China's low carbon strategies

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The Rise of China and Its Energy Implications
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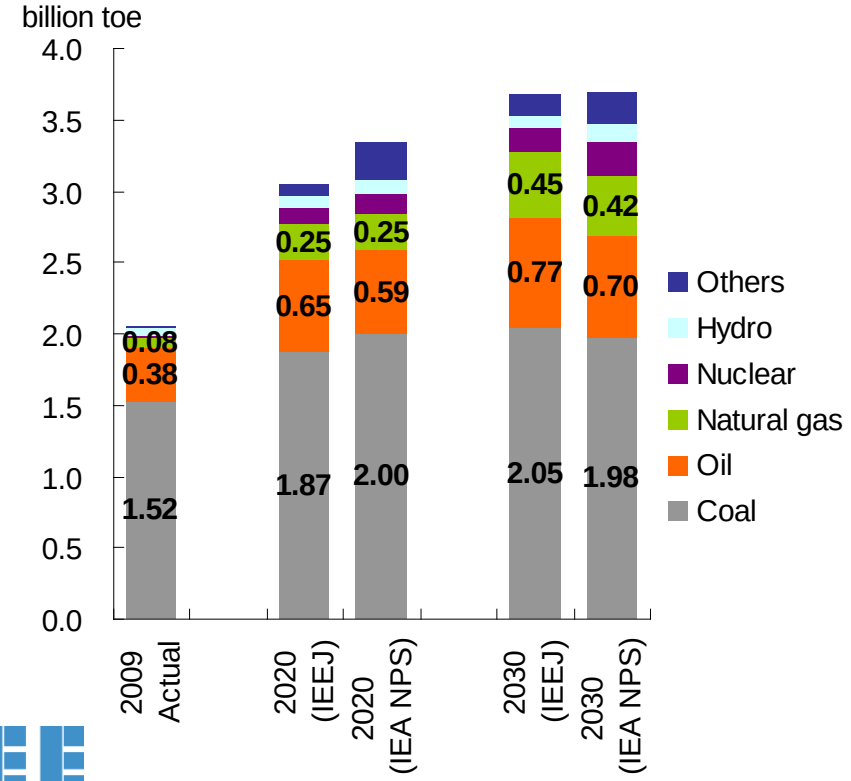
Rising energy demand and import dependence

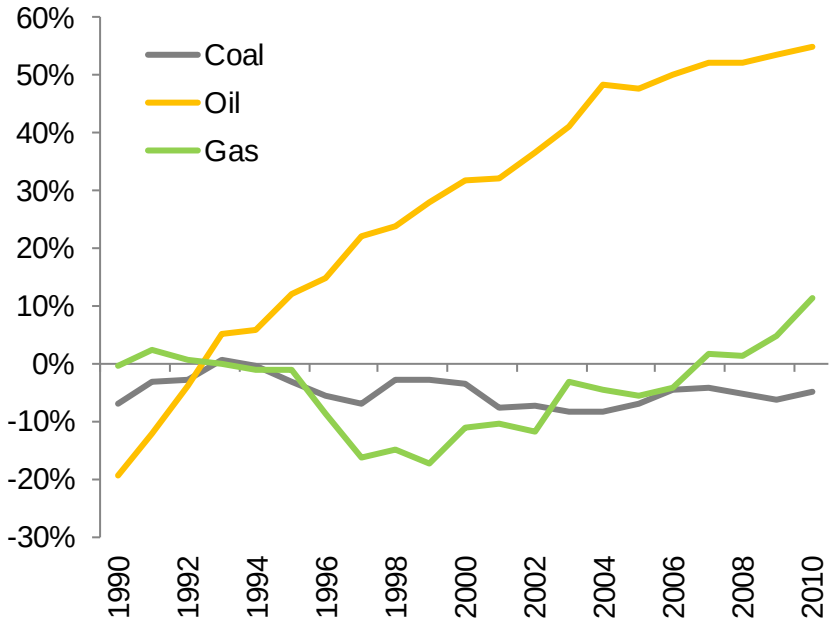
- Chinese primary energy demand will grow by 1.8 times until 2030.
- Import dependence of fossil fuels has been rising, and will continue to rise.

