

# Energy Future and Policies: Recent Application of AIM In China

Jiang Kejun, Hu Xiulian

Energy System Analysis and Market Analysis Center  
Energy Research Institute, China

## *IPAC Modeling Activities: Progress in 2008-2009*

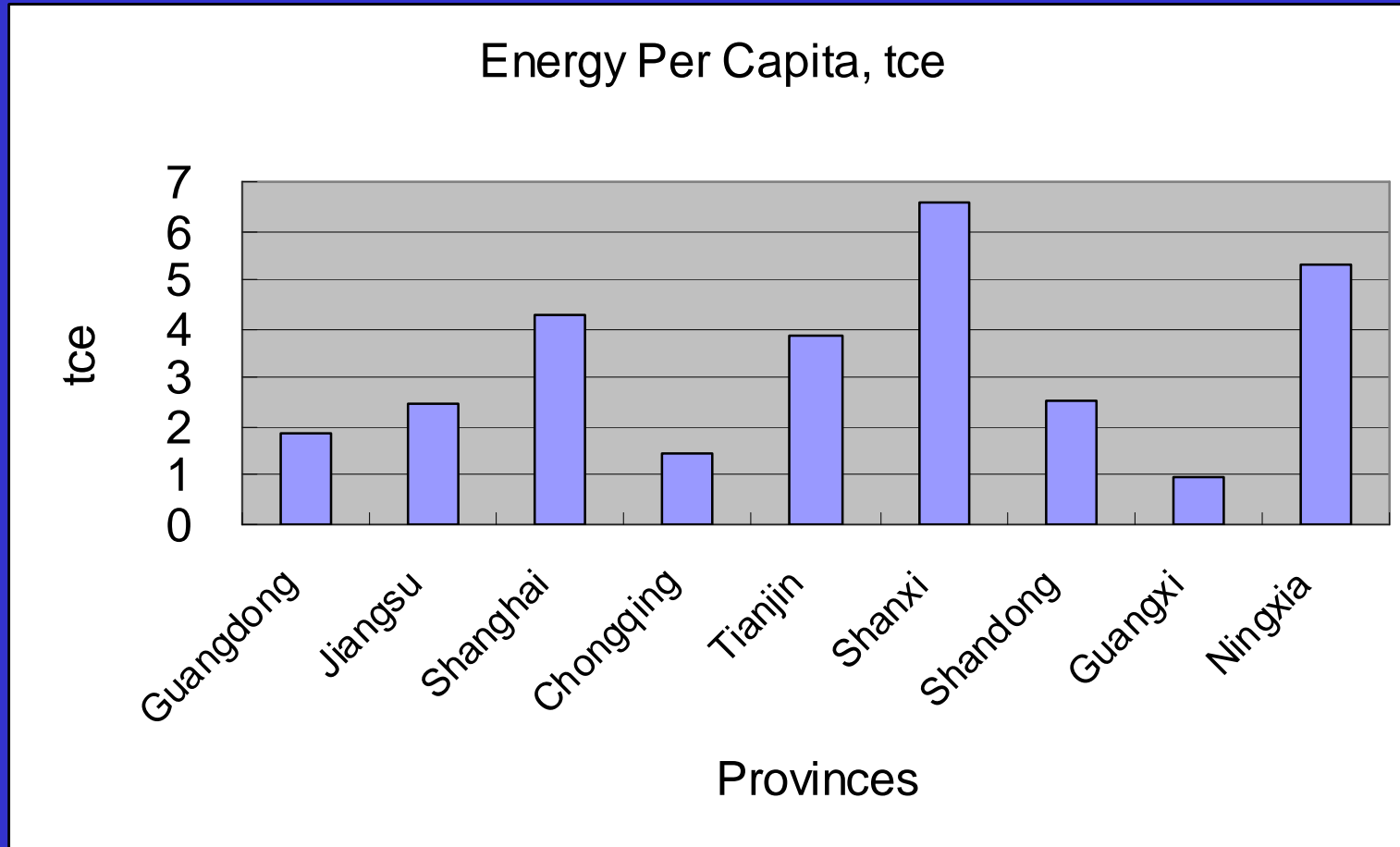
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- Energy and GHG Emission scenario up to 2030
- Urban Transport Development Study
- Beijing Energy and Environment Analysis
- Low carbon Emission Scenarios up to 2050
- Design and assessment of carbon tax
- Fuel Oil Tax Assessment
- Gains-Asia Modeling: co-benefit analysis
- Post-Kyoto Options for China

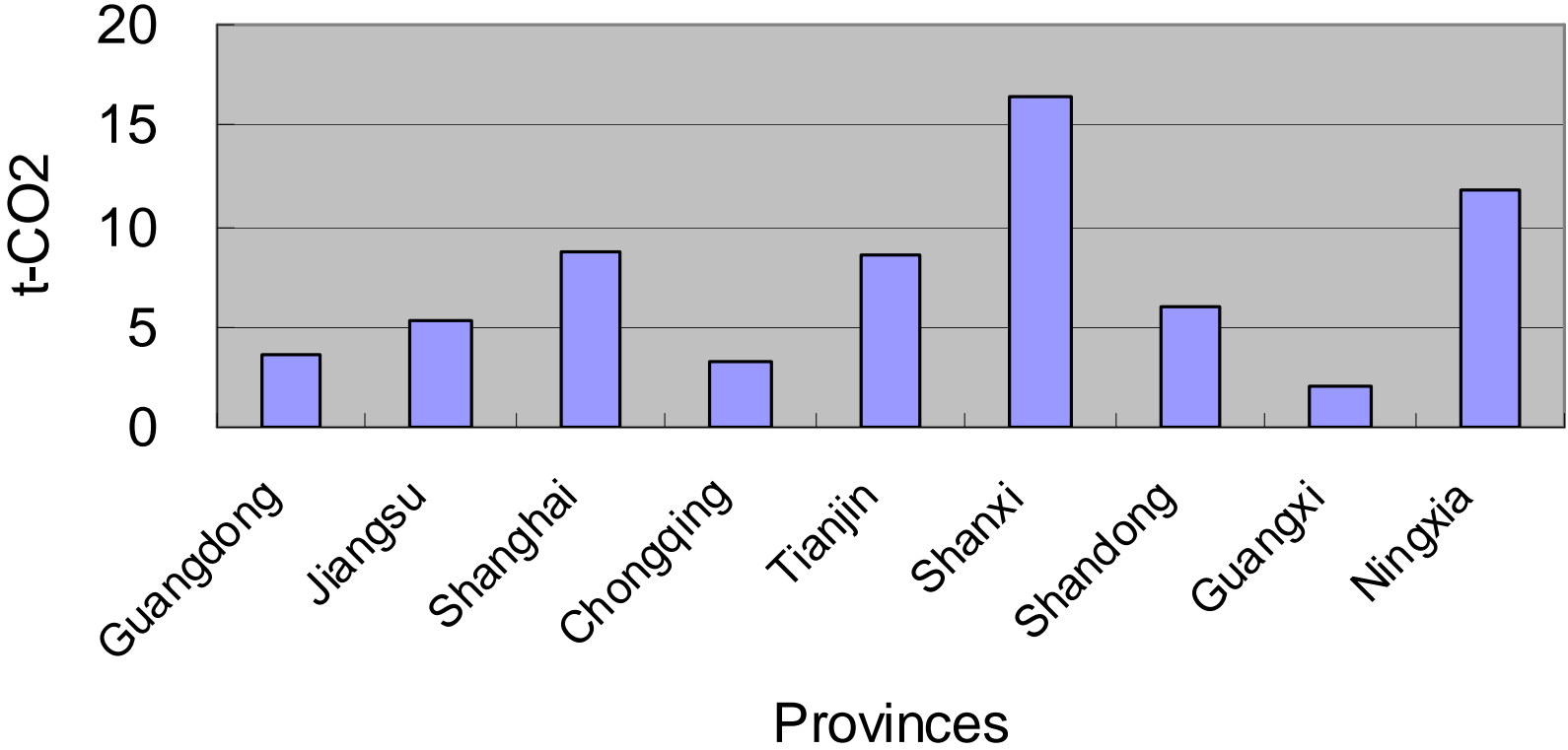
## *IPAC Modeling Activities: Progress in 2007-2008*

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- Sector based approach analysis: case study for power generation in China
- Opportunities for China to join post-2012 international regime
- Climate Change Program for Ningxia
- Embodied Energy in Export Goods
- Embedded carbon in highly traded goods
- Embedded carbon in consuming goods
- Carbon footprint in Shijiazhuang city



CO2 emission per capita, t-CO2



## *Tire 1 indicators for LCE*

Classification	Indicators	Note
Emission indicators	GHG emissions	Setting up emission target
Intensity indicators	GHG emission per GDP GHG emission per capita	With similar target as energy intensity target in China ' s 11 <sup>th</sup> Five Plan
Financial indicators	Share of investment on LCE Total investment on LCE	Government input together with other investment
Sector indicators	GHG Emission of sectors GHG emission per GHG Emission per output	
Behavior indicators	Involvement from public Government effort	

## *Tire 2 indicators for LCE*

Classification	Indicators	Note
Transport indicators	Share of public transport Non-mobility friendly transport	Share of road with nice bicycle lane, pedestrian side
Household	Low carbon life style: Low carbon campaign Share of renewable energy	Share of family register as Low carbon life style
Building	Share of energy saving building Share of buildings with solar Share of high efficiency lighting	
Low carbon technologies	Share of renewable energy in total energy Share of renewable energy in power generation Share of advanced technologies in major industry Other technologies	
Industry Sector	Emission/energy use per Emission/energy use per output Technology penetration rate Rate of recycle Investment on energy efficiency/emission reduction	

