

Building an Architecture of an Effective Future Regime

Low Carbon Scenario up to 2050 for China

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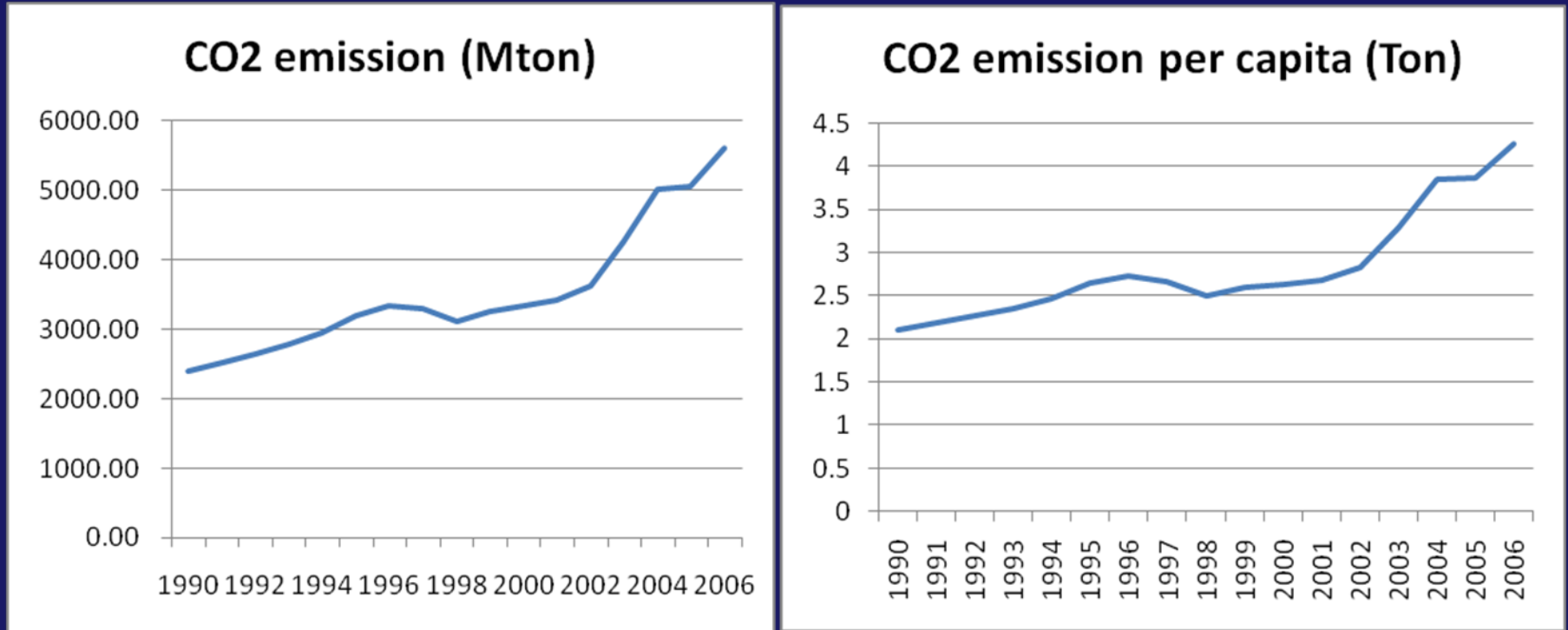
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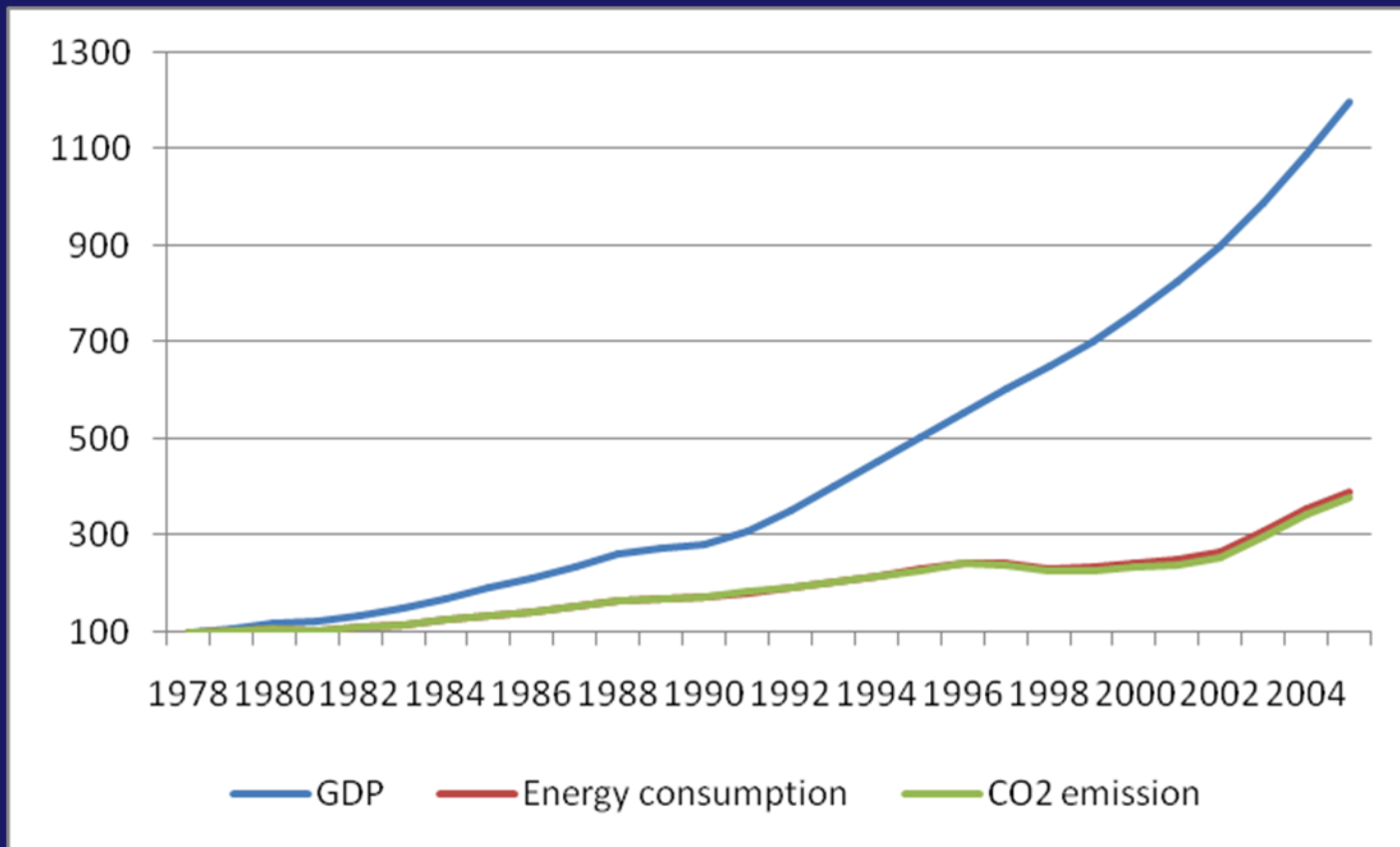
- Background information
- Methodology framework
- Main consideration
- Results
- Findings and conclusion

Background information



Source: CO2 from fuel combustion, UN Statistics Division

Background information



Background information

The Chinese government attaches a high attention on climate change issues.

- 2006, National Climate Change Leading Group
- 2008, Climate Change Department of NDRC
- 2006, “Climate Change Strategy of China”
- 2006, “National Programs on Climate Change”
- 2008, “China White Book on Policies and Actions to Address Climate Change”

