

# China Energy 2020

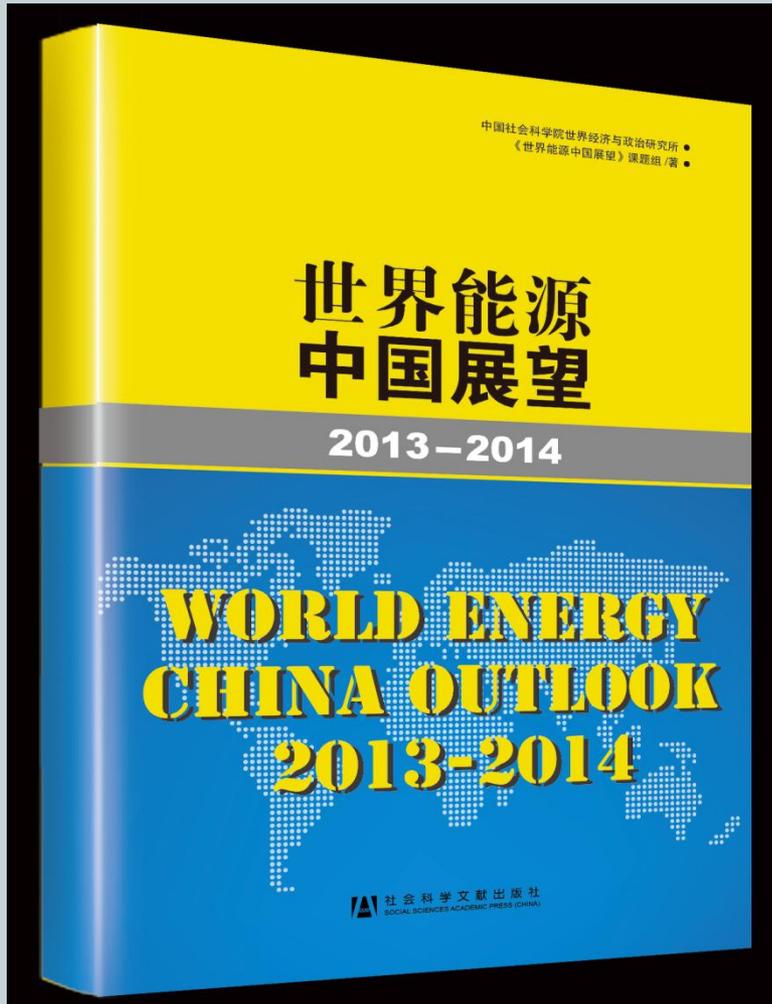
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**CHINESE ACADEMY OF SOCIAL SCIENCES**

# China vs. the World

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## Annual Interactive Energy Outlook

*2014-2015 Edition*

For Discussion

**IWEP Energy**

Chinese Academy of Social  
Sciences

# I. An Introduction

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- An interactive outlook
- Our central policy based scenario, similar to the IEA's New Policy Scenario, is Eco-friendly Energy Strategy (EES) employed to back up our analyses and outlook into 2030
- By definition, EES is intended to rethink and reposition ongoing energy strategy and policy with three aspects --
  - the EES serves to build up eco-energy system instead of economic growth as its eventual goal, energy strategy and policy are not merely serves the economic interests;
  - the EES respects ever enhanced requirements for human-being ranging from primary needs to advanced ones;
  - All of the above energy sources and their clean uses are identified as core of best practices and development patterns.

# Some Thoughts behind

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- Coal remains a dominant energy resource with great potential within Outlook period (2030 and even 2050). This is country's primary focus.
- Coal is dirty now but can be clean source. Near zero emission from IGCC or USC coal power facilities is tested, possible, and expanded for coal fired generation, indicating a fact that coal can be used wisely and be cleaner.
- Clean energy is set for “all of the above energy sources”. While an increasing non-fossil fuel use is proposed to optimize energy, cleaner fossil fuel/coal is policy focus.
- The year 2020 is critical for China to upgrade its energy intensive industry and the economy. There will be bigger changes thereafter in terms of technological application, energy efficiency and shifts of consumption mindset, behavior patterns and life style.
- Energy policy is serving the people's interests including economic growth, eco system and people's health.

