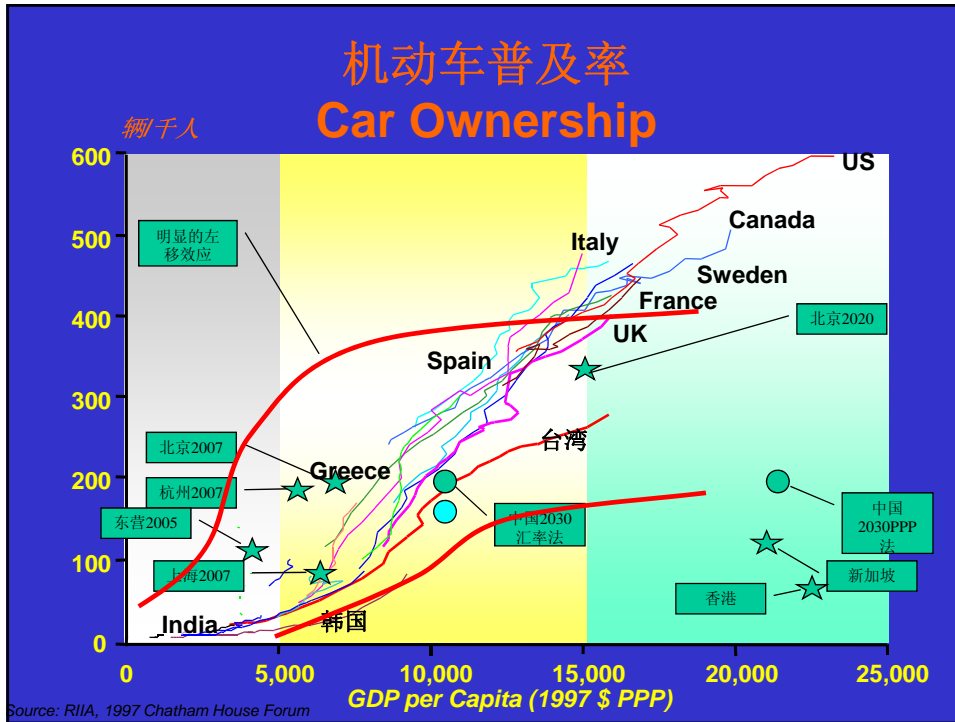
Steel production process in China



Parameter of Urban Household: by 2030 same life quality as that in developed countries

Service	Unit	Service		
		2020	2030	2050
Household, million		288	336	380
Share of HH with space heating		42%	44%	48%
Index of space heating intensity, 2000=1		1.35	1.5	1.6
Index of space heating time, 2000=1		1.33	1.36	1.4
Share of building with 50% efficiency standard		20%	45%	65%
Ownership of Air Conditioner		130	180	260
Index of Air conditioner intensity, 2000=1		1.3	1.4	1.6
Index of air conditioner utilization time, 2000=1		1.6	1.8	2.2
Ownership of Refrigerator	per 100HH	100	120	130
Average space of refrigerator	L	250	310	390
Efficiency of Refrigerator		0.8kWh/天	0.8kWh/天	0.7kWh/天
Ownership of washing machine	per 100HH	100	100	100
times to use washing machine per week		5.4	8	8
Ownership of TV	per 100HH	180	220	290
Average Capacity of TV		320W	300W	280
Hours per TV per day		3.5	3.2	2.9
Penetration rate of CFL		100%	100%	100%
Light per HH		14	21	27
Ownership of Water heater	per 100HH	100%	100%	100%
Ownership of Solar heater	per 100HH	18%	25%	33%
Ownership of Electric cooking	per 100HH	130	140	260
Hours per day of electric cooking	Minutes	12	30	50
Capacity of other electric appliance	W	1500W	1800W	2300W
Hours of other electric appliance	Minutes	50	80	100





Vehicle fleet, Low Carbon scenario, 10000

	2000	2005	2010	2020	2030	2040	2050
Total Vehicle	1609	3160	6227	18583	36318	51717	55810
Passenger	854	2132	4299	15504	32323	46083	48922
Freight	716	1027	1928	3079	3995	5634	6888
Car	670	1919	3921	14982	31558	45075	47662
Family Car	57	1100	3145	14032	30454	43675	46062
Other Car	613	819	776	950	1104	1400	1600
Mini-Bus	108	131	265	313	383	524	214
Large Bus	75.3293	82.3080335	113.4	208.8	382.5	483.84	1045.8
Bus	184	214	378	522	765	1008	1260
Motor Cycle	3771	6582	9848	10613	11193	11193	10634