## Energy intensity target

	Intensity, tce/10000yuan		Reduction
	2005	2010	%
Guangdong	0.79	0.66	16
Jiangsu	0.92	0.74	20
Shanghai	0.88	0.7	20
Chongqing	1.42	1.14	20
Tianjin	1.11	0.89	20
Shanxi	2.95	2.21	25
Shandong	1.28	1	22
Guangxi	1.22	1.04	15
Ningxia	4.14	3.31	20



## GDP结构和增长速度，基准情景, GDP mix and growth, BaU

%	1990	1995	2000	2005	2006	2007	2010	2020	2030
第一产业	25.1%	12.8%	9.2%	5.9%	5.3%	4.8%	4.0%	3.1%	2.4%
第二产业	32.2%	44.3%	46.5%	51.7%	52.7%	53.8%	53.0%	46.9%	38.6%
第三产业	47.1%	43.4%	44.3%	42.5%	42.0%	41.4%	43.0%	50.0%	59.0%
%	1990	1995	2000	2005	2006	2007	2010	2020	2030
GDP		19.6%	11.0%	13.2%	14.6%	14.5%	11.4%	9.10%	7.30%
第一产业		4.4%	3.9%	3.5%	4.2%	3.3%	4.7%	6.4%	4.6%
第二产业		27.4%	12.1%	15.6%	16.9%	16.9%	10.8%	7.8%	5.2%
第三产业		17.6%	11.4%	12.3%	13.4%	13.0%	12.7%	10.8%	9.1%

## 人口增长 , Population Growth , 百万人 , million

	2000	2005	2010	2020	2030
人口 total	87	92	95	98	101
城市 urban	48	56	64	73	82
农村 rural	39	36	31	24	19
城市化率	55.0%	60.7%	67.0%	75.0%	81.0%

Urbanization rate

## 主要工业行业总产值增长情景，亿元

GDP by major sectors

	2005	2010	2020	2030
电子信息	9831	22500	48576	104872
石油化工	3788	7300	15760	21180
机械工业	5257	7000	15112	32627
家用电器工业	539	2100	4534	9788
纺织工业	3275	4811.947	7838	12768
食品工业	480	2600	6155	13288
建材工业	1500	1327.61	2378	4258
造纸工业	183	1400	3022	4474
医药工业	5073	800	1727	3729
汽车工业	2150	3600	7772	16779

## 主要高耗能工业产品产量，基准情景

### Output by products

		2000	2005	2010	2020	2030
钢铁	万吨	286.99	757.07	1800	1800	1800
水泥	万吨	5872	8031.74	10000	12000	12000
玻璃	万吨	632.59	2328.82	5300	5900	6300
乙烯	万吨	54.85	56.17	140	250	250
炼油	万吨	985.52	1242.51	2400	3600	4500
塑料	万吨		551	942	1329	1543
纸和纸板	万吨		690	1400	1800	2100
汽车	万辆		41	160	250	290

## 交通业能源需求主要因素预测，万辆

### Key factors in Transport

	2005	2010	2020	2030
汽车总量，：	373	711	1824	3300
乘用车	247	559	1599	2968
货车	119	152	225	332
小汽车	217	521	1548	2898
家庭小汽车	180	467	1442	2724
其他小汽车	37	54	107	174
小巴	19	22	29	38
大型客车	11.7	15.96	22.44	32.2
Bus	30	38	51	70
摩托车	2123	2232	2465	2723
自行车	2915	3079	3401	3757

## Key parameters in service sector 服务业能源需求主要因素预测

	2000	2005	2010	2020	2030
建筑面积	280000	377880	581415.2	1143732	1863019
制冷	176400	249763.6	469376.5	1025241	2033019
采暖	0	0	0	0	0
照明	280000	385437.6	616300.1	1258105	2123841
复印机	168000	231262.6	401176.5	823486.9	1397264
计算机	168000	233529.8	418619	892110.8	1564936
电梯	168000	228995.3	383734	754862.9	1229592
其他电器	196000	290967.6	488388.8	1040796	1825758
热水	196000	269806.3	431410.1	880673.4	1434524
炊事	28000	41566.8	69769.8	148685.1	251507.5

## Urban Household parameters

	2000	2005	2006	2010	2020	2030
人口, 人	47575000	55807580	58615200	63583536	73310868	97233896
户数, 户	15055380	18418343	19669530	22467681	27152173	31365773
每户面积, 平方米	30	34	38	41	43	44
每户人口, 人	3.2	3	3	2.8	2.7	3.1
炊事服务	15055380	18418343	19669530	22467681	27152173	31365773
电炊	14754272	26946036	28324123	32353460	45887173	61476915
热水	11201203	29837716	35405154	40441825	64486412	90333426
采暖	0	0	0	0	0	0
空调	10478544	32047917	45436615	51900342	81184998	158083495
电扇	20400040	53413195	59008591	67403042	81456520	94097319
照明: 白炽灯	15055380	16260766	18081918	20654218	26182453	29035744
照明: 荧光灯	752769	6314861	12644698	14443509	18851366	24196453
电冰箱	15055380	18178905	24783608	28309278	41814347	51753525
电视	21905578	32416284	48583740	55495171	79827390	103507051
洗衣机	14453165	18759083	28127428	32128783	53696138	85628560
其他电器	15055380	18418343	19669530	22467681	27152173	31365773

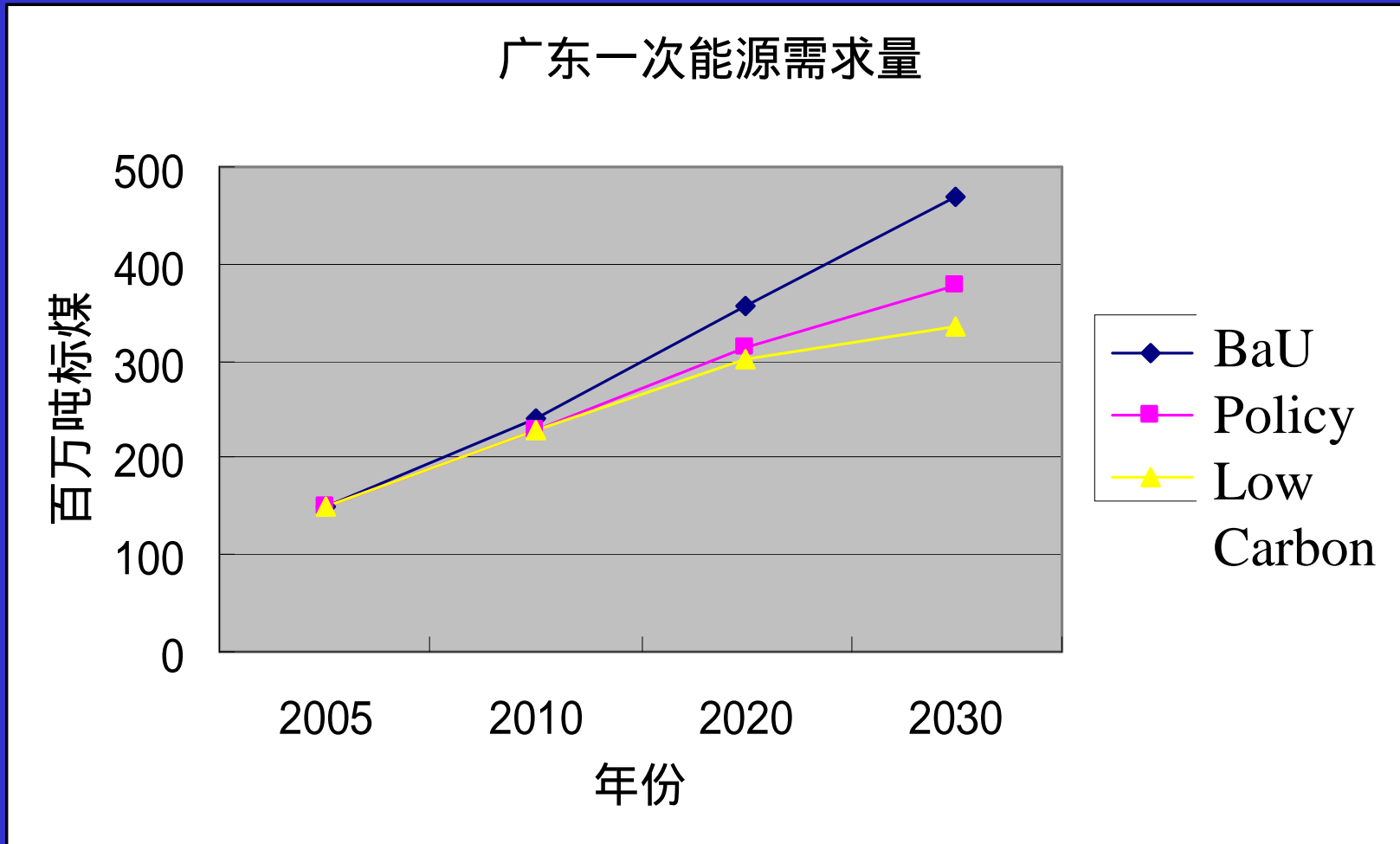
## 工业部门，主要产品单耗，政策情景

Unit energy use for major industrial products, Policy scenarios)

产品	单位	2005	2020	2030	2040	2050
钢铁	Kgce/t	760	650	564	554	545
水泥	Kgce/t	132	101	86	81	77
玻璃	Kgce/重量箱	24	18	14.5	13.8	13.1
砖瓦	Kgce/万块	685	466	433	421	408
合成氨	Kgce/t	1645	1328	1189	1141	1096
乙烯	Kgce/t	1092	796	713	693	672
纯碱	Kgce/t	340	310	290	284	279
烧碱	Kgce/t	1410	990	890	868	851
电石	Kgce/t	1482	1304	1215	1201	1193
铜	Kgce/t	1273	1063	931	877	827
铝	kWh/t	14320	12870	12170	11923	11877
造纸	Kgce/t	1047	840	761	721	686
火电	Gce/kWh	350	305	287	274	264