China's primary energy demand outlook



Source: IEEJ; IEA

China's import dependence

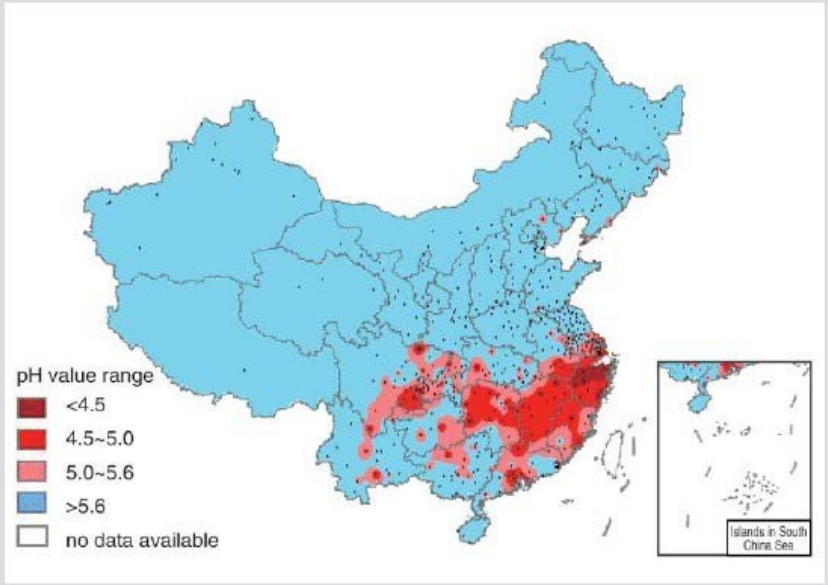


Source: BP

Air / water pollution

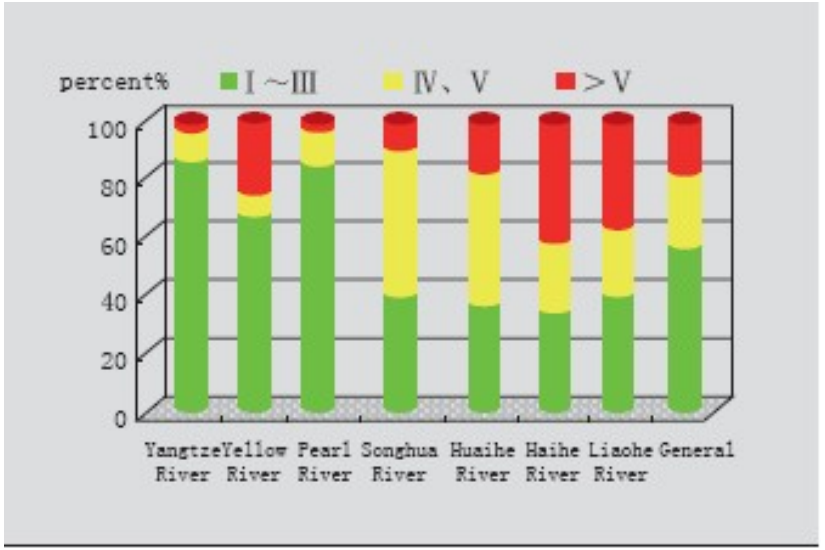
- Control and reduction of pollutions is another incentive for clean energy development.

China's distribution of acid rain



Isograms of annual average pH values of the precipitation in 2009 in China

Water pollutions in major rivers



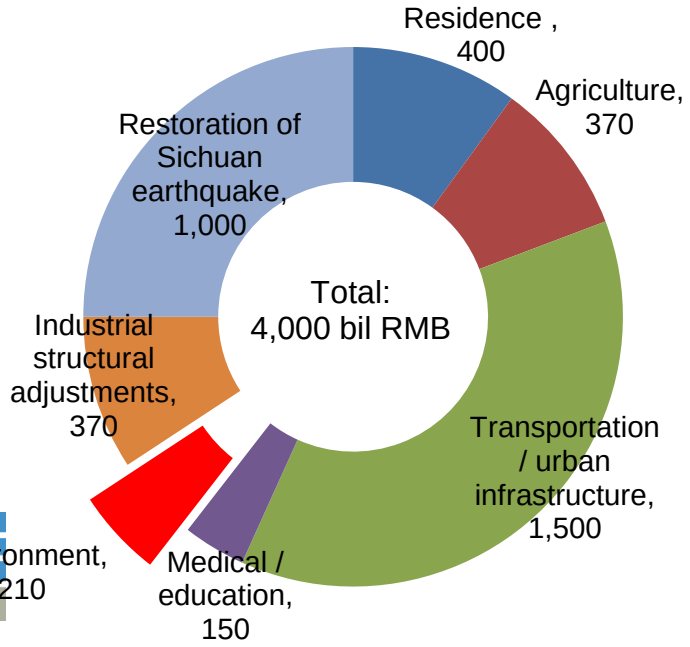
Water quality grade of seven big rivers in China

Source: Ministry of Environmental Protection

Green growth

- RMB 210 billion was spent for energy conservation and environmental sector as a part of RMB 4 trillion rescue package after the Lehman shock.
- Target of the shares of “emerging industries”
  - State Council aims to achieve the share of emerging industries, which include renewable and nuclear industry, to 8% of GDP by 2015 and 15% of GDP by 2020.
- Investments continues to be made in China’s renewable industry.
- A number of urban infrastructure developments are being pursued under the name of “eco city” or “smart community” developments.