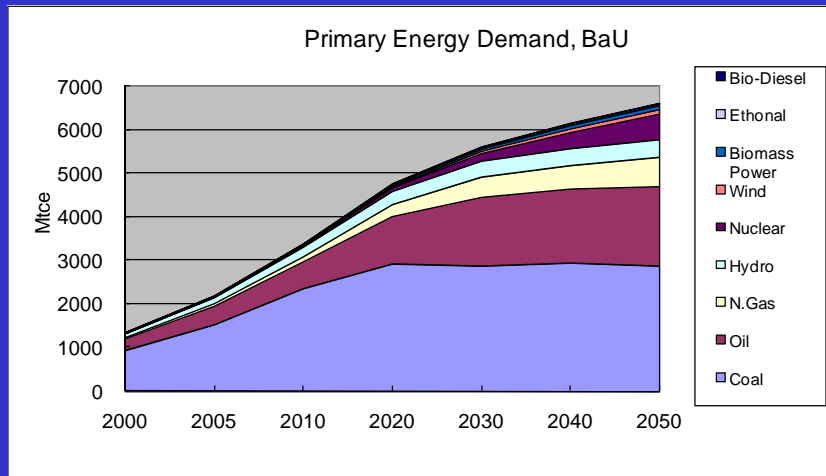
Transport, Low carbon scenario

		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 engine size of family cars, liter		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%

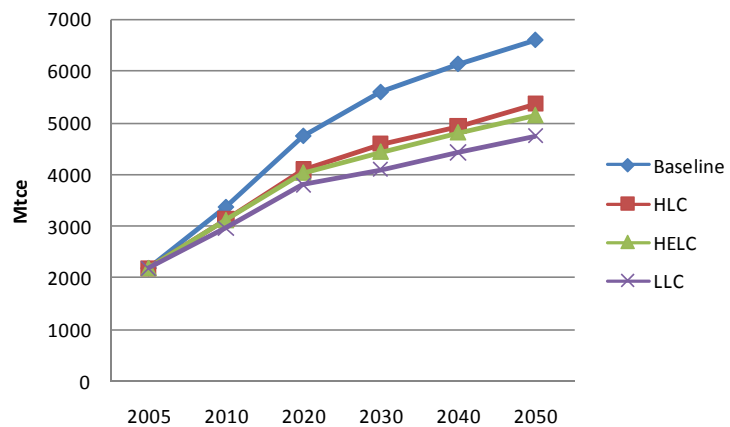
Comparison of BaU and Low Carbon Scenario

Technology	Efficiency	Ratio in 2030		Ratio in 2050		Note
		Reference scenario	Low carbon scenario	Reference scenario	Low carbon Scenario	
Ed coke	11900 Mcal/ ton coke, with gas production of 1340 Mcal	58%	50%	77%	42%	Fully localization
eneration	10300 Mcal/ ton coke, with gas production of 1420Mcal	17%	47%	23%	58%	
nching	2.4 Mcal/ ton J Recovery	80%	100%	90%	100%	Localization, with promising prospect of market potential
g furnace international level	390 Mcal/ ton sinter lump, saving 42% of energy	45%	85%	67%	90%	Needed to be localization
urnace of onal level	3750 Mcal/ ton hot metal, saving 21% of energy	40%	65%	64%	87%	
s recovery	Heat and electricity recovery 0.7 Mcal/ ton hot metal	44%	70%	85%	100%	
ous and	Saving 86% of energy	90%	98%	85%	95%	