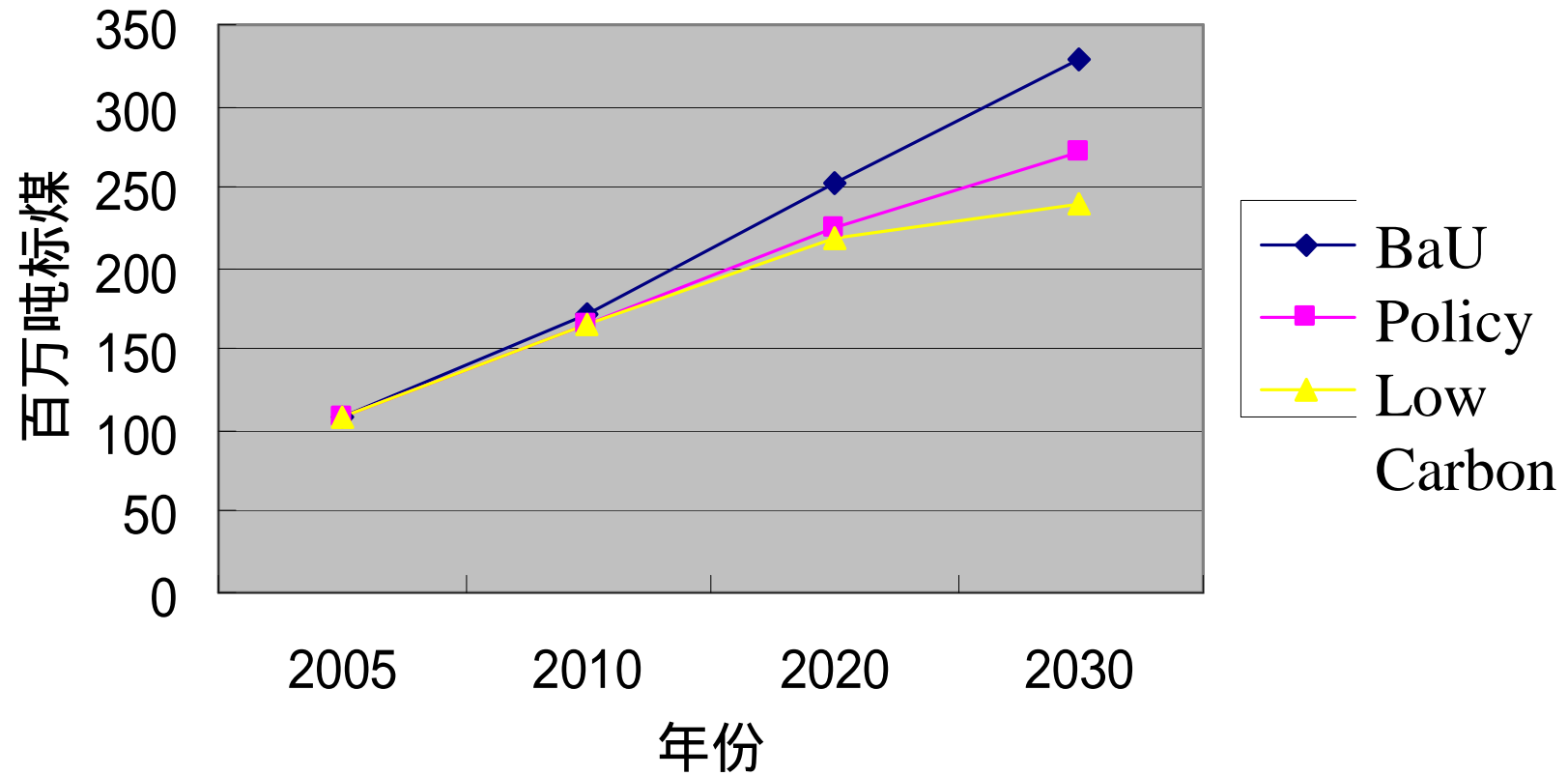


## Primary energy demand in Guang Dong

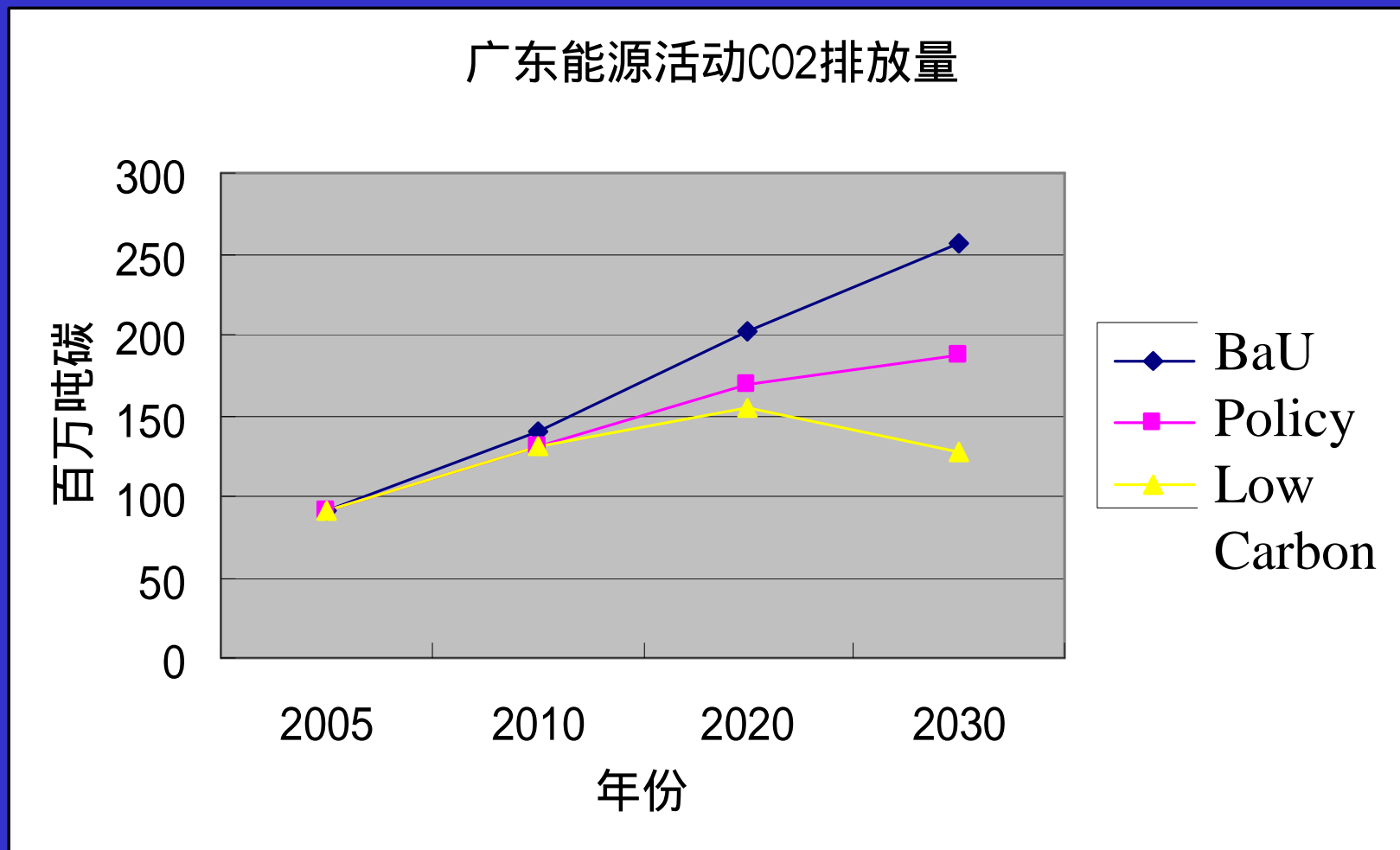


## Final energy demand in Guang Dong

### 广东终端能源需求量



# CO2 emission from energy activities in Guang Dong, mt-C



## *Guang Dong's Low Carbon Economy*

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- Optimization of Economy structure: investment
- All newly installed technology should be best technology, from now
- Low Carbon Transport: public transport with focus on metro, non-mobile transport system, super high efficiency vehicle
- Building: all newly constructed building are energy efficient; local efficiency standard advanced than national one; household renewable energy widely used.
- Public campaign

## 政策 Policies

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### *经济政策(Economic policies):*

- 发展低能耗行业，向发达国家经济结构看齐。
- 占领优势低能耗行业，促进本地经济竞争性。
- 技术竞争性，使本地技术发展成为国内以及亚洲的领先者。
- 规范条例竞争性，形成促进低能耗，低碳发展的体制环境。
- 政府规划明确低碳发展

# 政策

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## 财政政策(*Financing policies*):

- 采用燃油税, 能源税, 碳税. 提前公布采取税的日程.
- 在已经采取减少出口退税的基础上, 公布进一步措施的时间表, 使企业早有准备, 并影响未来近期的投资

## 投资政策(*Investment policies*):

- 加大对促进城市环境友好设施的建设投入力度(垃圾处理, 污水处理), 在可以建立的城市均要建立. 可以通过提高收费来实现赢利, 这样可以吸引非政府投资.
- 大幅加大构建公共交通的投入, 特别是轨道交通. 北京已经有比较好的吸引民间资本的经验.
- 加大国家对技术开发的投入. 采用债券等多种途径进一步吸纳民间资金.