Related Policies and Measures: After 2003

National laws and plans

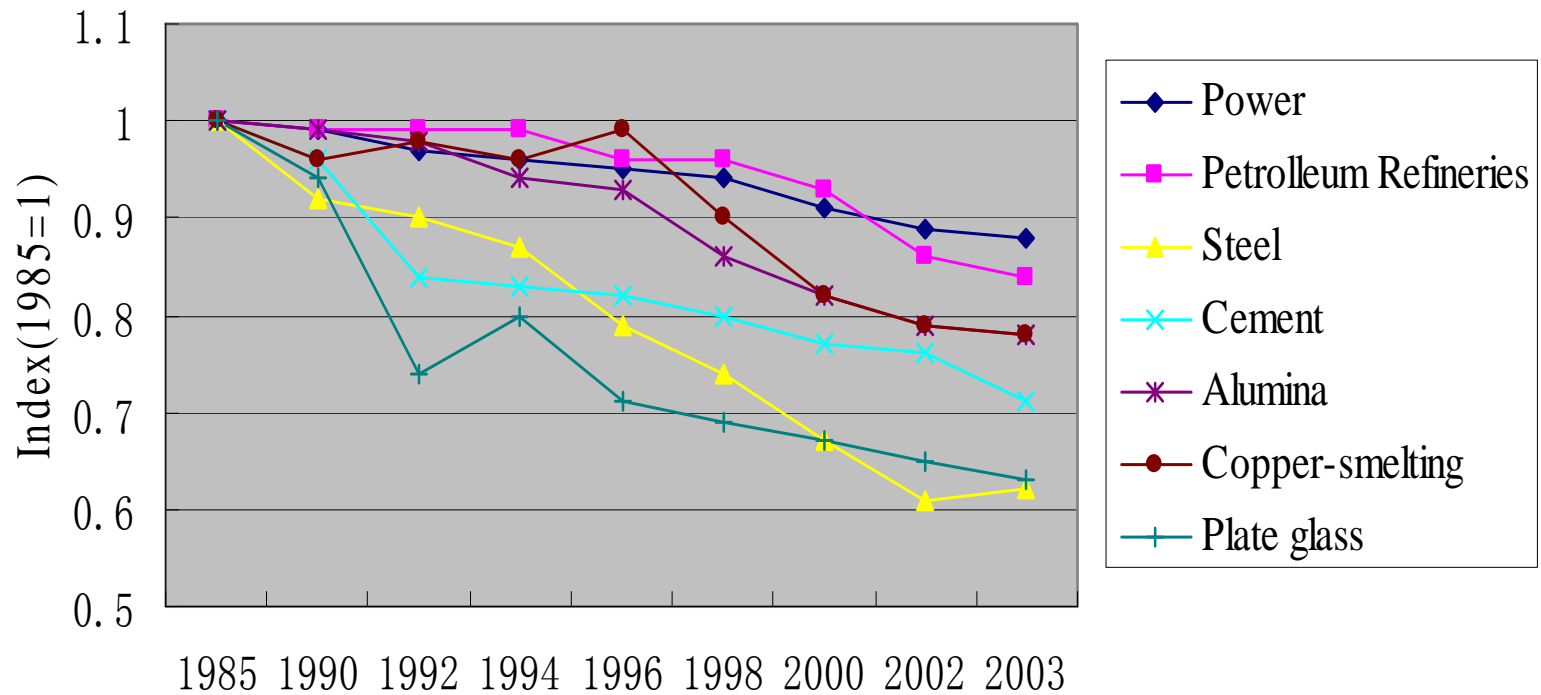
- Long- and Medium-term Energy Conservation Plan, with much more concrete content
- Renewable energy law
- Renewable energy development plan up to 2020
- 11th-five-year Energy Plan: National energy intensity target

Standards, regulations and measures

- Vehicle fuel efficiency standard
- Strictly implementation of building energy standards
- Fuel tax
- Releasing the control on coal price for all users
- Higher consumption tax for larger engine vehicles
- Energy monitoring for 1000 large energy users

Background information

Major Products Energy Consumption Index change from 1985 to 2003



Future views on climate change

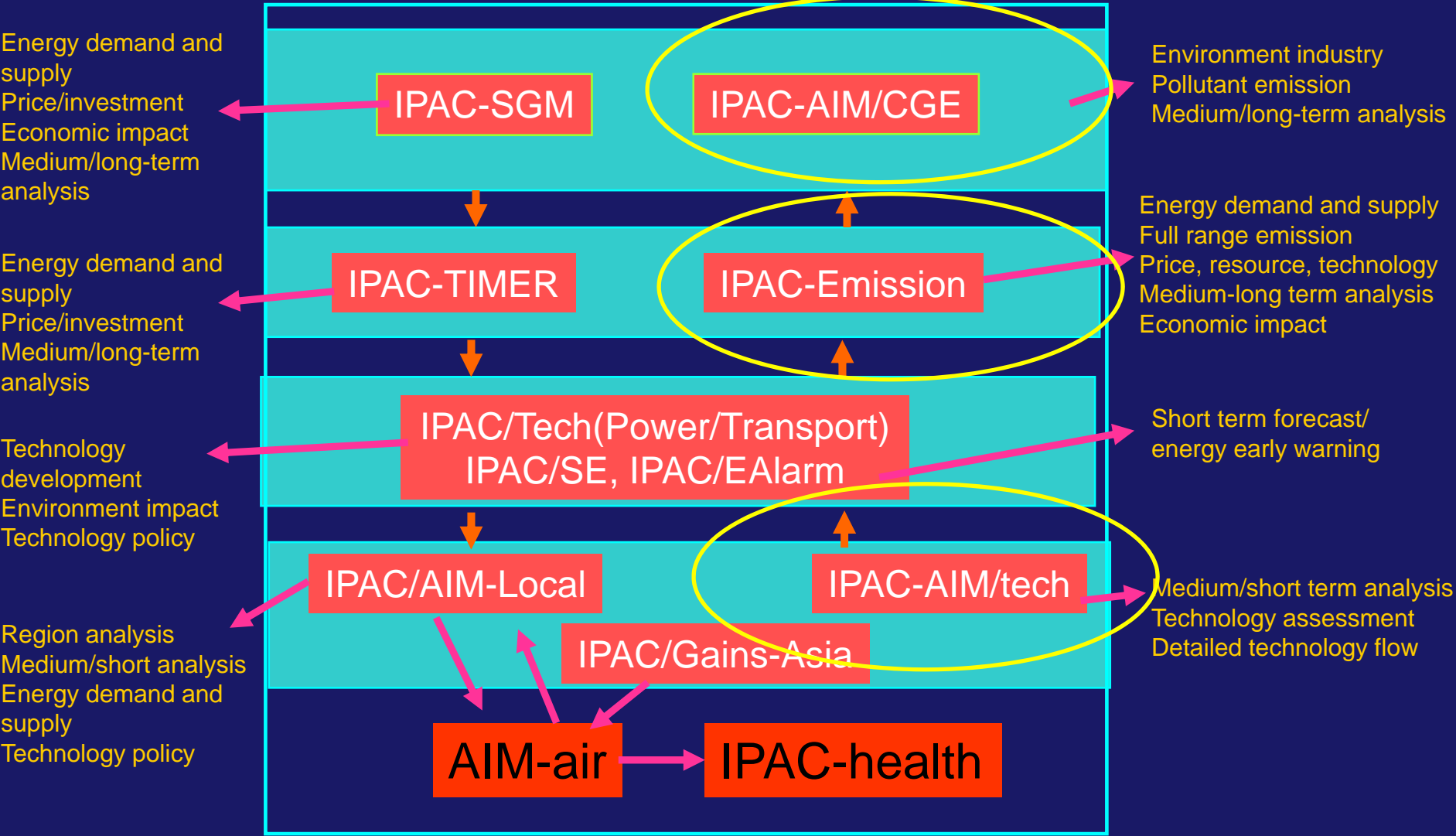
- China's GDP will maintain a gradual growth and the energy demand will increase very fast from the relatively low energy-service level, which will drive the growth of GHG emission in the future
- China's effort on energy saving, renewable energy development and environmental protection will have apparent positive effect on GHG mitigation, which will control the growth speed of GHG by large degree
- China face many choices in future development pathway. It is very key and important to identify the main forces to drive China toward a low carbon direction

Research on low carbon scenarios

- Low carbon: *slow down the growth of carbon emission*
- Focus: *Main contributors for low carbon*
- Research oriented: *Forecasting and Backcasting*
- Methodology: Integrated model framework
Integrated Policy Assessment for China (IPAC)

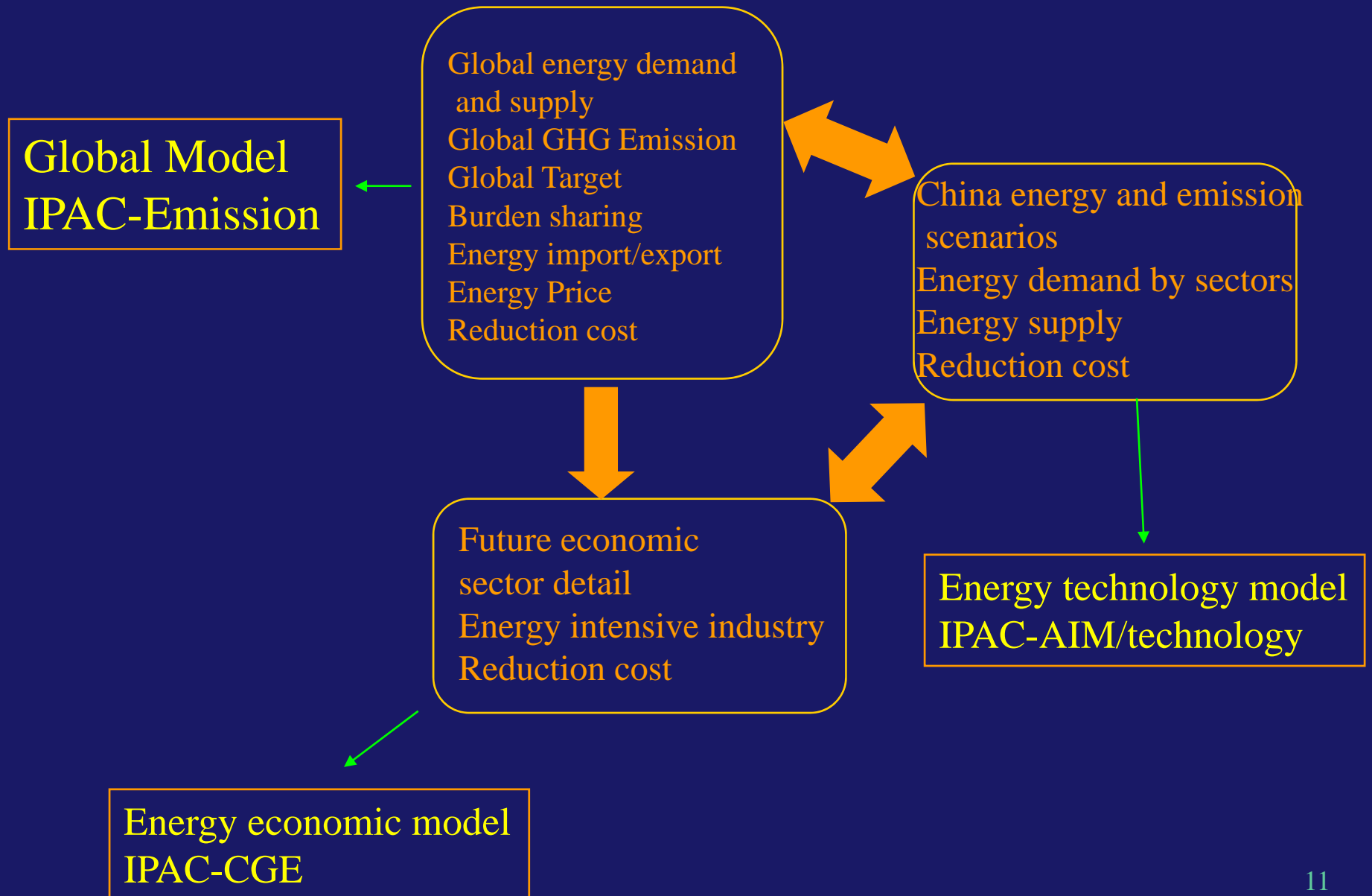
Methodology: Model framework

Integrated Policy Model for China (IPAC)