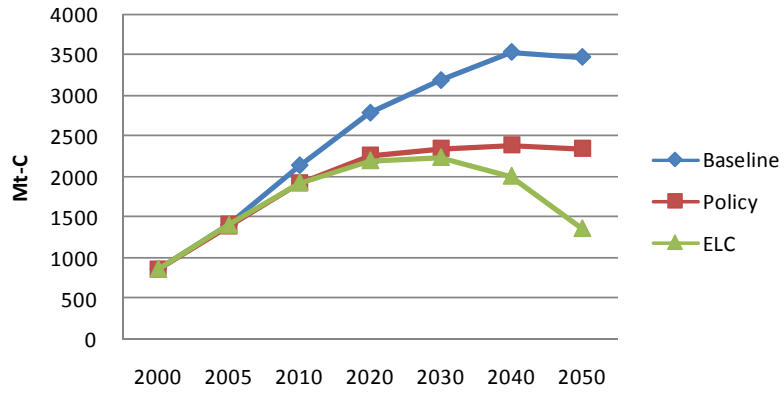
Primary energy demand, BaU



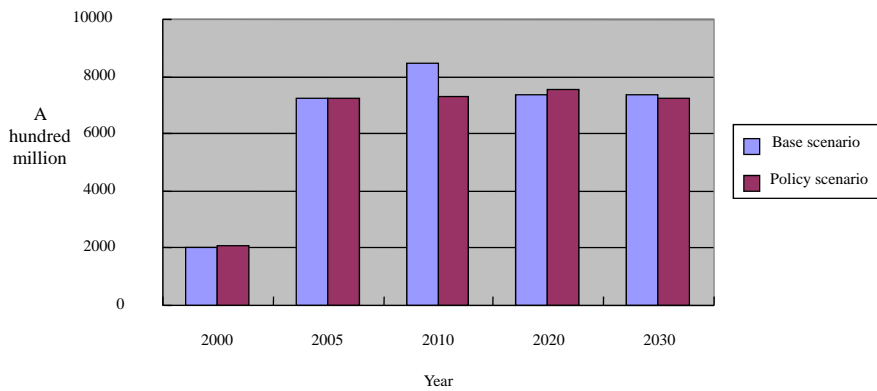
Primary Energy Demand

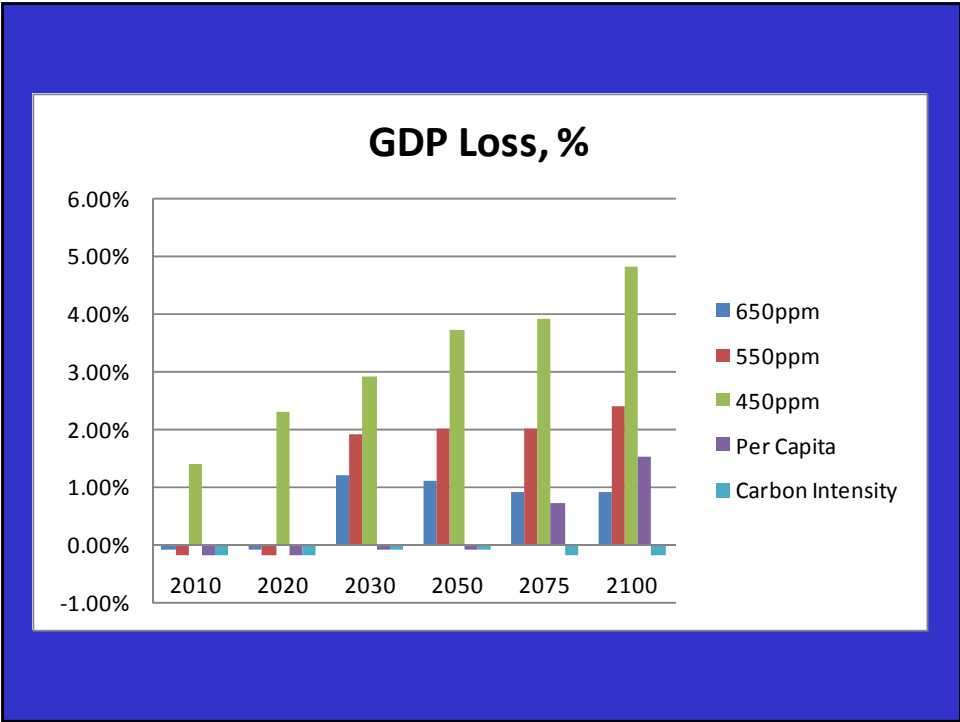
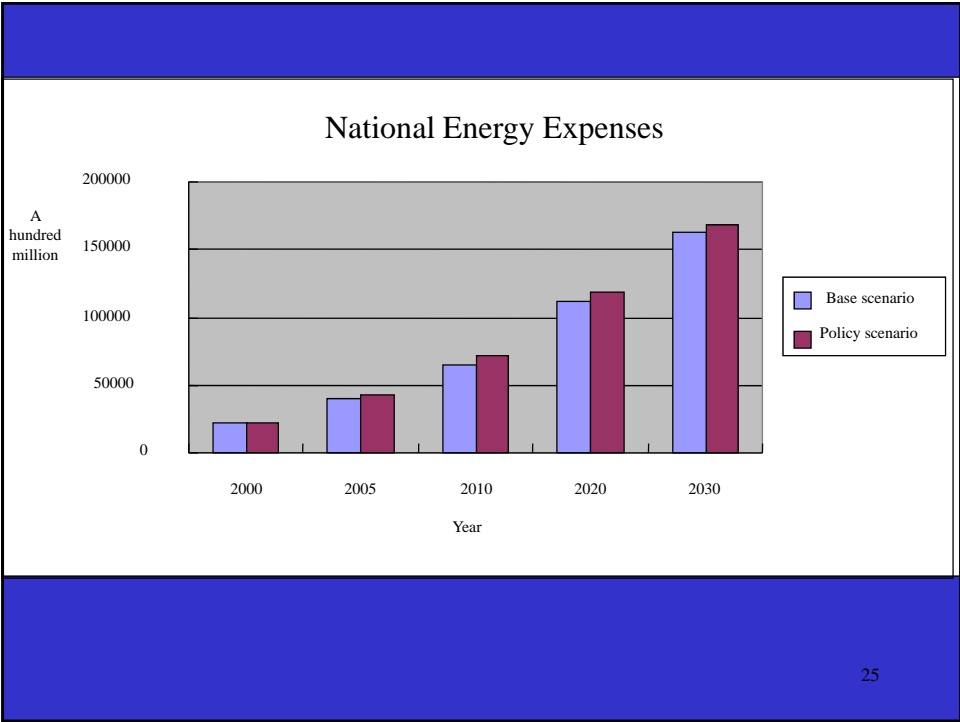