## 政策建议(续)

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### 节能政策(*Energy conservation policies*):

- 大力强化行业的节能, 实现部门节能目标
- 大幅度提高已有技术的能耗标准, 采取市场准入制度.
- 严格实施建筑节能标准, 使新建建筑的节能普及率明显提高. 如北京方式, 青海方式.

### 新能源和可再生能源政策(*Renewable energy policies*):

- 大力发展新能源和可再生能源, 发展新能源和可再生能源就是节能. 建筑太阳能热水器大力普及. 如秦黄岛的对策.

### 环境政策(*Environment policies*):

- 需要进一步强化的环境政策. 环境政策可以影响工业和能源发展, 但也会增加能源消耗. 环境政策会促进新型产业, 这对经济发展有益.
- 鼓励东部已经发达但已经失去优美环境的省份加大产业结构调整, 和恢复环境的投入.

## 政策建议(续)

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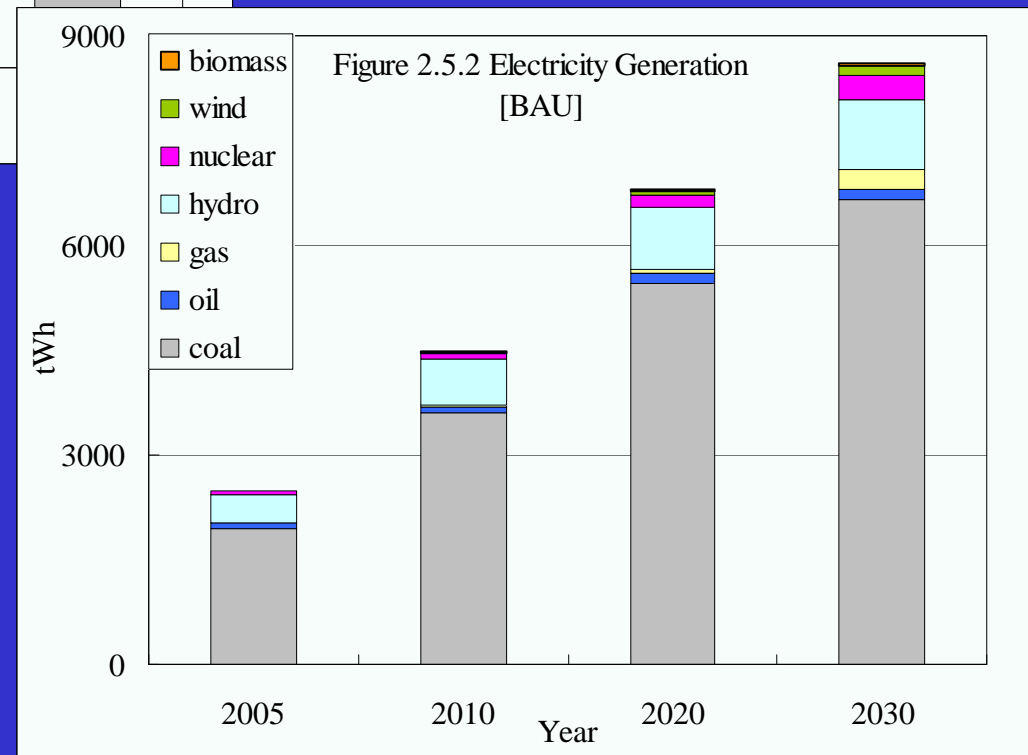
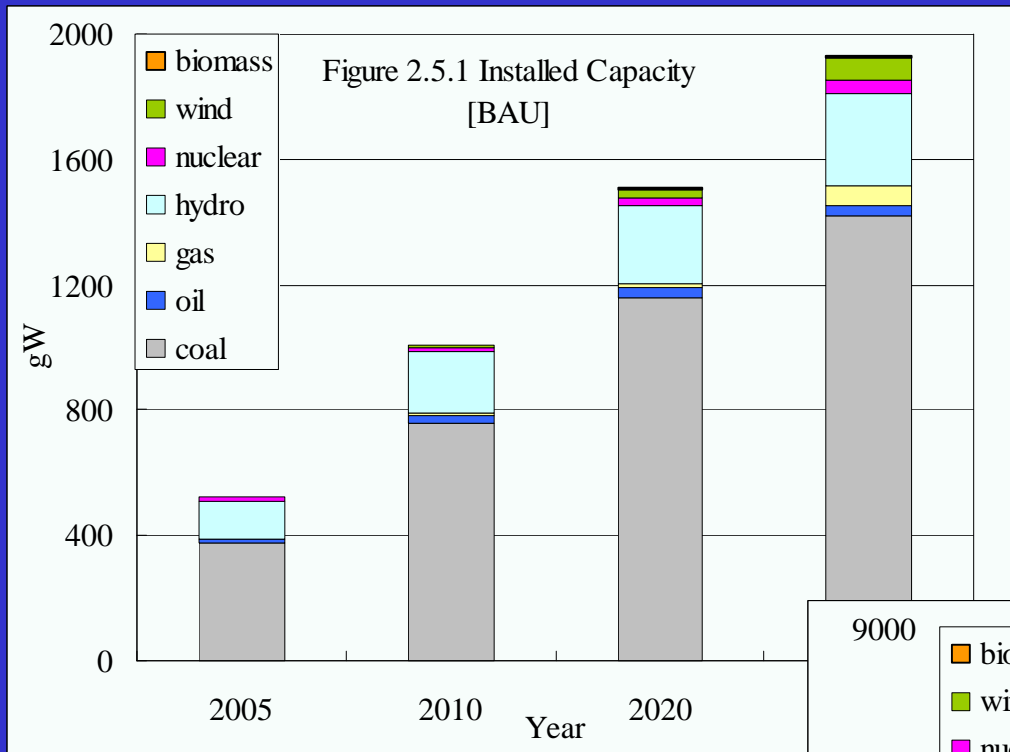
### *交通政策(Transport policies):*

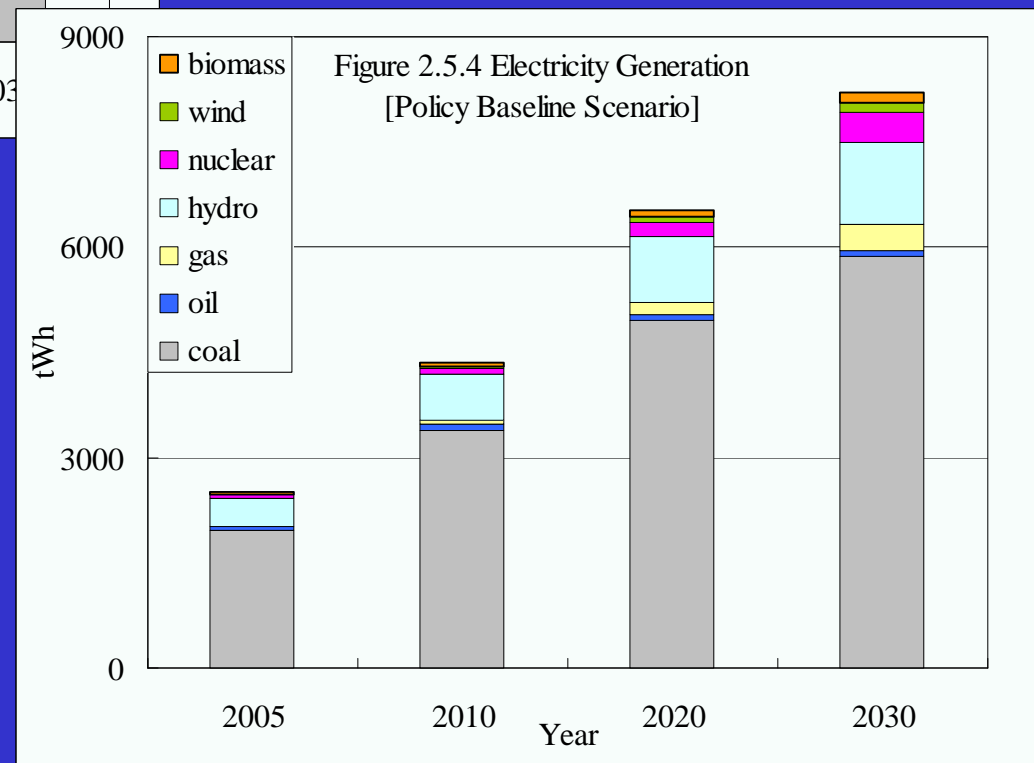
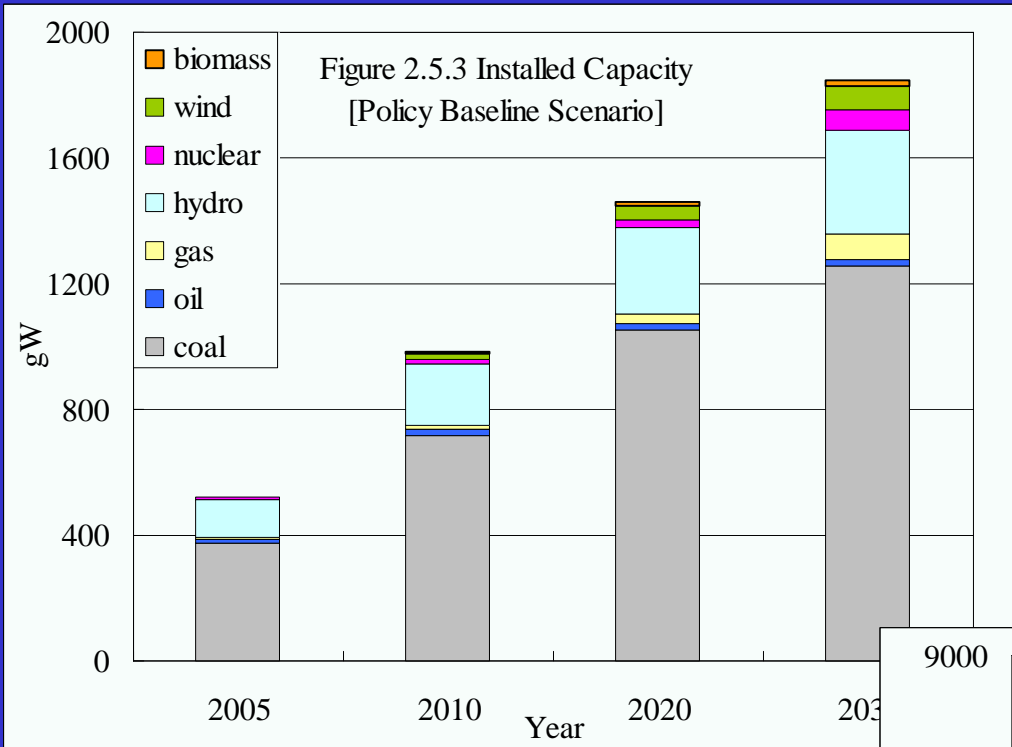
- 大力发展公共交通，遏制私人小汽车，会有明显节能效果
- 构建适合于步行和自行车出行的交通体系，而不是目前以机动车为主的的城市交通体系
- 大大鼓励电动自行车：高峰自行车专用道（如左安门到