China’s RMB 4 trillion rescue package



Major eco-city projects in China

Source: infzm.com

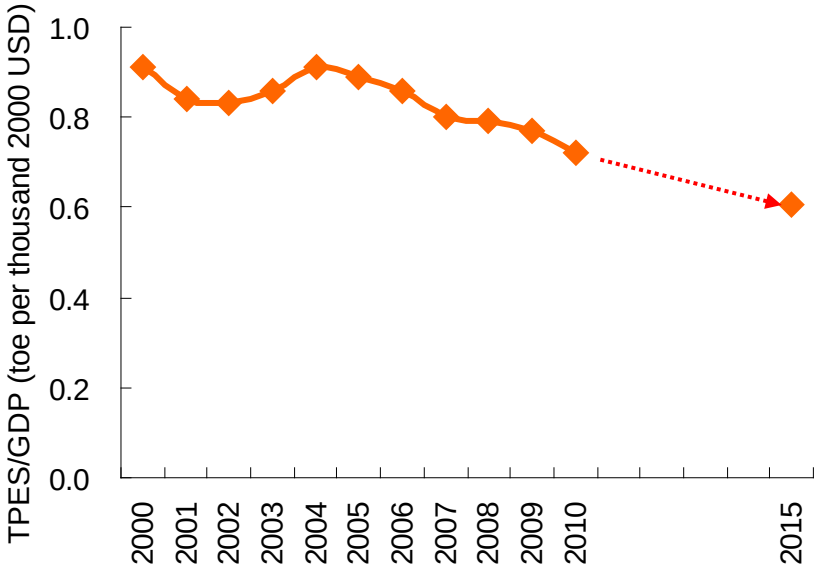
Five pillars in China's low carbon strategy

- International pledge to reduce carbon emissions
  - China internationally committed to reduce its carbon emission *per GDP* by 40-45% by 2020 compared to the 2005 level.
- International cooperation
  - Japan and China has held annually energy conservation forum since 2005
  - US and China agreed to found Clean Energy Research Center (CERC) and signed MOU for clean energy development.
- Development of legal framework and target control system
  - Since the provision of Renewable Energy Act in 2006, China has developed a number of laws, plans, guidelines, and targets.
- Energy conservation
- Alternative energy developments

Low carbon targets in 12th FYP (2011-2015)

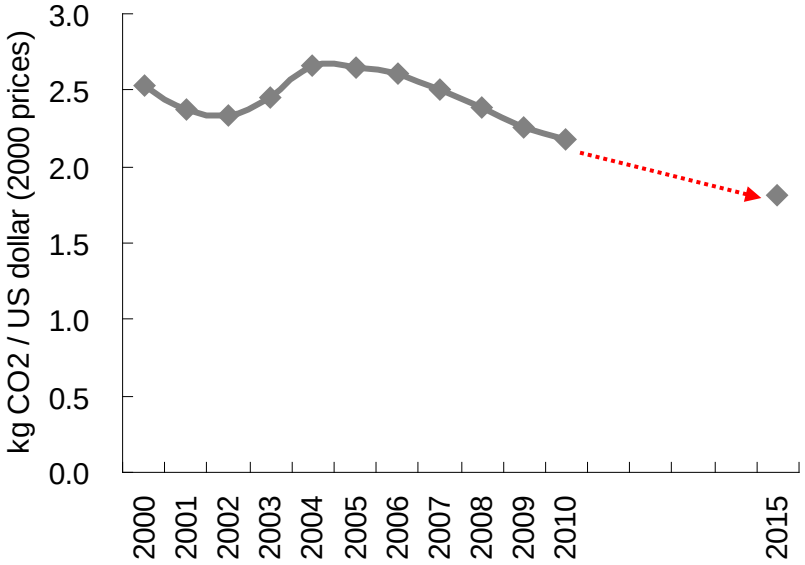
- From “quantitative growth” to “qualitative growth”
- Binding numerical targets:
  - The share of non-fossil fuel to be raised from 8.3% in 2010 to 11.2% in 2015
  - Reduction of energy consumption per GDP by 16%
  - Reduction of carbon emissions per GDP by 17%