# Assumptions

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	IEA's CPS	IWEP's EES
1. GDP \$ Industries	Global GDP growth rate 3.6% in 2011-2035 while China GDP 8.1% in 2011-2020, 5.7% in 5.7% in 2011-2035	<b>China GDP growth rate 7.5% in 2013, 7.2% in 2014-2015), 7.0% in 2016-2020; secondary sector 43% in 2015, 41% in 2020 and 35% in 2030.</b>
2. Population & Urbanization	Worldwide: 7-8.7 billion from 2012 to 2035 with annual growth rate at 0.9%	<b>China: 1.354 billion in 2012, projected to be 1.44 billion with annual growth rate 0.77%. 1.47 billion in 2030 with annual rate 0.21%; urbanization 55+% now and 65% in 2020 and 70% in 2030.</b>
3. Pricing & Subsidies	Oil: imported at \$113/bbl in 2020 and \$128/bbl in 2035. Gas price gap narrowed. Coal price remain lower than oil.	<b>Coal market is damping , gas price higher to coal, power price is too low to cover the renewables costs ; Subsidies are remains but rigid</b>

# Assumptions *continued*

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	IEA's CPS	IWEP's EES
4. Energy Conversion	Coal Conversion Ratio 38.27% in 2013	<b>Coal power Conversion Ratio 40% today, 42% in 2020 and 45% in 2030.</b>
5. CO2 Constraints	Global: CO2 emission will increase 34% by 2035 from 8% in 2012. If carbon marketing initiated in all sector, carbon price could \$30 per ton in 2035 from \$10/ton in 2020.	<b>In China, 45% carbon emission will be reduced in 2020 to 2005. Carbon tax could be better option than carbon marketing.</b>
6. Technology	Technology in use or under development will be cost effective in association of energy supply and demand	<b>Technology innovation potential is huge, esp. clean coal, production enhancement, energy efficiency and CCUS will be expanded wider after 2020. Therefore, carbon emissions are lower than those envisioned by the IEA.</b>

# 10 sets of technologies

	Global	China	Forward Looking
Clean Coal	Coal chemical and coal power integration	Clean coal tech spread around 2020, coal2gas under development	Cost reduction and water solutions to be explored
Unconventional Drilling	US, Poland, Australia, etc.	Development approach toward tight gas, CBM and shale. Unconventional rate will be upward to 67% in 2020	Comprehensive solutions dealing with uncertainties in geology, technology, infrastructure and regulations
Deep Water	Deep and ultra-deep water E&P activities and produce 200 Mt in 2020	Moving to deep water for production 50 Mt in 2020	Further openness and technology & equipment innovation
Renewable electricity	Solar PV capacity grow at 42% while wind capacity grow at 27%	Solar and wind power sector are under restructuring for higher increases	Cost effectiveness and policy supports are required.
Nuclear	Nuclear plants are under review and re-start. 15-20 nuclear plants could be restored, Nuclear power could account for 15%.	Currently, 21 nuclear plants under operations, 28 more plants are planned. 50 GW in 2020	Benchmarking pricing and safety & security, plus public awareness
CCUS	13 large CCS pilot projects are under operation or construction	CCUS (2+9) is listed into its 5-year energy Hi-tech planning	Enhance financing and policy supports, increase pilot projects
Bio energy	Enhance policy supports and further investment dealing with over investments	Promoting bio energy diversification (fuel, power, gas) fitting local requirements	Provide policy incentives to build up confidence and promote R&D while promote international cooperation
HEV/EV	HEV/EV sale increase sharply for better future	Working on HEV technical routes and standards and promote in major cities in 2015	Further reduce battery costs, plus logistics.
Energy Efficiency	Majority of consumers released incentive and policy	Efficiency is developed in details	Diminishing obstacles
Energy Saving Environmental protection		Release further development energy saving and environmental protection proposals in August 2013	Take energy saving as a new life style by launching “new energy, new life” campaign