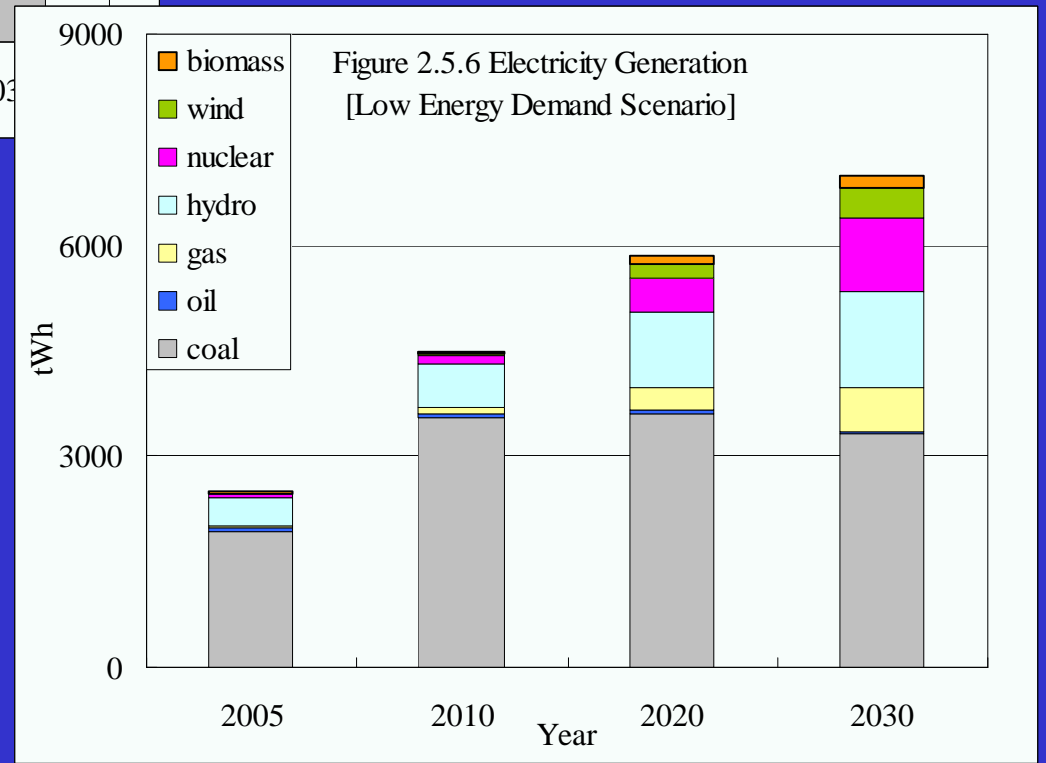
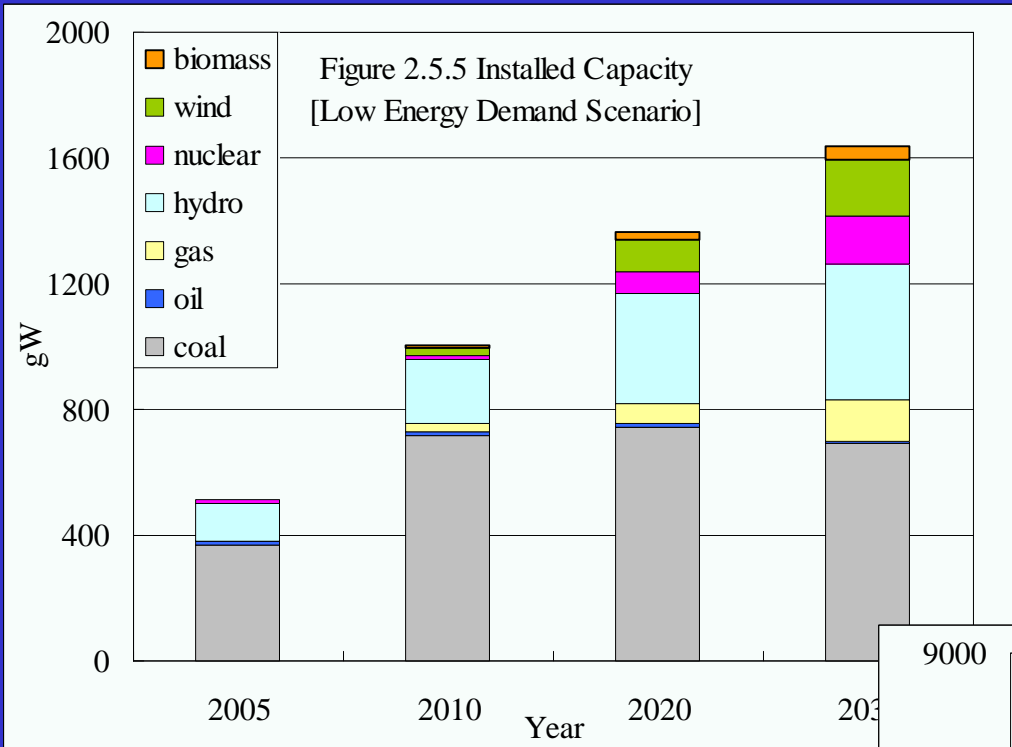
### *居民用能和消费(Household consumption policies):*

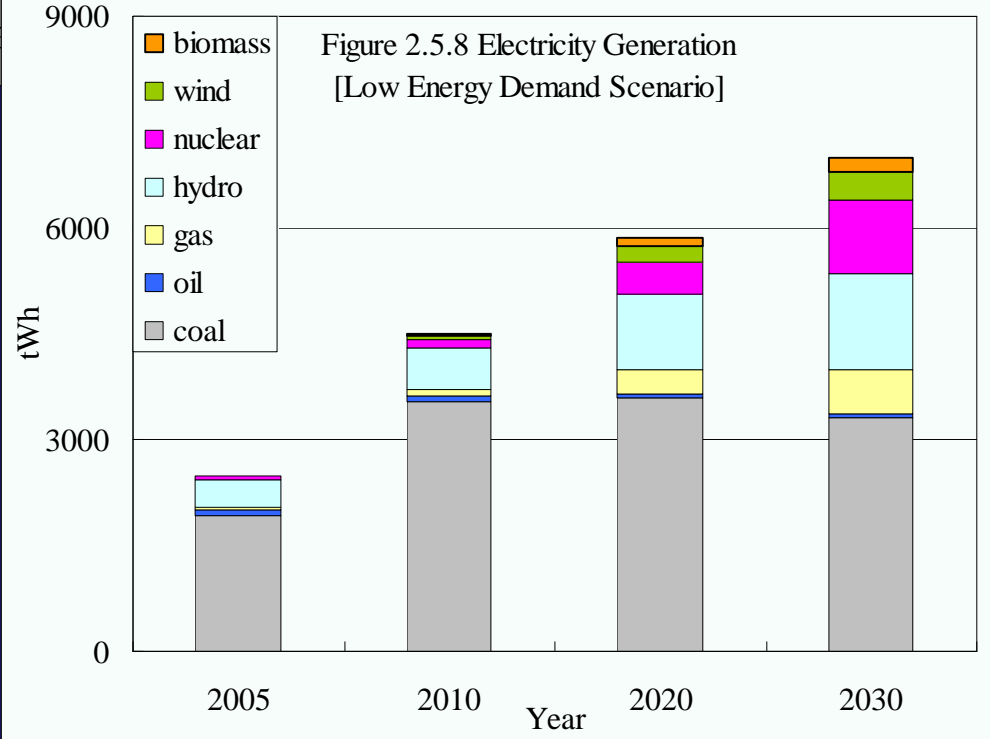
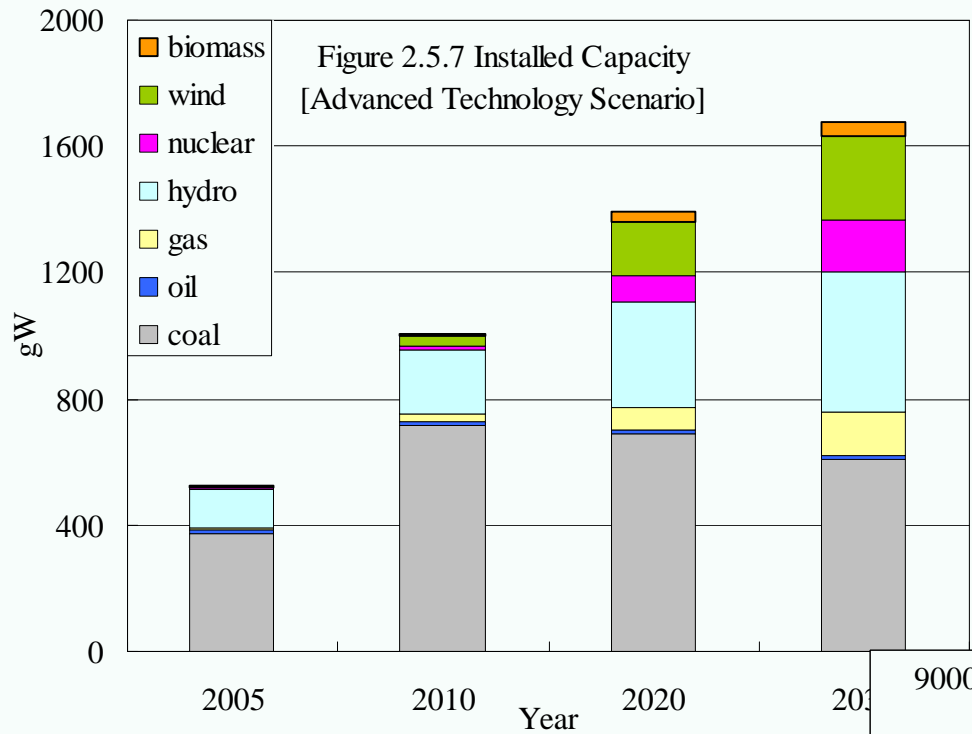
- 购买使用节能电器
- 低能耗消费：食品，饮料，当地产品等