Energy consumption per GDP



Source: IEA

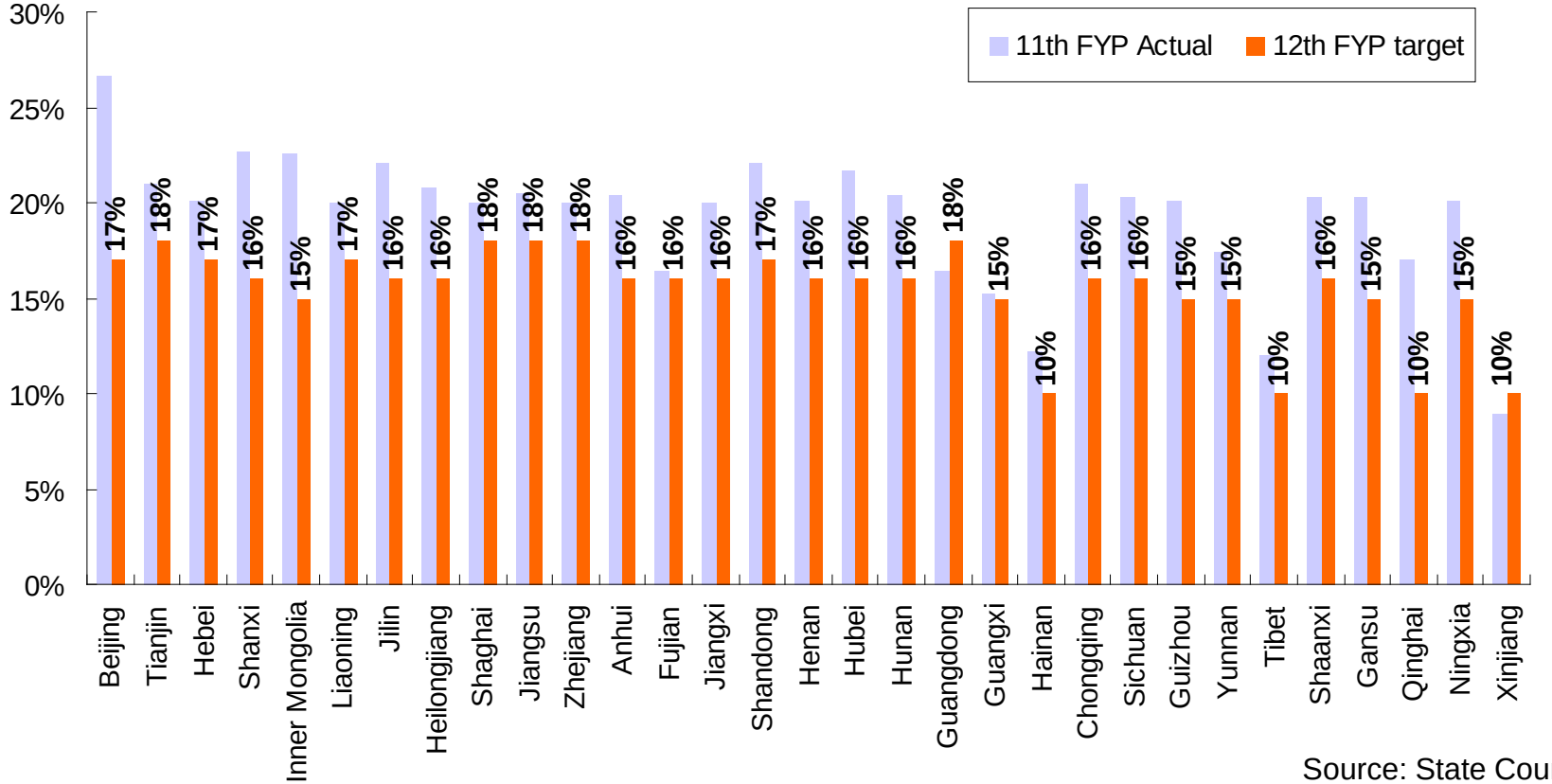
Carbon emissions per GDP



Source: IEA

Energy efficiency improvements

- Efficiency improvement targets are set for each province in 12th FYP.
  - Developed regions are imposed higher improvement targets.
- Energy pricing reform will be implemented with caution.

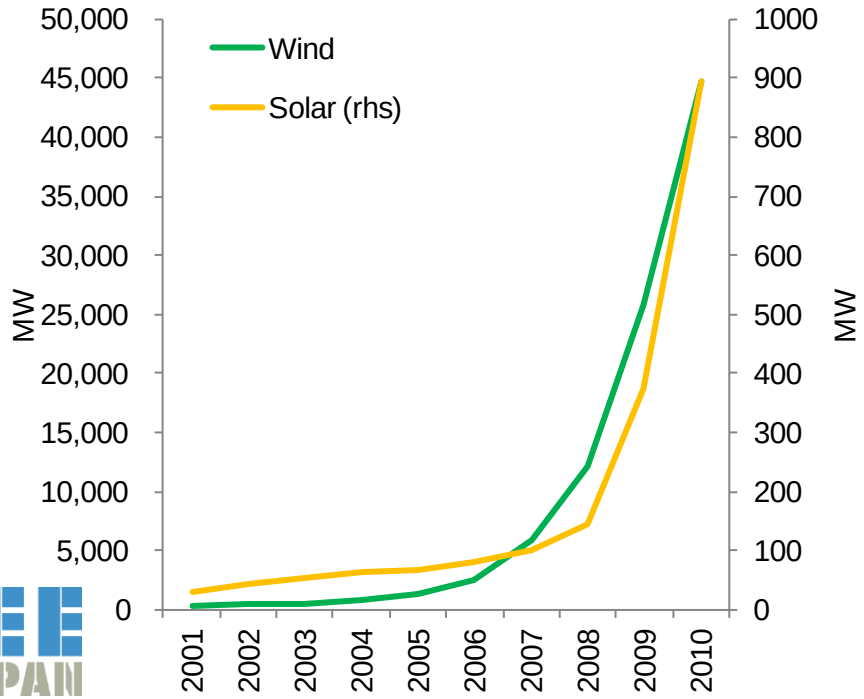


Source: State Council

Renewable energy

- FIT system was introduced for onshore wind power in 2009 and will be for solar by the end of 2011.
- Significant capacity expansion is planned for the next five years.