Climate Model

Methodology: Analysis framework

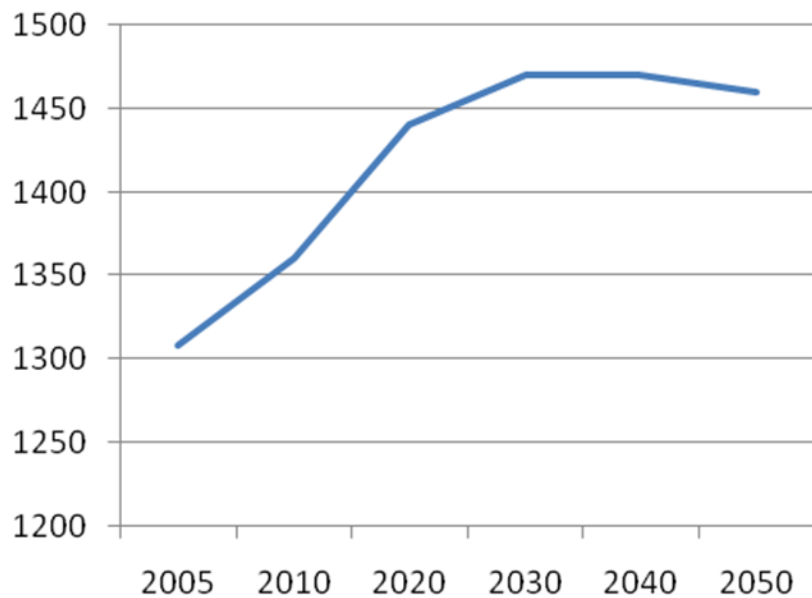


Two Scenarios

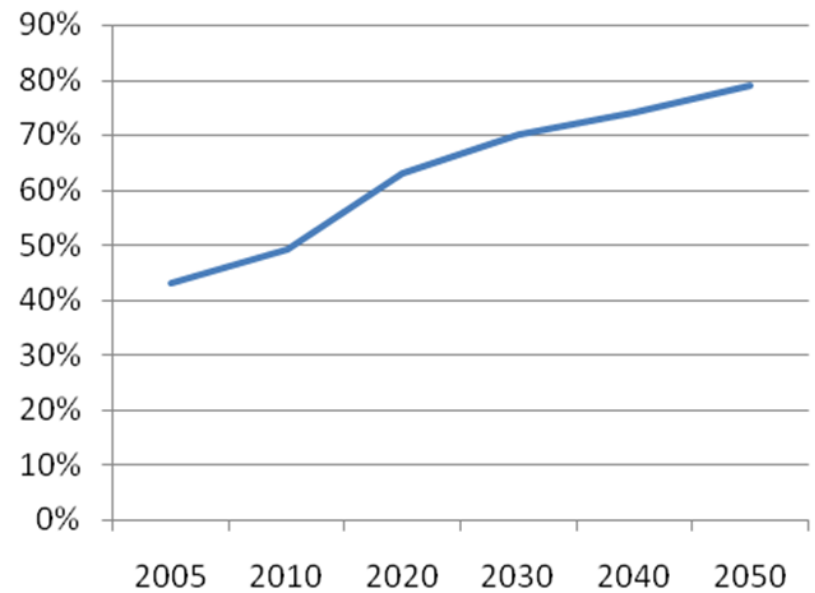
- BAU scenario:
 - Economy is the main driving force;
 - High consumption pattern, concern on environmental protection, technology progress
- Low carbon scenario:
 - Low carbon approach:
 - More driven by domestic forces and measures
 - Combined measures: new energy technology adoption, energy saving, enhanced technology innovation and development, considering energy security and economic competitiveness
 - Cost reduction of low carbon technologies;
 - Investment on low carbon economy