## Sectoral No Lose Target

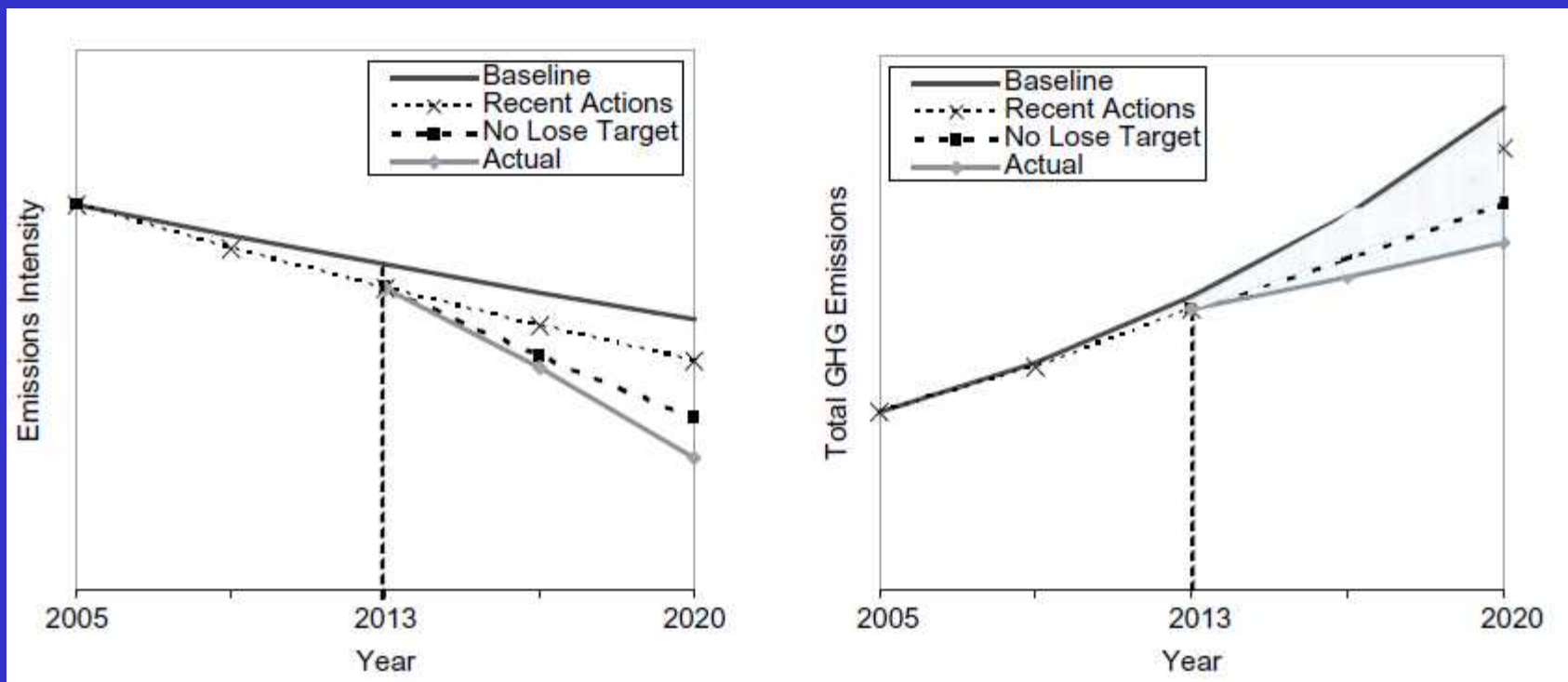


Figure 3.2.1 Total CO<sub>2</sub> emission from Chinese electricity sector

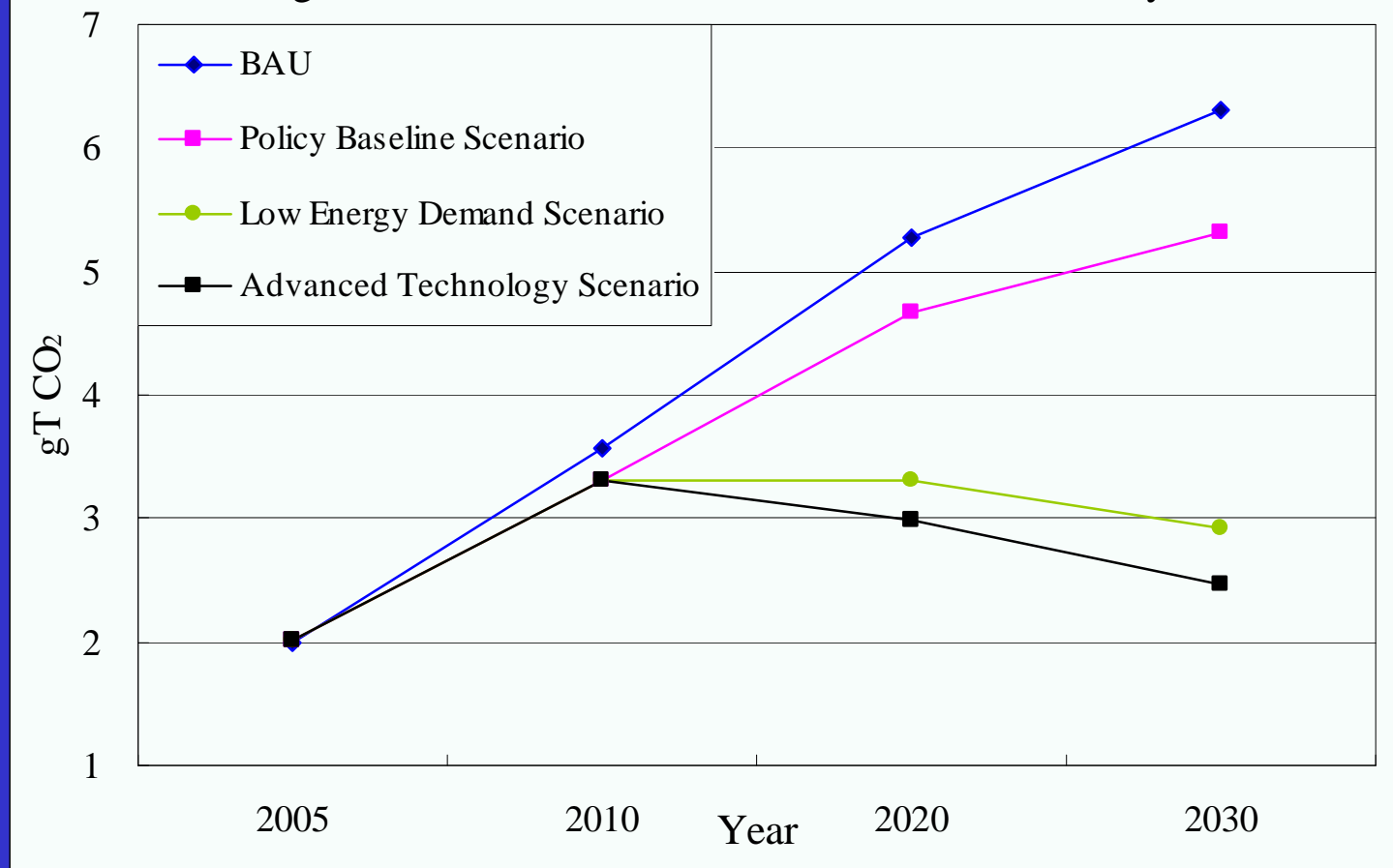
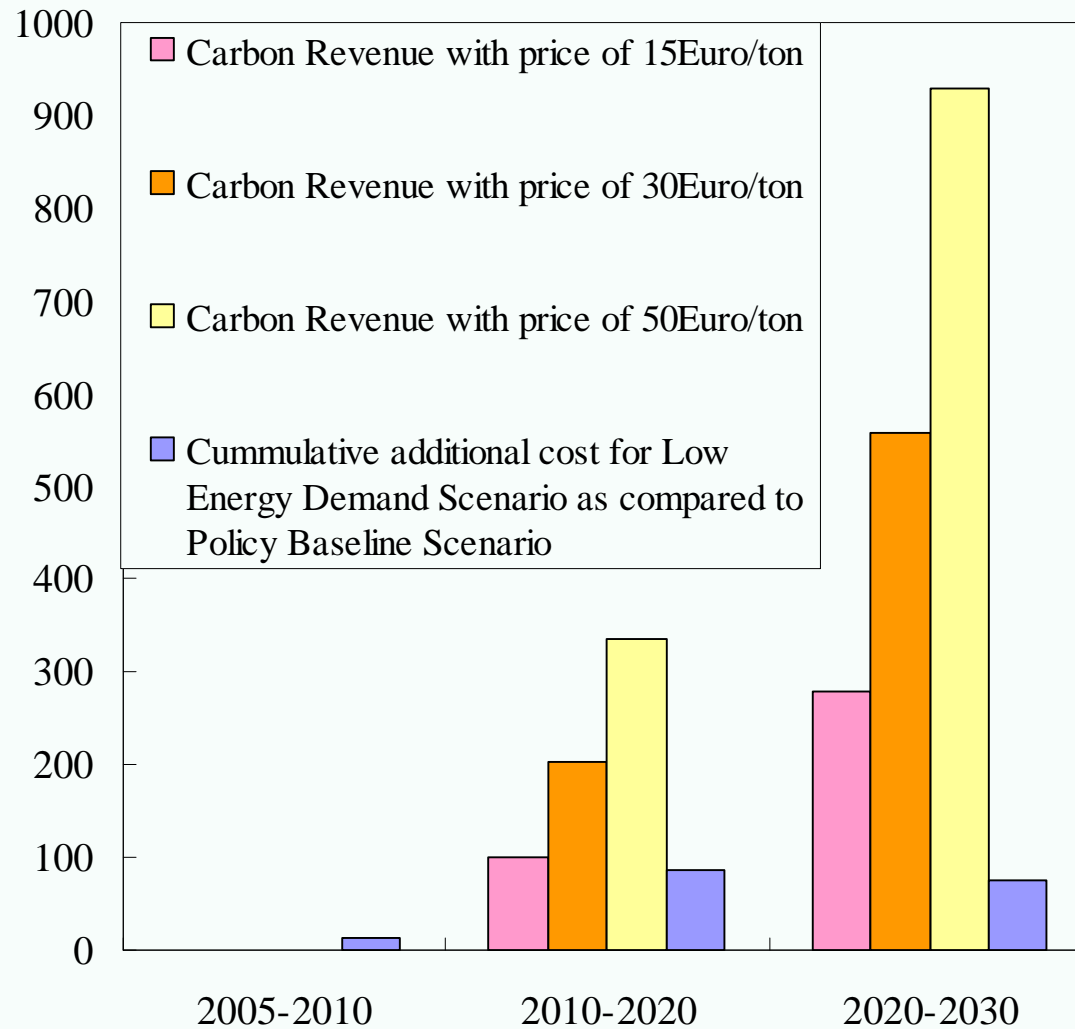
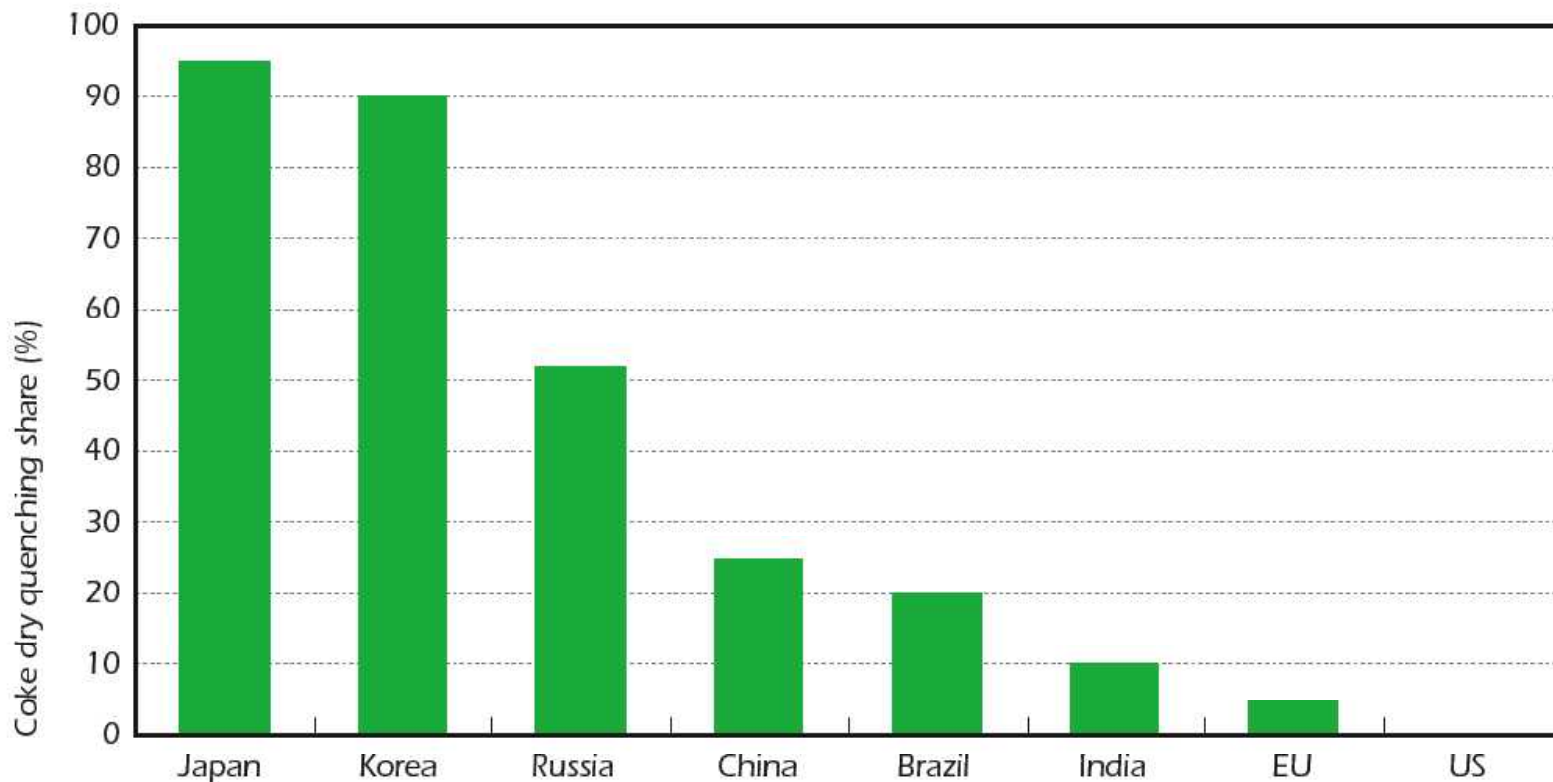