China's installed capacities of solar and wind power generation



China's renewable energy developments plan toward 2015

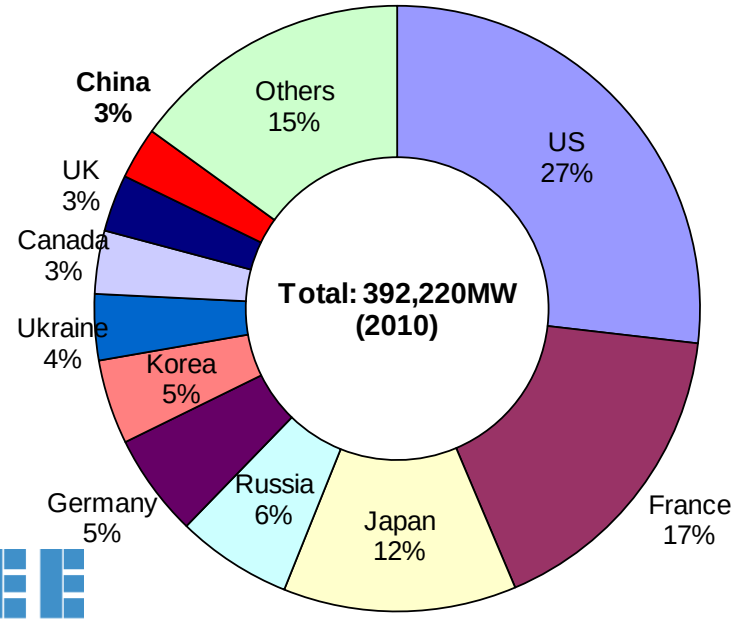
	Unit	2010 Actual	2015 Target
Power generation			
Hydro	GW	213	310
Wind	GW	31	100
Solar	GW	1	10
Biomass	GW	7	10
Heat			
Biogas	Bcm	160	25
Solar	Million m2	168	300
Geothermal	Mil toe	5	10
Liquid			
Ethanol	mil tons	2	5
Bio diesel	mil tons	1	1

Source: ERI

Nuclear power generation in China

- Currently 13 units are in operation and 28 units are under construction.
- Significant capacity expansion is planned.

World nuclear capacity



	Country	MW	Units	Planned	Units
1	US	105,240	104	10,600	9
2	France	65,880	58	1,630	1
3	Japan	48,850	54	19,590	15
4	Russia	24,190	28	25,470	24
5	Germany	21,520	17	0	0
6	Korea	17,720	20	9,600	8
7	Ukraine	13,820	15	2,000	2
8	Canada	13,230	18	0	0
9	UK	11,950	19	0	0
10	China	10,850	13	58,900	53
11	Sweden	9,390	10	0	0
12	Spain	7,730	8	0	0
13	Belgium	6,190	7	0	0
14	Taiwan	5,200	6	2,700	2
15	India	4,560	19	10,820	12
16	Czech	3,970	6	2,000	2
17	Switzerland	3,410	5	0	0
18	Finland	2,820	4	1,720	1
19	Brazil	2,010	2	1,410	1
20	Bulgaria	2,000	2	2,000	2
	Others	11,690	21	27,040	34
	Total	392,220	436	175,480	166

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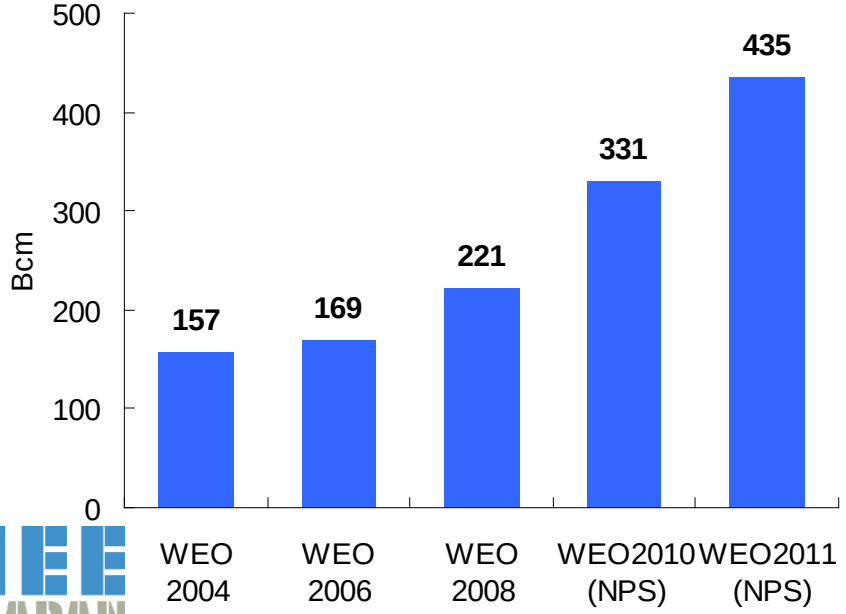
China's natural gas supply

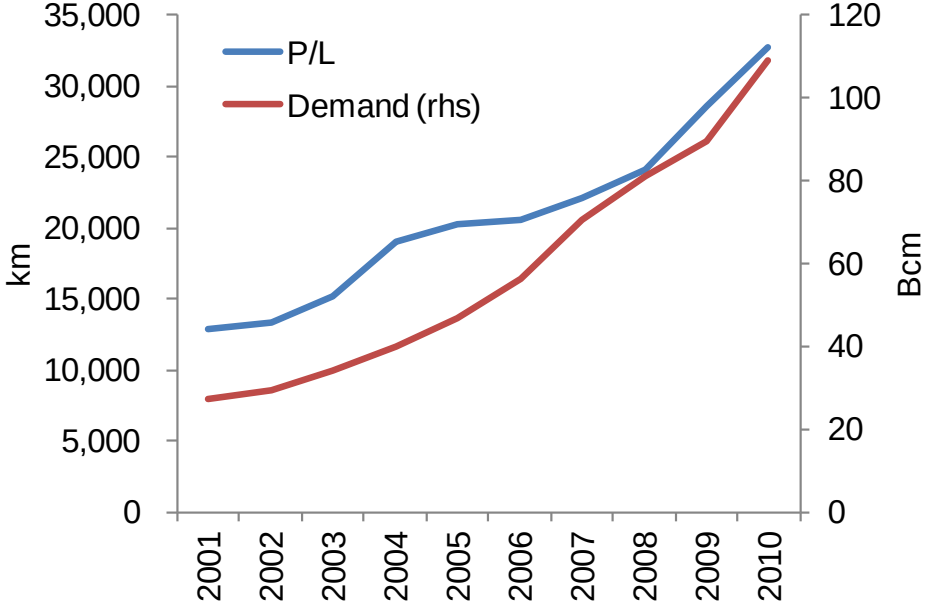
- China's interests to natural gas has significantly increased in recent years
  - Gradual increase of the share of natural gas is regarded as the most realistic and effective approach in the China's low carbon efforts.
  - China's natural gas demand outlook has been continuously revised upward reflecting the Chinese government's growing interests to natural gas.
- China's natural gas demand growth will be largely determined by infrastructure development and pricing policy by the government.