Population and urbanization

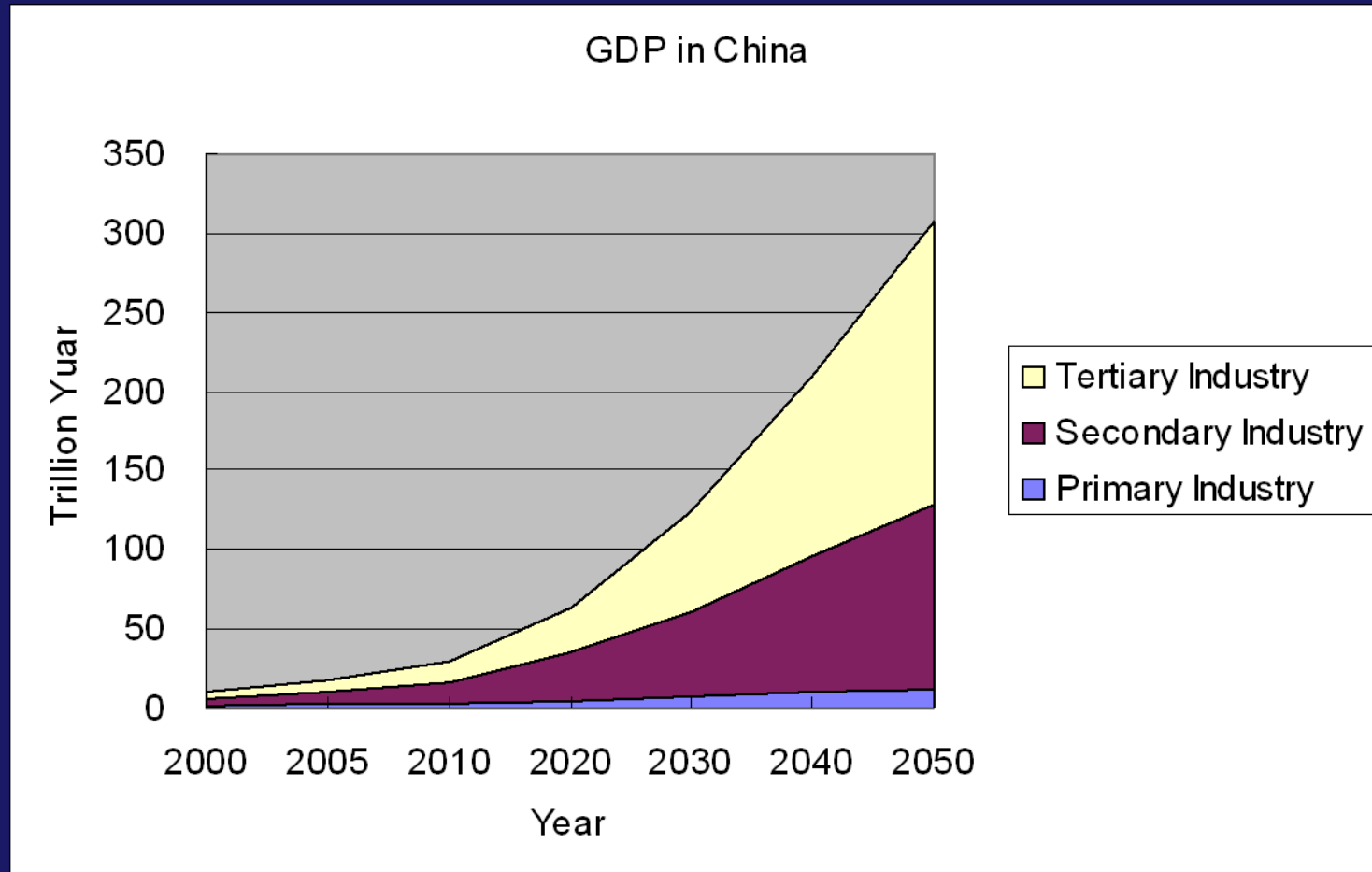
Population



Urbanization rate

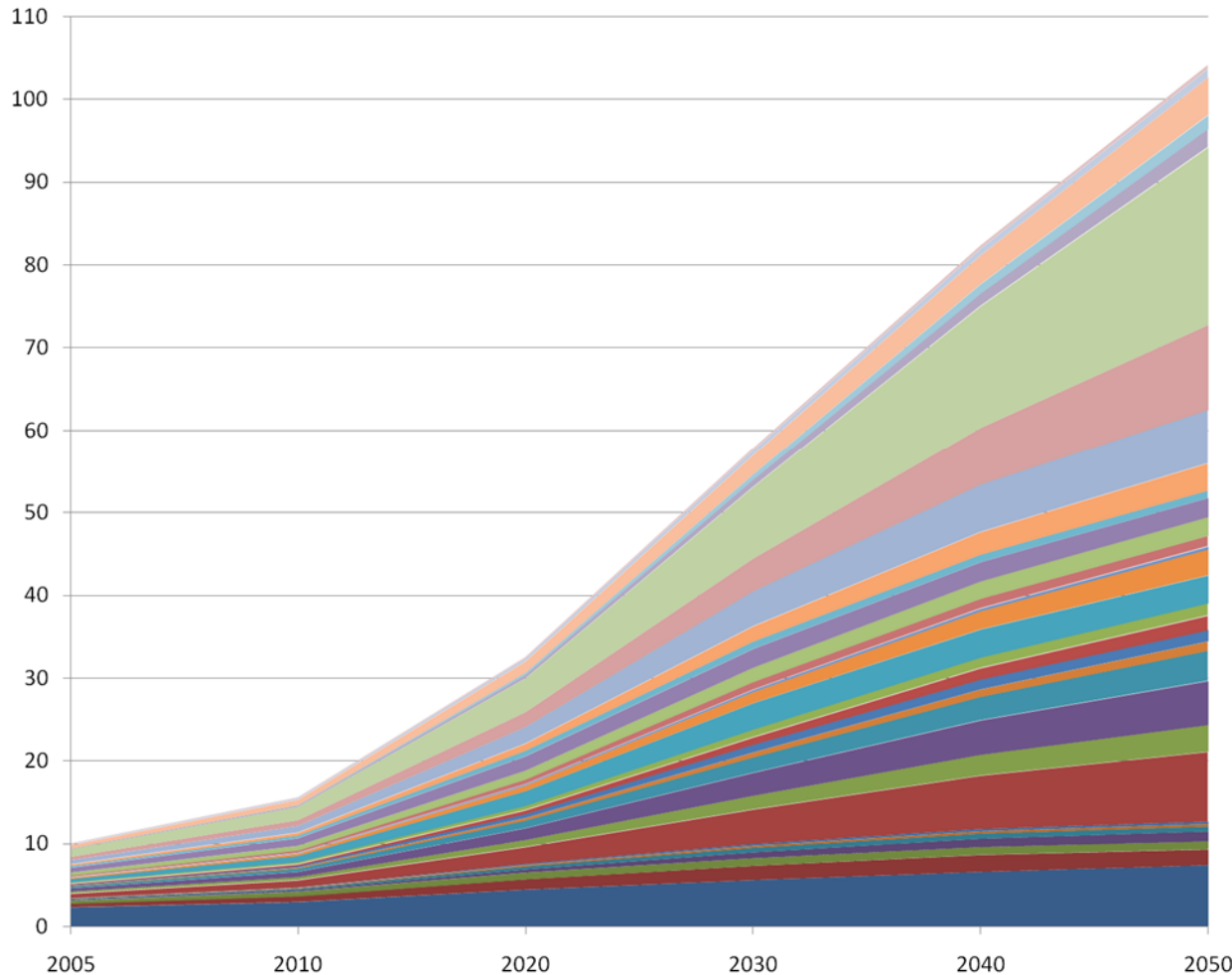


GDP growth trend



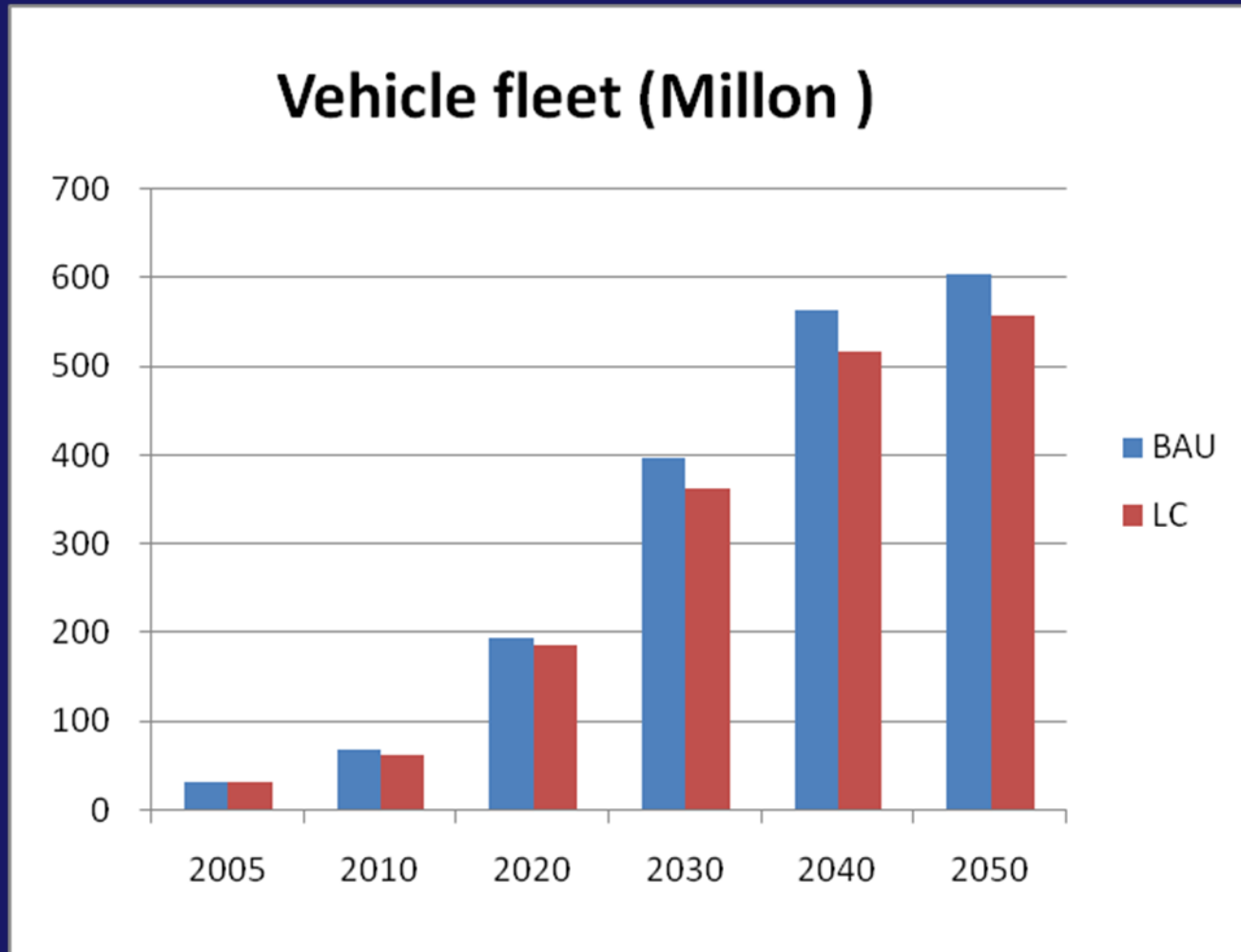
GDP by sectors

Trillion Yuan

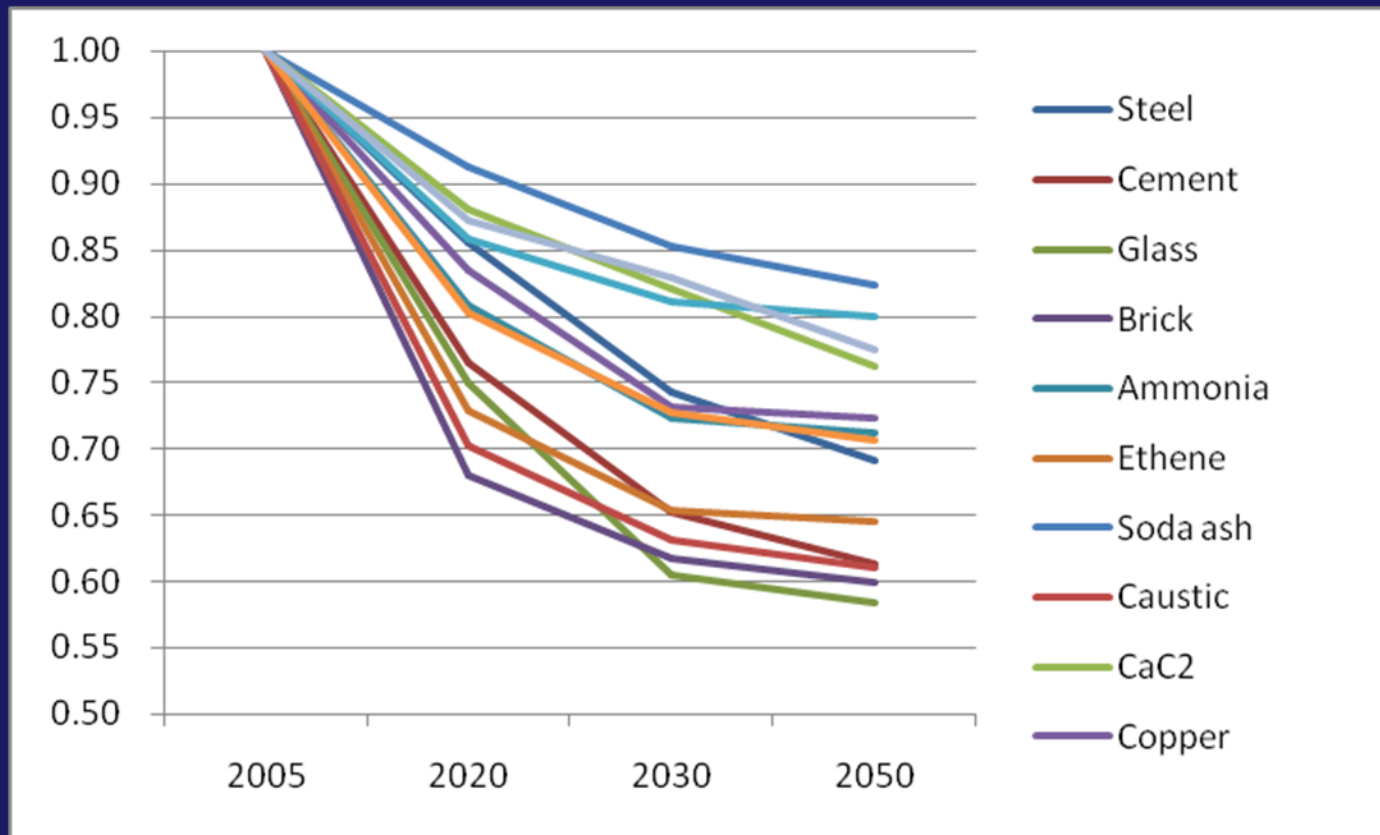


- Coal gas
- Heat
- Electricity
- Other Machinery Industry
- Instruments, Meters, Cultural and Office Machinery
- Electric Equipment and Machinery, Electronic and Telecommunications Equipment
- Transportation equipment
- Ordinary Machinery, Equipment for Special Purpose
- Metal Products
- Smelting and Pressing of Nonferrous Metals
- Smelting and Pressing of Ferrous Metals
- Nonmetal Mineral Products