Figure 3.3.1 Comparison of carbon revenue with abatement cost in ERC scenario A (Billion Euro)



# For example, case of Coke Dry Quenching (CDQ)

## *Global diffusion rate*



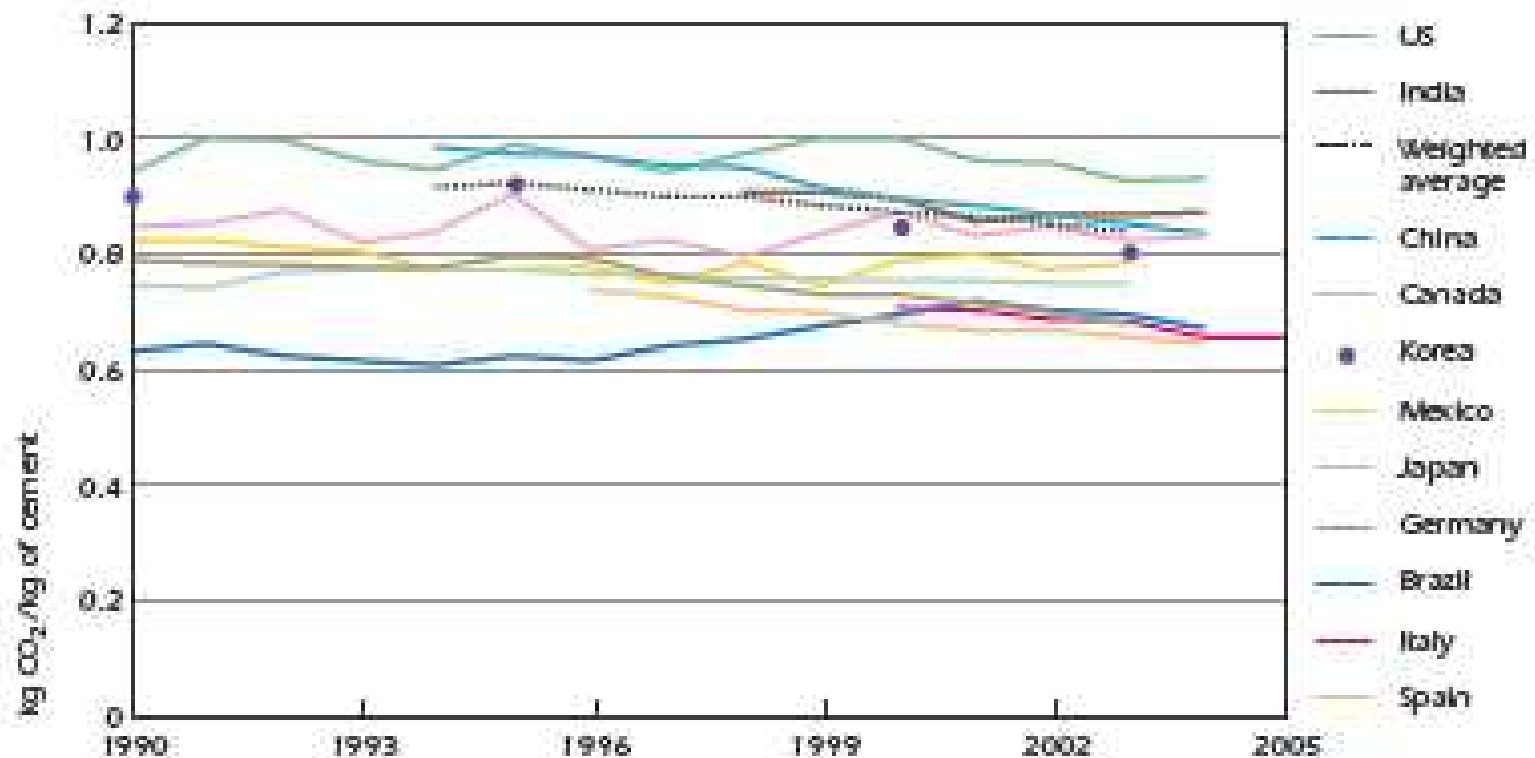
Sources: IISI communication; Institute of Energy Economics Japan (IEEJ) (2006).