IEA's historical outlooks of China's natural gas demand as of 2030



Source: IEA

China's natural gas pipeline length and natural gas demand



Source: CNPC

Pipeline gas from Russia

- China is not very enthusiastic to import Russian gas at this moment.
  - Russia on the other hand is playing Korea card and Japan card.
- Yet, in the long term, pipeline natural gas supply from East Siberia to China should be a cornerstone China's energy security and carbon reduction.

East Siberian gas fields

Source: Gazprom

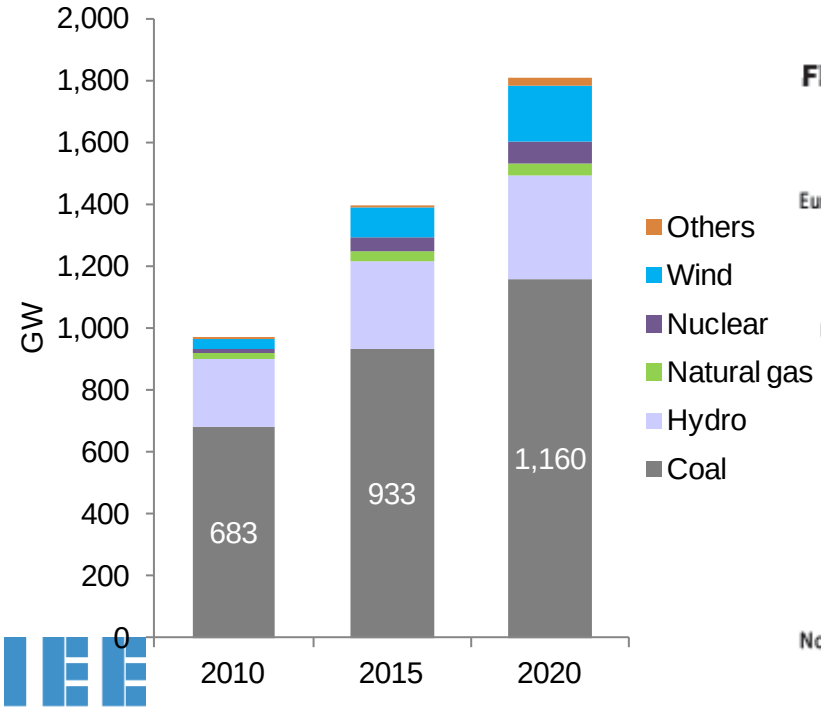
Diversification in transportation fuel

- Electrification of transportation sector
  - Several numerical targets for next generation vehicles have been set.
    - 500,000 vehicles manufacturing capacities to be developed by 2011.
    - The share of HV to be raised to 20% of total car manufacturing by 2015, and 3 million HVs to be deployed by 2015.
    - The share of EV to be raised to 10% of total manufacturing by 2015, and 1.5 million HVs to be deployed by 2015.
  - 20 large cities such as Shanghai and Beijing are designated as a model city to promote green vehicles.
    - HV and EV purchase for public sector receives RMB50,000 (USD7,500) and RMB60,000 (USD9,000), respectively.
  - 5 cities such as Shenzhen and Hangzhou are designated as a model city for personal use of green vehicles.
    - Individual who purchases green vehicles receives RMB3,000 (USD450) per kW capacity of vehicles.
- Natural gas vehicle (NGV)
  - NGV is one of the areas where natural gas can be used with a higher priority in China.

… But coal will still continue to be dominant.