- Rubber Products, Plastic Products
- Chemical Fiber
- Medical and Pharmaceutical Products
- Raw Chemical Materials and Chemical Products
- Coking
- Refined petroleum
- Printing, Cultural, Education and Sports Articles
- Papermaking
- Furniture
- Wearing clothes, fur
- Textile Industry
- Tobacco Processing
- Food and Beverage
- Other Miners Mining and Dressing
- Nonferrous Metals Mining and Dressing
- Ferrous Metals Mining and Dressing
- Natural gas
- Crude Oil
- Coal Mining
- Agriculture

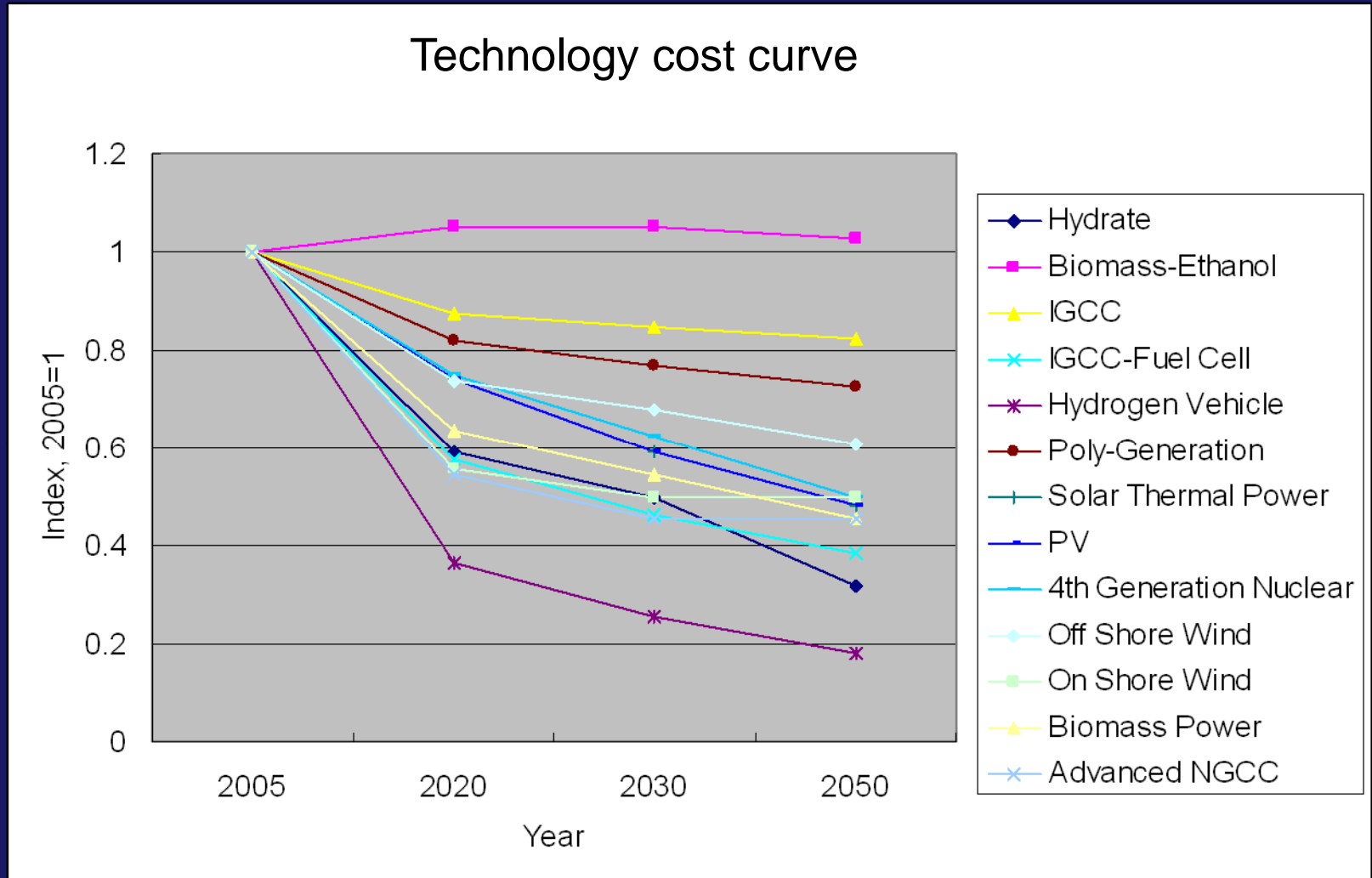
Transportation sector



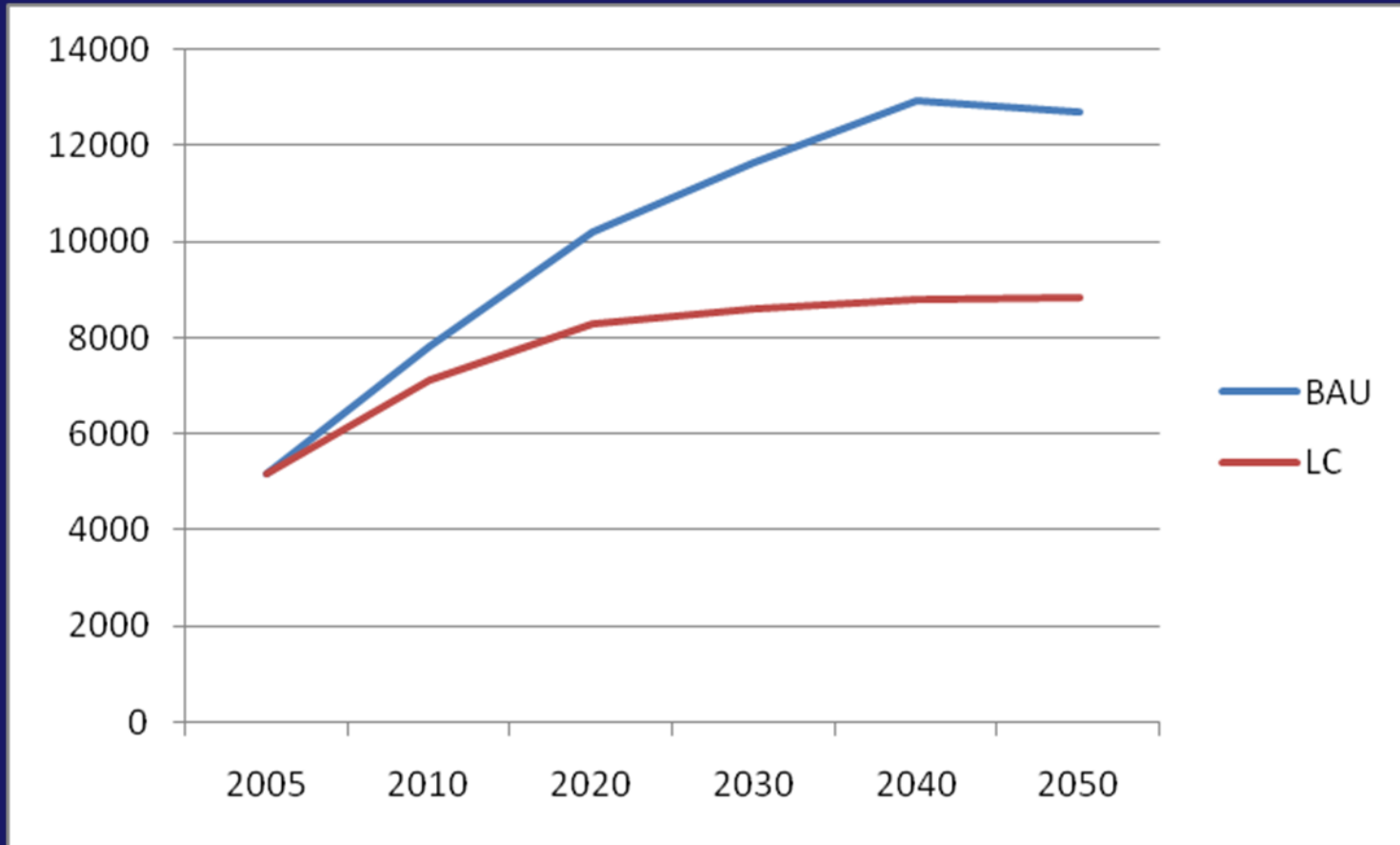
Energy efficiency improvement for main industry products