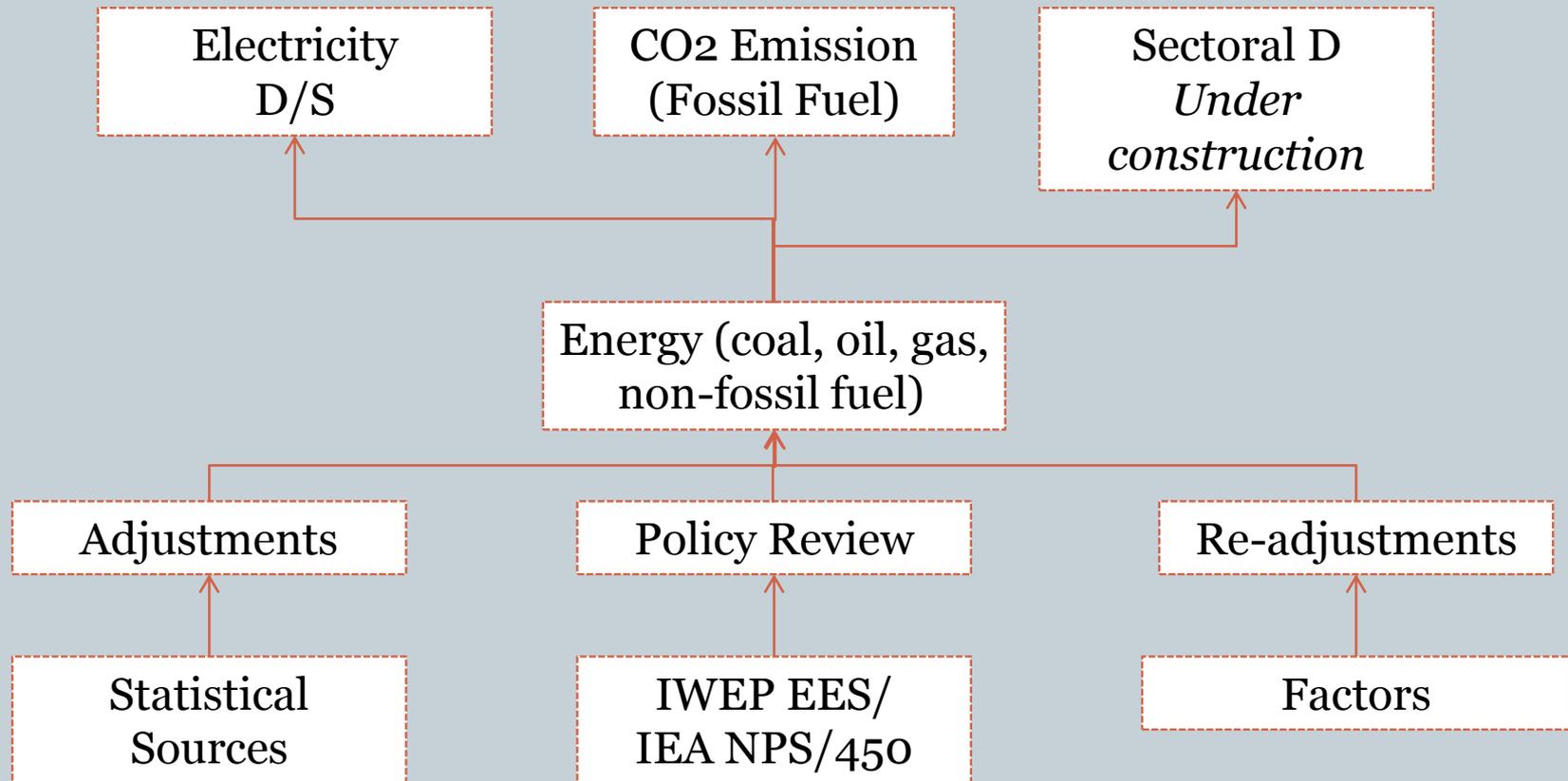
# Factored in Policies and Relatives

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#	Dates	Authority	Documents/conference	Types
1	13-1-1	State Council	Five Year Plan for the Energy Industry	Central
2	13-7-1	State Council	Policy Briefing on Solar Sector Development	Central
3	13-8-2	State Council	Policy on Energy Saving and Environmental Protection Industrial Development	Central
4	13-9-1	State Council	Plan for Actions against Atmospheric Pollution	Central
5	13-9-1	Ministry of Environmental Protection, NDRC, MOII, MOF, NEA	Implementation Details for Actions against Atmospheric Pollution in Beijing-Tianjin-Hebei and neighboring regions	Inter-provincial
6	13-9-2	Hebei Province	Implementation Plan for Actions against Atmospheric Pollution in Hebei	Provincial
7	14-1-1	National Energy Administration	National Energy Conference 2014 – Policy Briefing	Sectoral
8	14-3-1	NDRC, NEA, MOEP	Working Plan against Atmospheric Pollution in Energy Sector	Central
9	14-4-1	State Council	An Establishments of Effective Mechanisms to Enhance Natural Gas Supply – Policy Briefing	Central
10	14-4-1	National Energy Commission	The 2 <sup>nd</sup> National Energy Commission Conference Report	Central
11	14-5-1	State Council	Low Carbon Plan for Actions toward Energy Saving and Reduction of Emission in 2014-2015	Central
12	14-6-1	Central Financial Steering Committee	The 6 <sup>th</sup> Central Financial and Economic Steering Group Conference	Central