CO2 Emission in China



Investment Demand of Energy Industry





Technology Roadmap

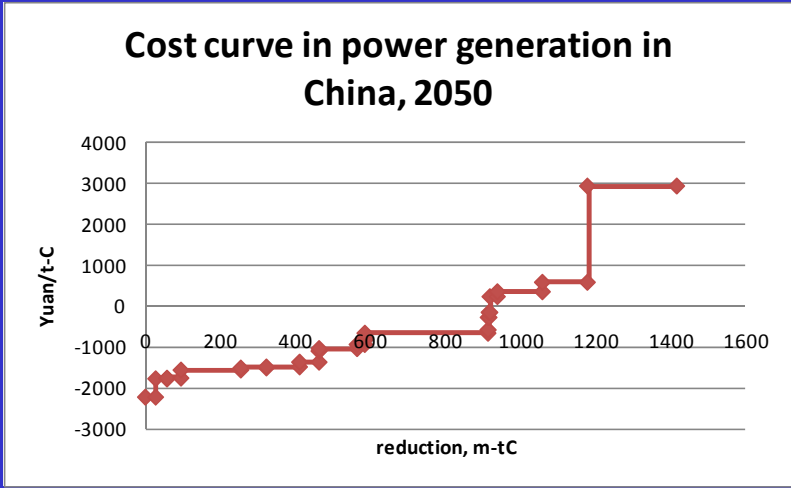
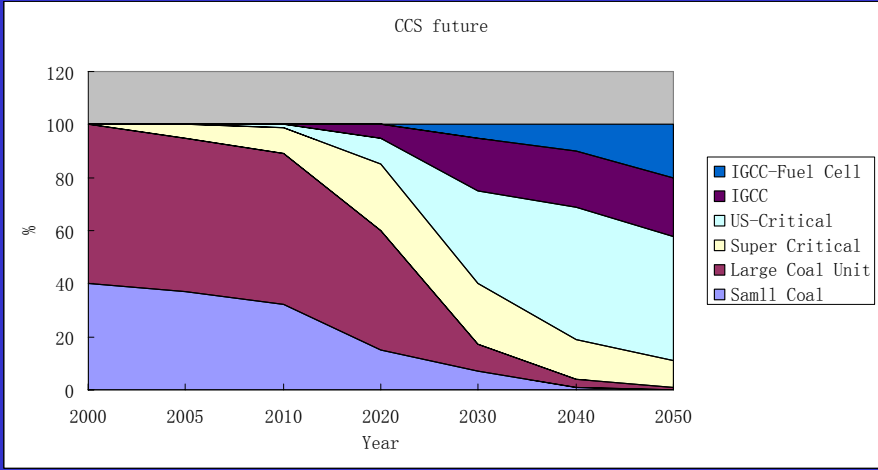
Field	Technology	2010	2015	2020	2025	2030	2035	2040	2045	2050	
Industry	Advanced energy technique of industry	<p>Popularization Rate: 90% - 100%</p>									
Transport	Hybrid Electric Vehicle	<p>Popularization Rate: 30%</p>									