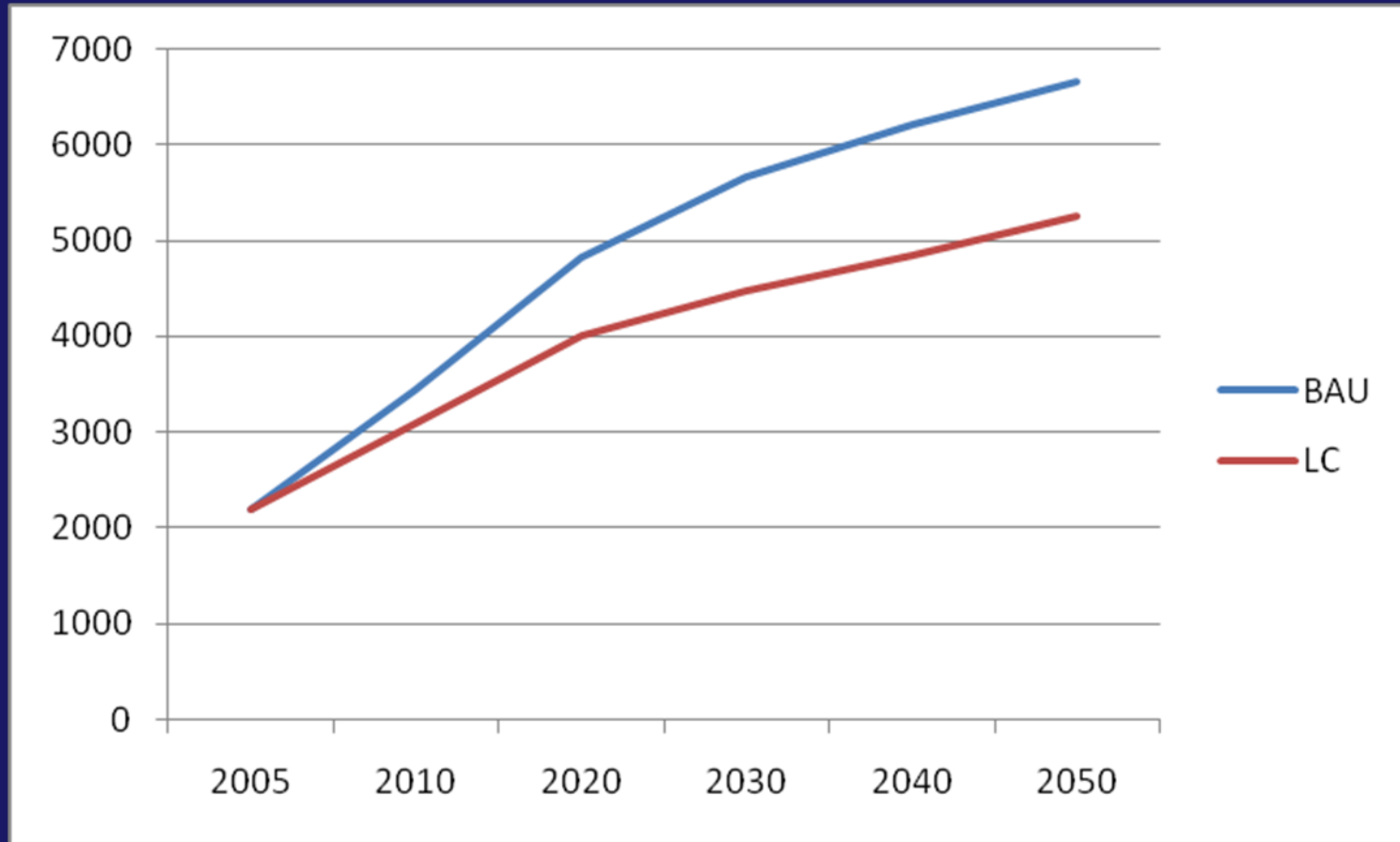
Technology development: *Cost curves of main technologies*



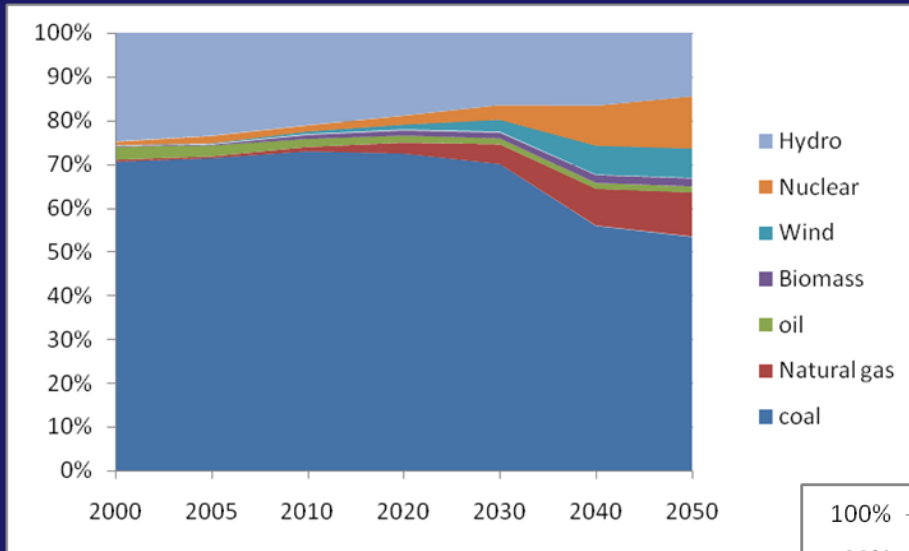
Result --- Carbon emission (Mton)



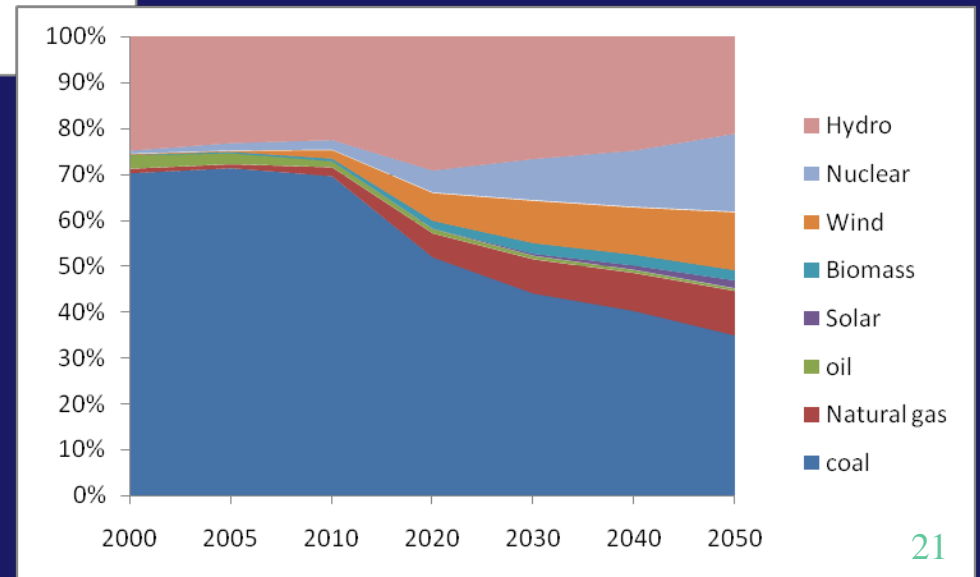
Result --- *Primary energy demand (Mtce)*