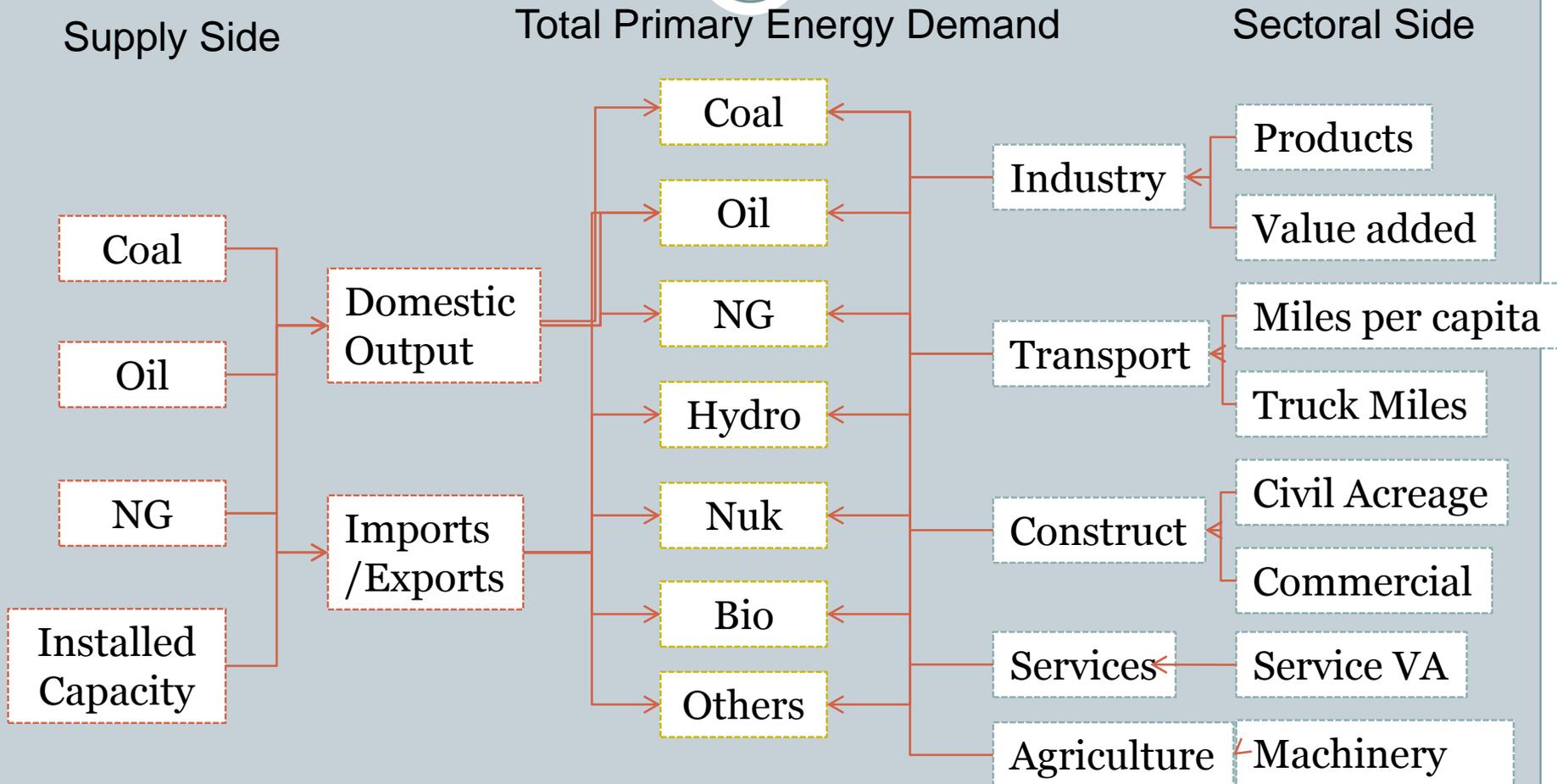
# Outlook Database (1)

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# Outlook Database (2)

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# Outlook Database (3)

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## Energy D/S

- **Demand** : Amount, subsector, growth, mix
- **Supply** : Amount, subsector, growth, mix
- **Storage**
- **Net Import**
- **Elasticity**

## Electricity

- **Installed Capacity** : Amount, subsector, growth, mix
- **Use** : Amount, subsector, growth, mix, average use of hours
- **Elasticity**