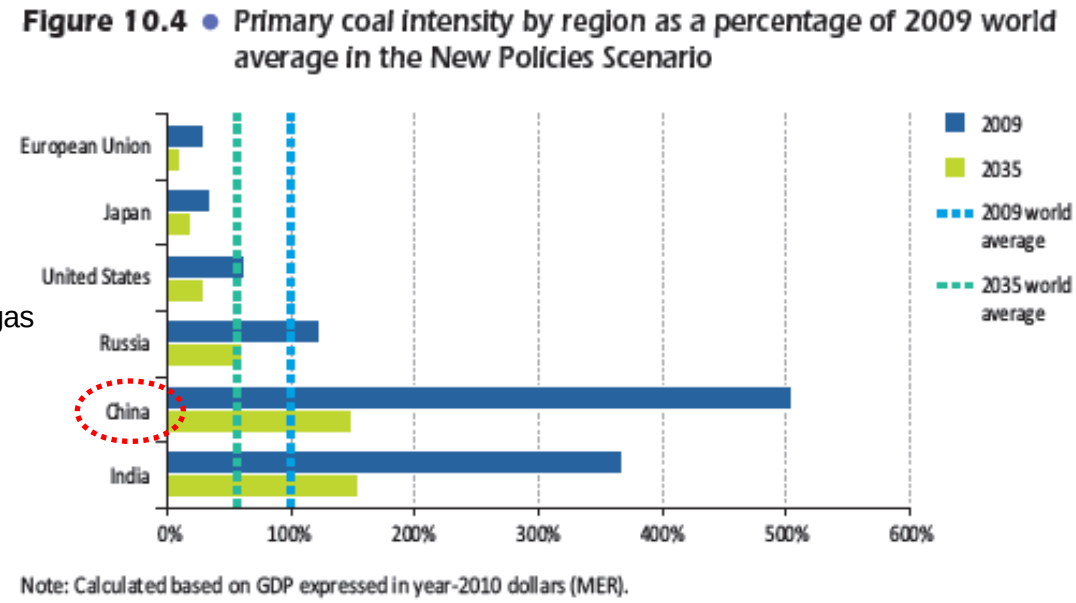
- Capacity addition of coal fired power plant is by far the largest among all fuels.
- Coal intensity will be significantly reduced; but it's still among the highest in the world.