Result --- Power capacity mix

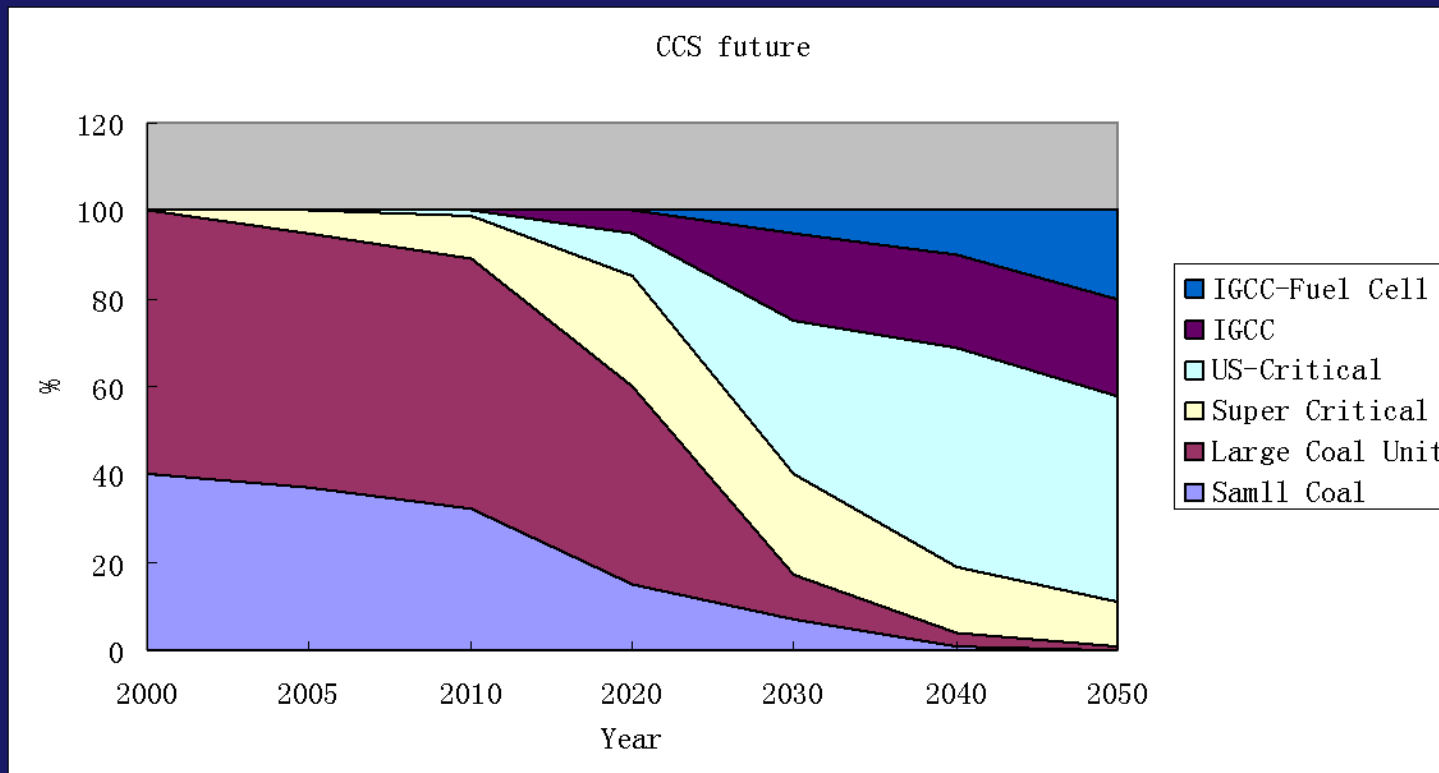


LC



BAU




Result --- *new technology penetration, CCS in power sector*

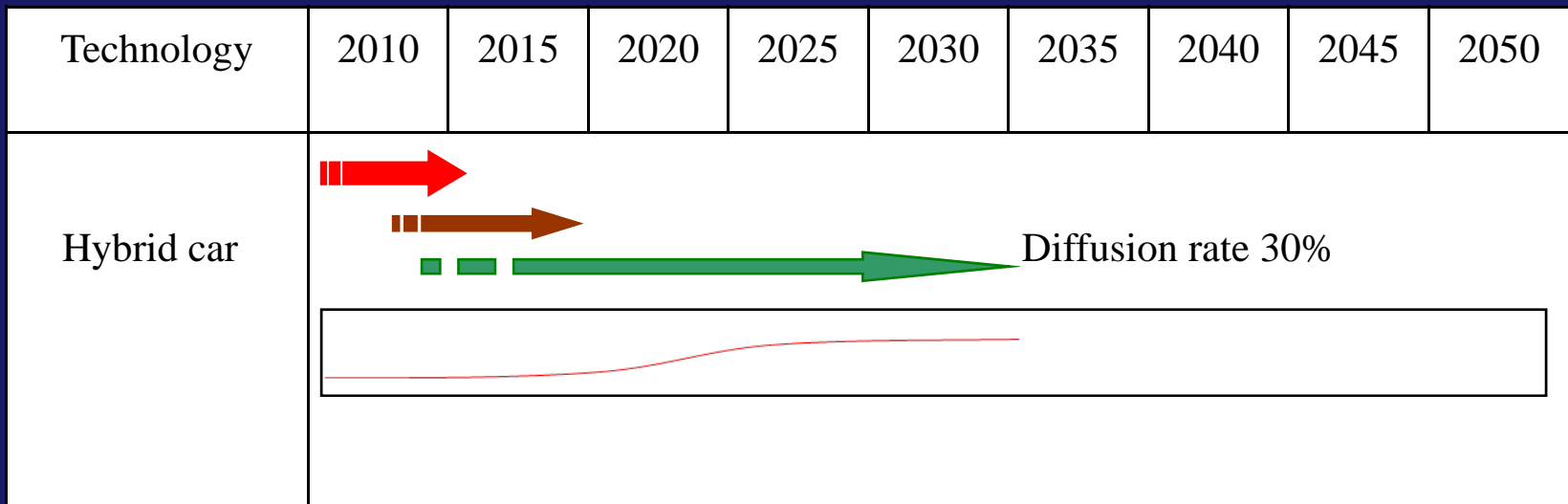


Result --- Identified efficient technologies (fully used by 2020)

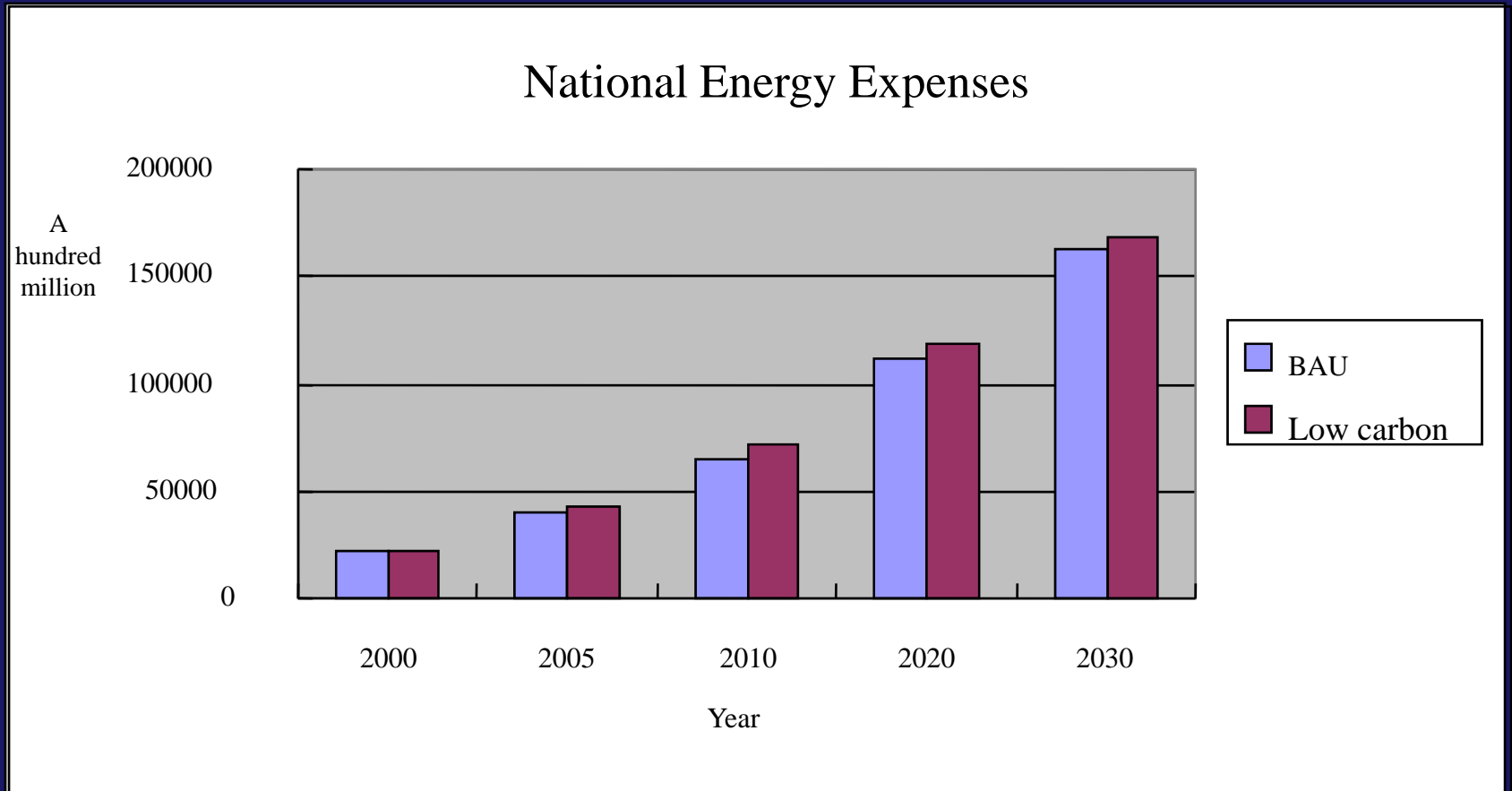
Sector	Technologies
Steel Industry	Large size equipment (Coke Oven, Blast furnace, Basic oxygen furnace ,etc.), Equipment of coke dry quenching, Continuous casting machine, TRT Continuous rolling machine, Equipment of coke oven gas, OH gas and BOF gas recovery , DC-electric arc furnace
Chemical Industry	Large size equipment for Chemical Production, Waste Heat Recover System, Ion membrane technology, Existing Technology Improving
Paper Making	Co-generation System, facilities of residue heat utilization, Black liquor recovery system, Continuous distillation system
Textile	Co-generation System, Shuttleless loom, High Speed Printing and Dyeing
Non-ferrous metal	Reverberator furnace, Waste Heat Recover System, QSL for lead and zinc production
Building Materials	dry process rotary kiln with pre-calciner, Electric power generator with residue heat, Colburn process, Hoffman kiln, Tunnel kiln
Machinery	High speed cutting, Electric-hydraulic hammer, Heat Preservation Furnace
Residential	Cooking by gas, Centralized Space Heating System, Energy Saving Electric Appliance, High Efficient Lighting
Service	Centralized Space Heating System, Centralized Cooling Heating System, Co-generation System, Energy Saving Electric Appliance, High Efficient Lighting
Transport	Diesel truck, Low Energy Use Car, Electric Car, Natural Gas Car, Electric Railway Locomotives
Common Use Technology	High Efficiency Boiler, FCB Technology, High Efficiency Electric Motor Speed Adjustable Motor, Centrifugal Electric Fun, Energy Saving Lighting