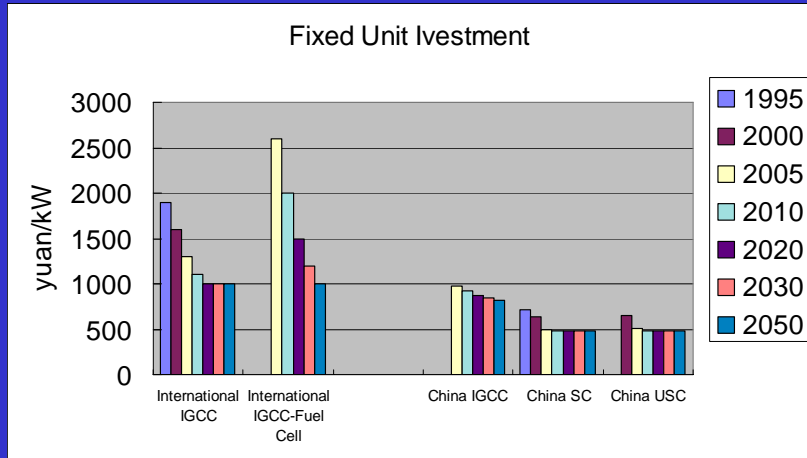




斯德歌尔摩:在欧洲许多城市,自行车、步行在逐渐形成主要交通方式







20% Energy Intensity Target in 11th Five Year Plan: China is taking the lead

- 20% energy intensity reduction within 11th Five Year Plan(2005-2010)
- Very good for China, not only for energy, but also for environment, economic structure optimization
- Most ambitious target in the world: making full effort to reach the target
- One of the Biggest actions on GHG mitigation: 190million t-C reduction in 2010 compared with baseline, 410million t-C reduction compared with no intensity change

Post 2012 option road map of China

	2010	2020	2030	2040	2050
Domestic Energy Saving Target	██████████	██████████			
APP	██████████	██████████	██████████		
Post Kyoto Mechanism	██████████	██████████	██████████		
Bilateral Cooperation	██████████	██████████	██████████		
Emission Trade		██████████	██████████	██████████	██████████
Non-constraint Emission Reduction Target		=====			
GHG Reduction Target Considering Promises			██████████	██████████	██████████

What is happening now on policy

- Negotiation towards Copenhagen, and after that
- 12th Five Year Plan on Energy, Climate change
- Low Carbon Development Planning and Strategy
- National long-term energy plan

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	11 th 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

Domestic climate change strategy

- What is the targets of GHG in China? Short-term and long-term?
- Key policies and countermeasures for low carbon future
- Long-term Energy and emission pathways?
- Economy development pattern?
- Technology R&D strategy? What kind of technologies?
- Near-term action and policies? Cost and benefit of these near-term policies?

Other relative studies: 2008-2010

- Energy and GHG Emission scenario up to 2030: Energy Bureau
- 2050 Low carbon Society Emission Scenarios: MOE(Japan), Defra(UK)
- New IPCC Scenarios
- CCICED low carbon scenarios
- Chinese Academy of Engineering: 2050 Energy Strategy, energy ceiling.
- Post-Kyoto Options for China
- Sector based approach analysis: case study for power generation in China
- Low Carbon Scenario in Province and Cities: Guangdong, Hongkong, Jilin, Jilin City, Baoding, Shanghai, Beijing, Shijiazhuang
- AEEMF: Asian Scenarios
- Embedded Carbon: international trade, final products