**Source: IEA (2007) "Tracking Industrial Energy Efficiency and CO<sub>2</sub> Emissions" p.112.**



# For example, case of Cement

## *Process and Energy (including electricity) CO<sub>2</sub> Emissions per tonne of Cement by Country, 1990-2005*

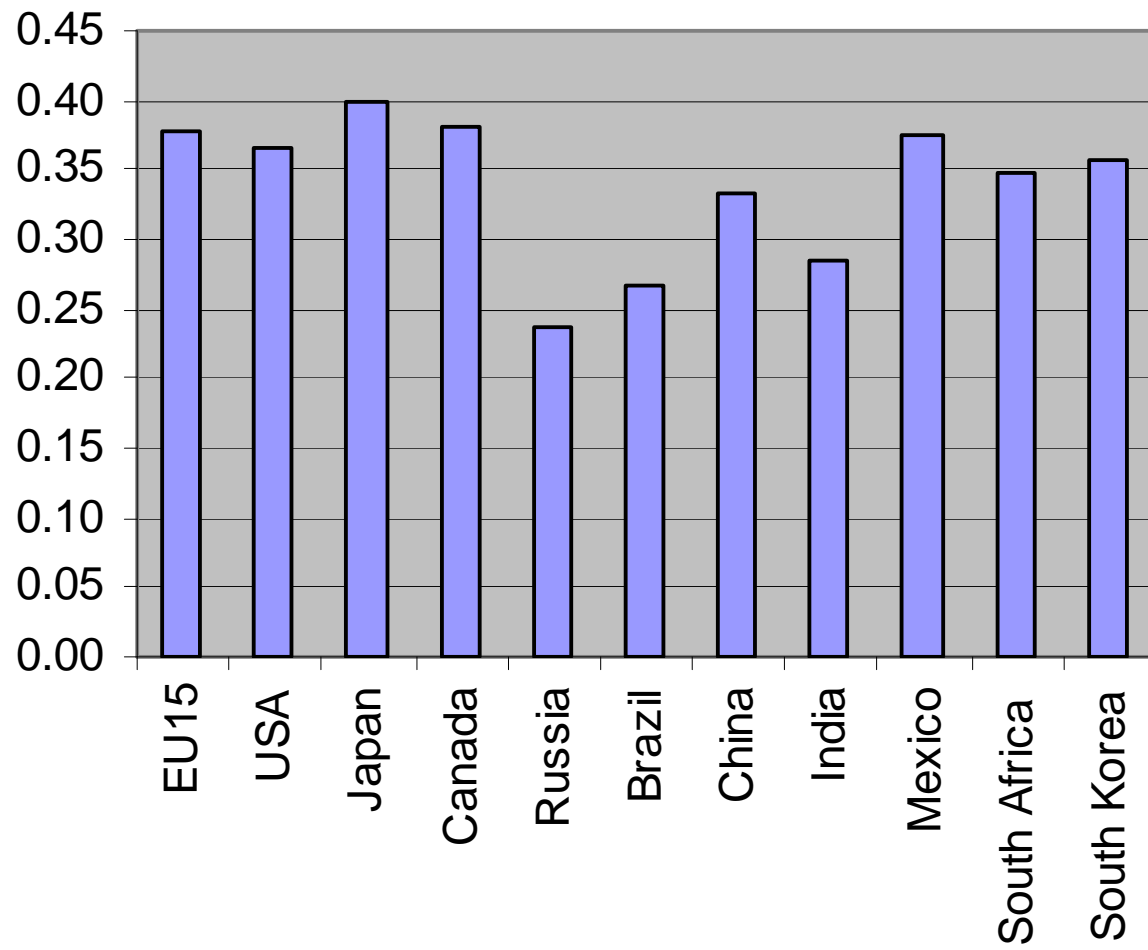


Note: Includes impact of electricity generation from waste heat in Japan. Boundary definitions may differ by country.

Sources: As for Figures 6.4, 6.5, 6.8 and 6.9; IEA statistics.

Source: IEA (2007) "Tracking Industrial Energy Efficiency and CO<sub>2</sub> Emissions" p.141.

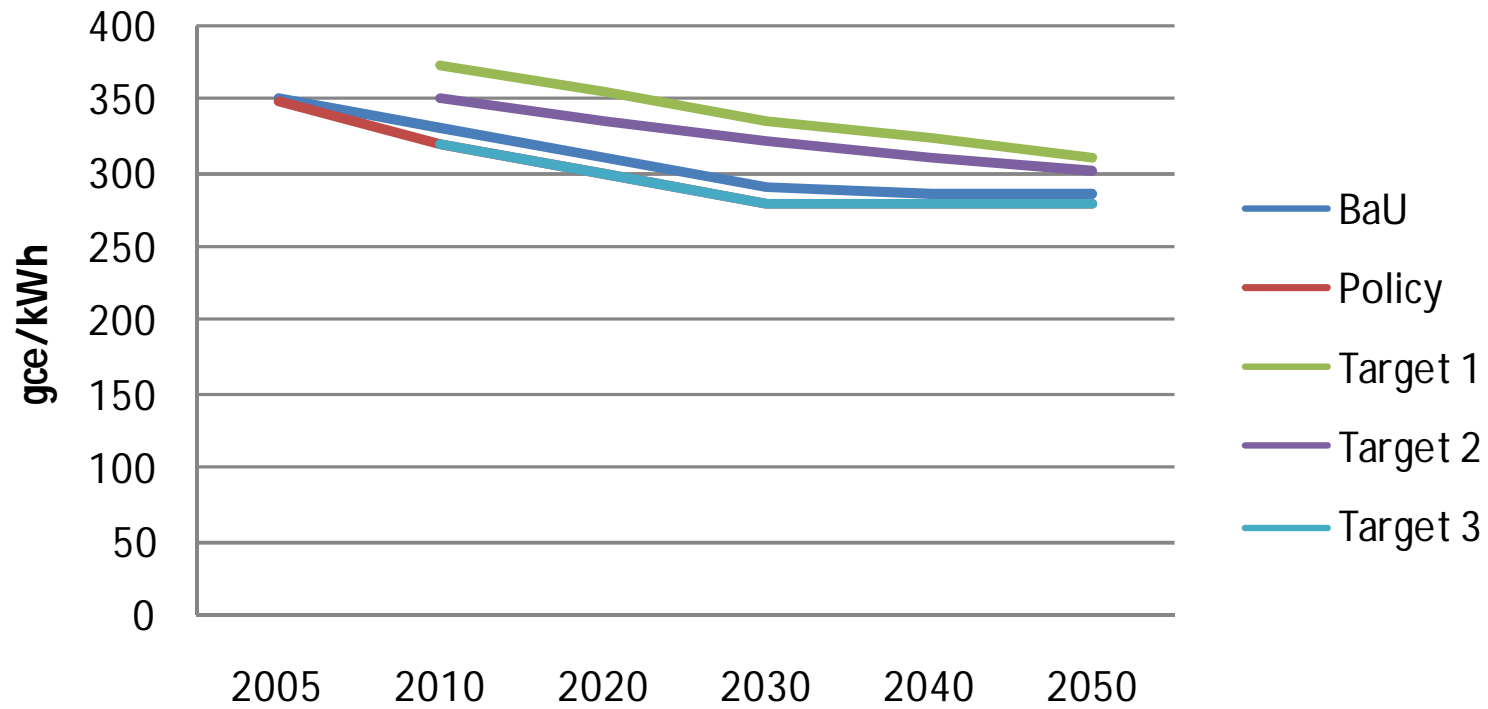
Generation efficiency coal



# Targets

- Target 1: Take global average
- Target 2: Take average of developed countries 10 years ago
- Target 3: best effort of China

# Energy use comparison for coal fired power generation



## *Confirmed next study*

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- LCS China
- Global and China Mitigation Scenarios
- IPCC New Emission Scenario
- Low carbon scenarios for selected cities and provinces: Guangdong, Hongkong, Shijiazhuang, Baoding, Shanghai, Beijing, Jilin city, Jilin Province
- 2050 emission reduction target
- Detailed road map for policy options
- Road map for technology options
- Post-Kyoto Commitment
- Sector based approach: cement, power generation, transport
- CCS in China: end use sector and province study
- MRV application in China

# AEEMF Workshops

- 1<sup>st</sup> Workshop: July 26-27, Tsinghua University, Beijing
- 2<sup>nd</sup> Workshop: July 19-20, 2005, Renmin University, Beijing
- 3<sup>rd</sup> Workshop: May 30-31, Beijing University, Beijing
- 4<sup>th</sup> Workshop: June 2-4, Fudan University, Shanghai
- 5<sup>th</sup> Workshop: End of June. 2009, Beijing