Technology road map: *Hybrid car*

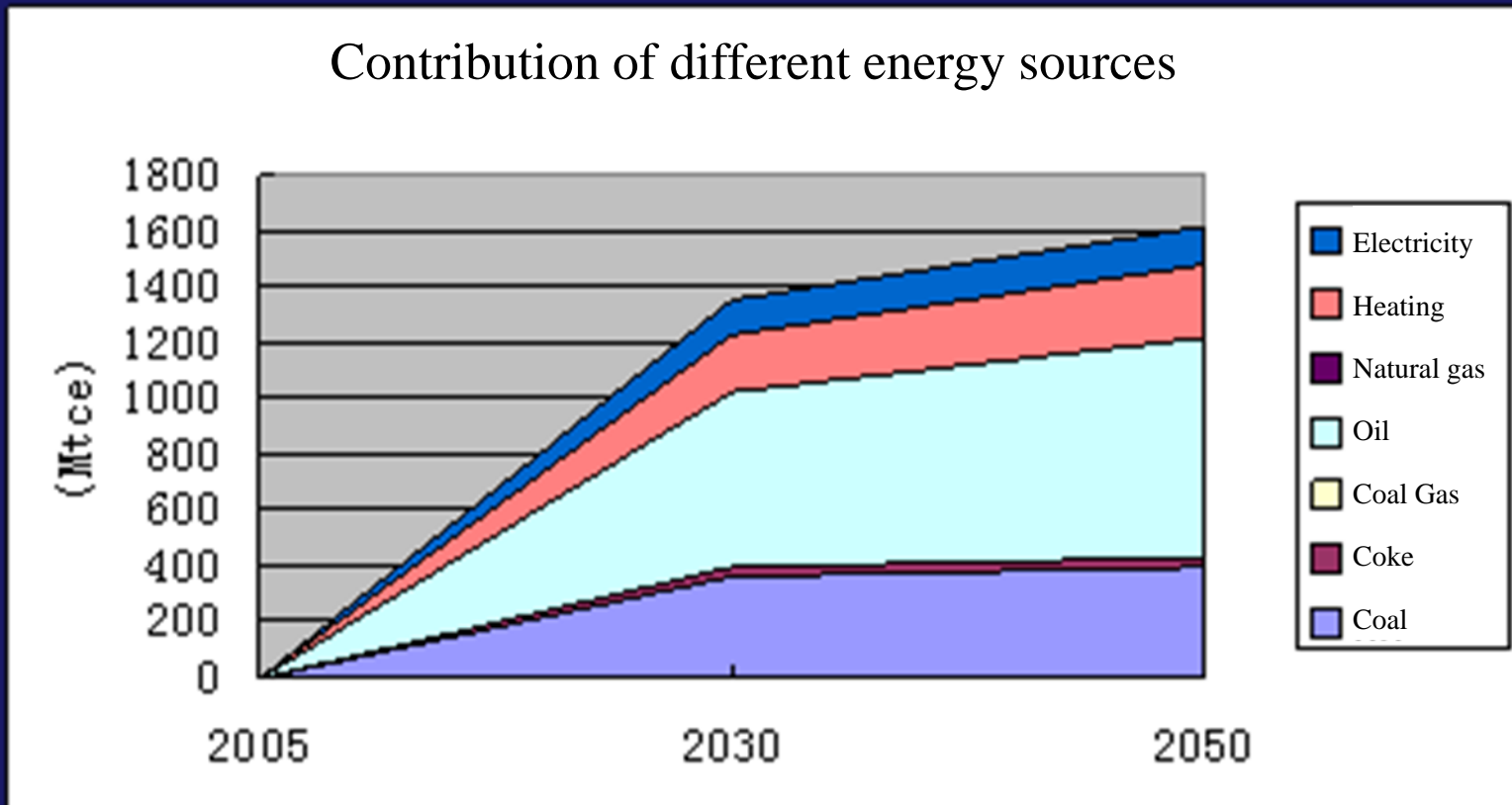
-  R&D
-  Demonstration and initiation in the market
-  Maturation and diffusion



Cost: *National Energy Expense*

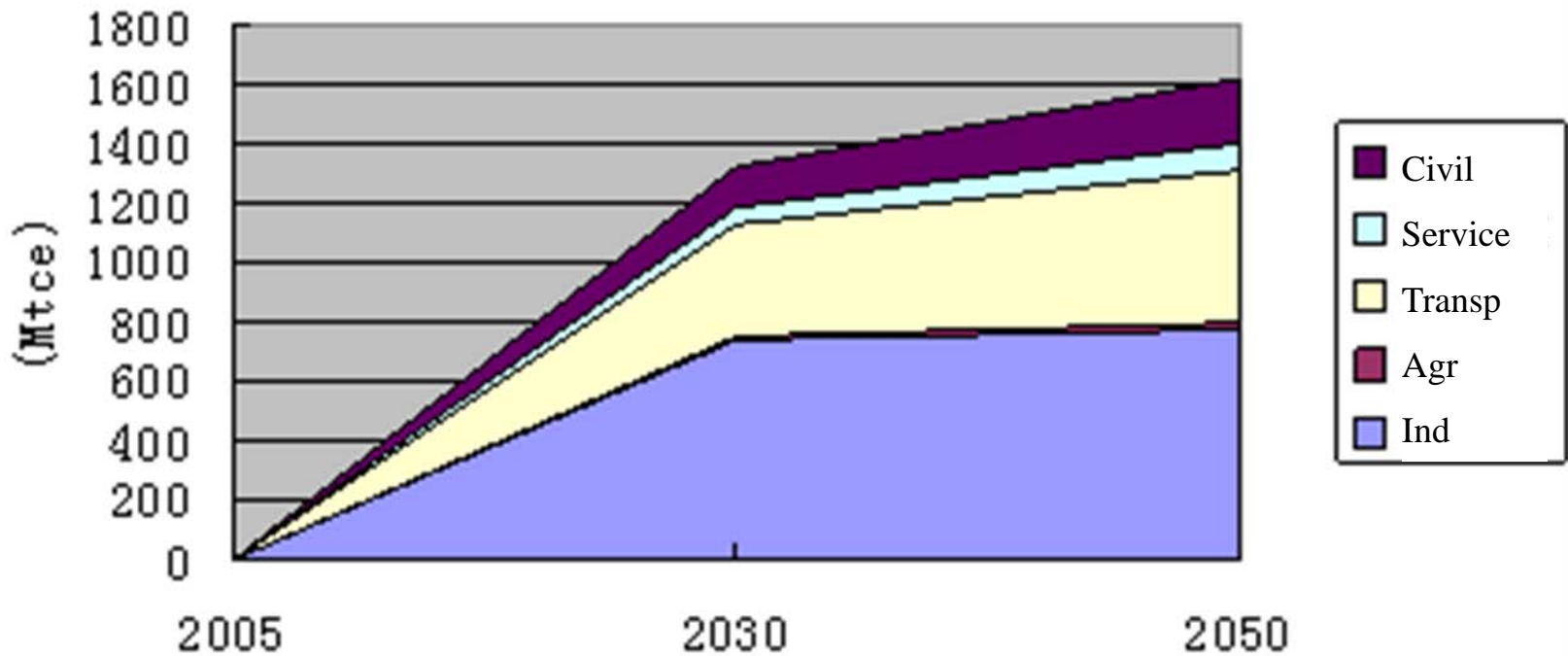


Contribution to energy saving



Contribution to energy saving

Contribution of different sectors



General findings

LC via BAU scenario:

- CO2 emission is reduced by 44%
- Primary energy is reduced by 26.8%
- Energy structure is optimized: share of coal is reduced from 44% to 37.4%, oil from 27.6% to 20.2%, nuclear 9% to 14.2%, RE from 9.4% to 13.8%

Mainly finding:

- Industry and transportation contribute much to energy saving
- Application of new and low carbon techs is crucial
- A challenge: demand of oil and gas increase very fast
- Cost and benefit: certain amount of cost should not be avoided but opportunities exist

Primary conclusion

In order to develop toward a low carbon scenario, appropriate policies and measures are needed to promote:

- Optimization of economic structure:
Energy saving, competitiveness, international cooperation
- Popularization of low carbon technologies:
Industry, buildings, building energy use, transportation
- Low-carbon living pattern:
Behavior change, awareness raising, new LC and ES equipments
- Cycling economy and sustainable development
Standards and R&D, achievement of cobenefit

Current researches

Research topics and areas:

- Low carbon scenarios for China up to 2050:
Together with other research team in China
- Low carbon zones & cities: actions
E.g. Beijing, Shanghai, Ji Lin, Baoding
- Low carbon technologies: Technology roadmap
RE&EE technologies, CCS (IGCC), Solar, FC
- Policies and measures:
E.g. energy taxes, trading system, sectoral approaches
- Short term via long term
E.g. Economy recession, 12th-five-year plan, sustainable development

Thank you!

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