Power generation capacity



Source: Association of China's Power Industry

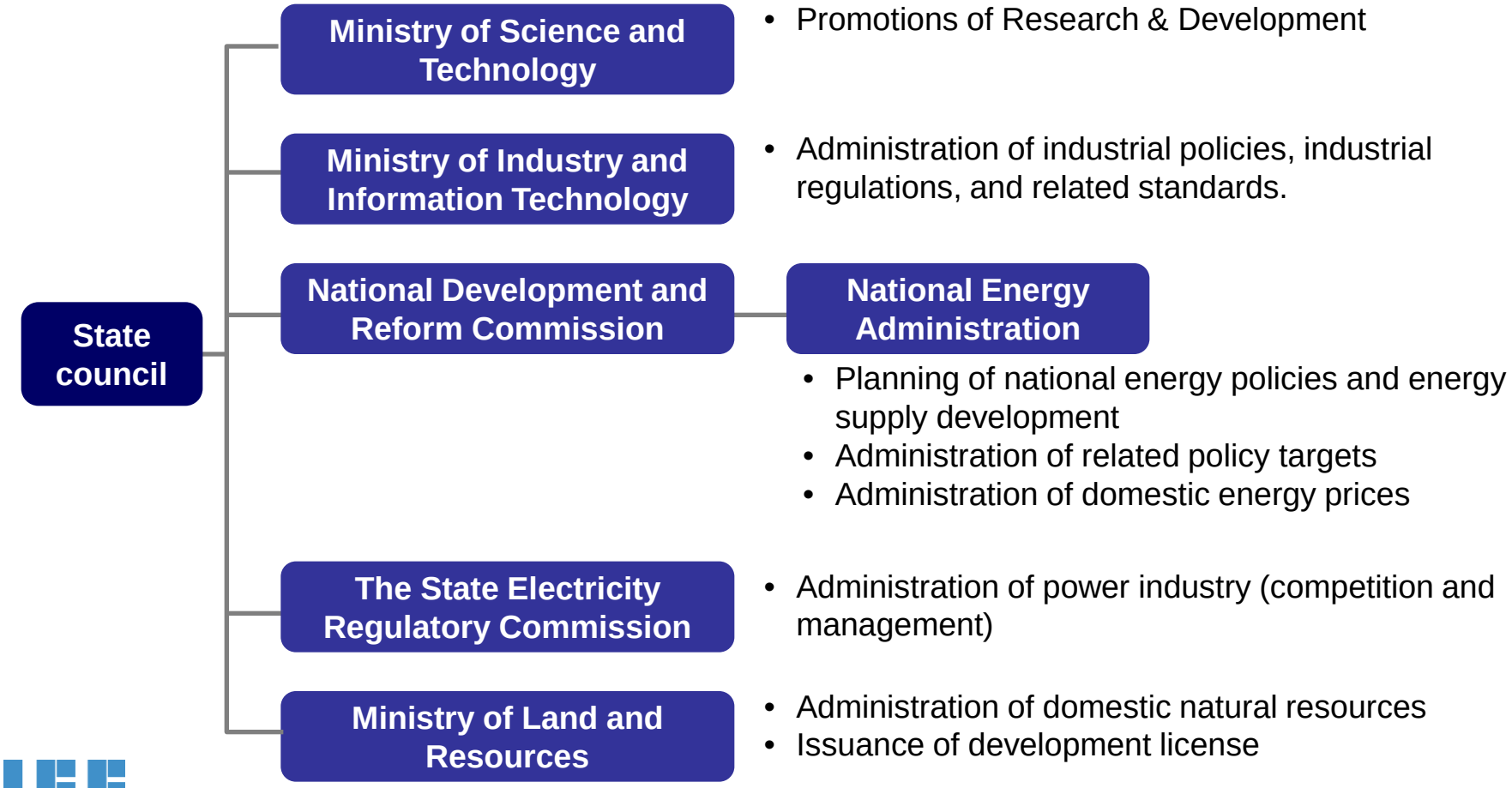
Coal intensity of major countries



Source: IEA

State institutions

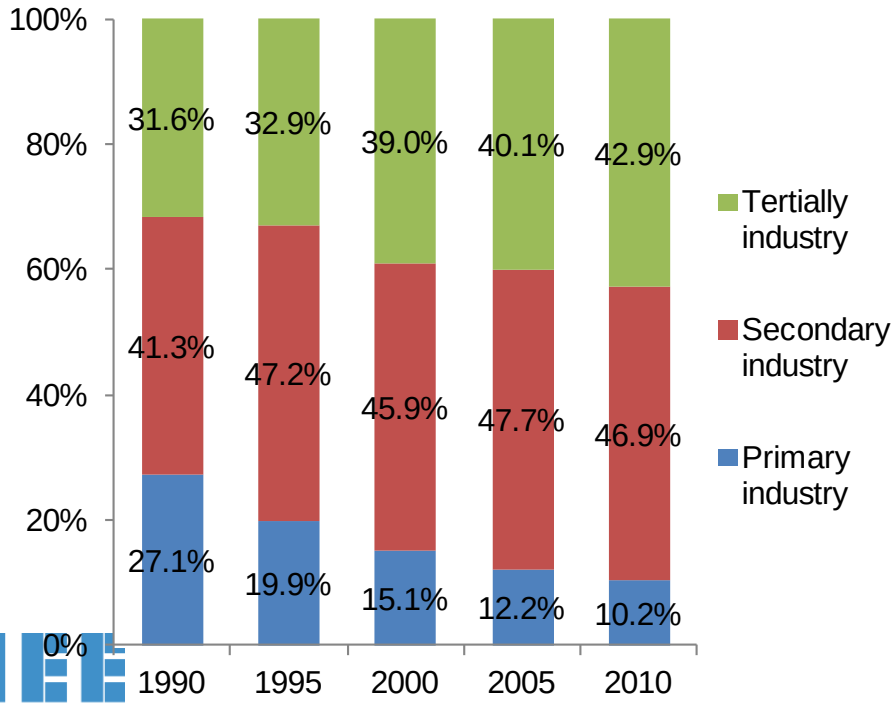
- Various institutions are involved in low carbon efforts in China.
- As the scope of low carbon policies expands, effective policy management is getting more important.



Need for industrial structural reform

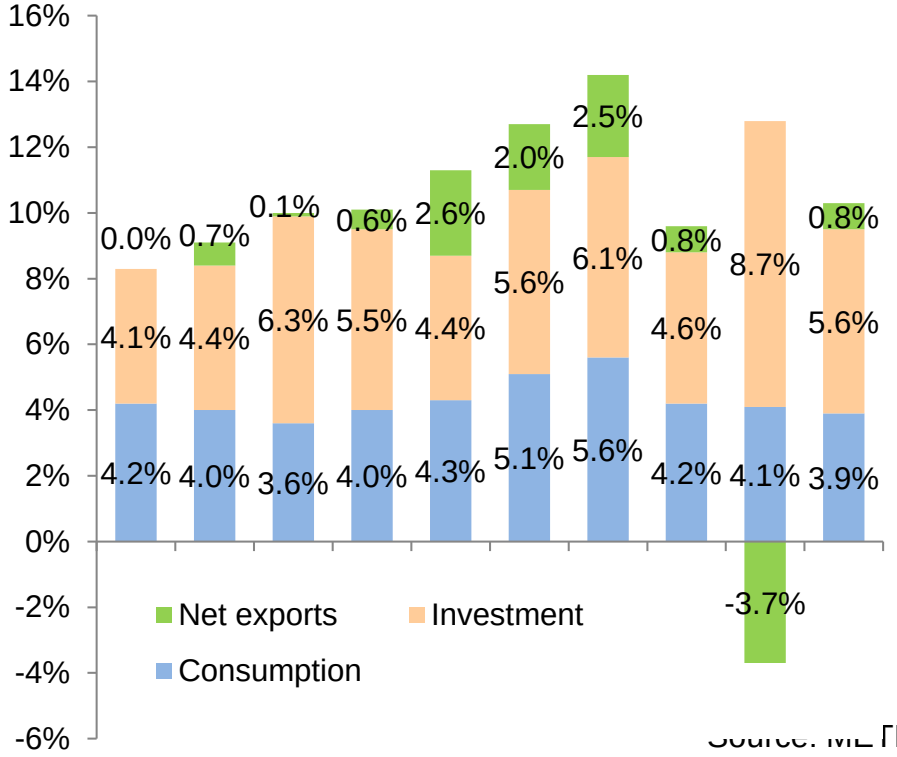
- Reform of the existing industrial structure is also required to drastically reduce carbon emissions.

China's industrial structure



Source: China NBS

GDP components



Source: METI

Conclusion

- China's low carbon actions are mainly pursued from energy security, public health, and industrial policy perspectives.
- Energy conservation and "gasification" are regarded as the two most effective items for China's low carbon actions.
- Reform of economic and industrial structure and effective policy management will be needed for the long-term and sustainable reduction of carbon emissions.