## CO2

- **Fossil Fuels** : Amount, subsector, growth, mix, emission parameters
- **Non-Fossil Fuels**
- **Carbon density**

## Sectors

- **Industry, transport, construction, services, agriculture** (*under construction*)

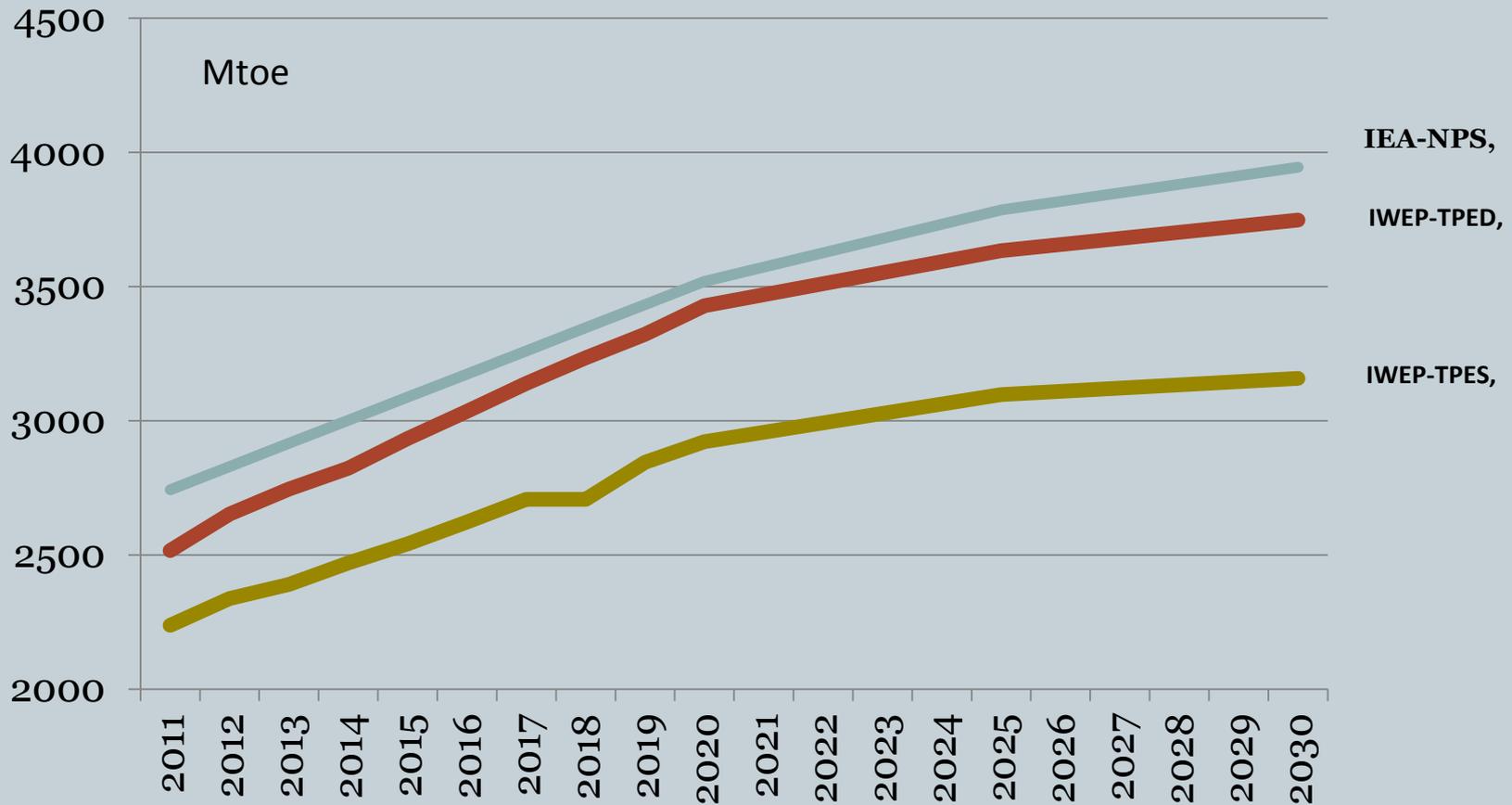
# II. Some Findings

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- Energy D/S Outlook 2020
- Electricity Use
- Energy Mix
- CO<sub>2</sub> Emission – fossil fuels
- Coal Use Efficiency
- Gas Mix and Foreign Dependency
- Energy Efficiency
- Policy Options: Capacity and Coal Use Reduction

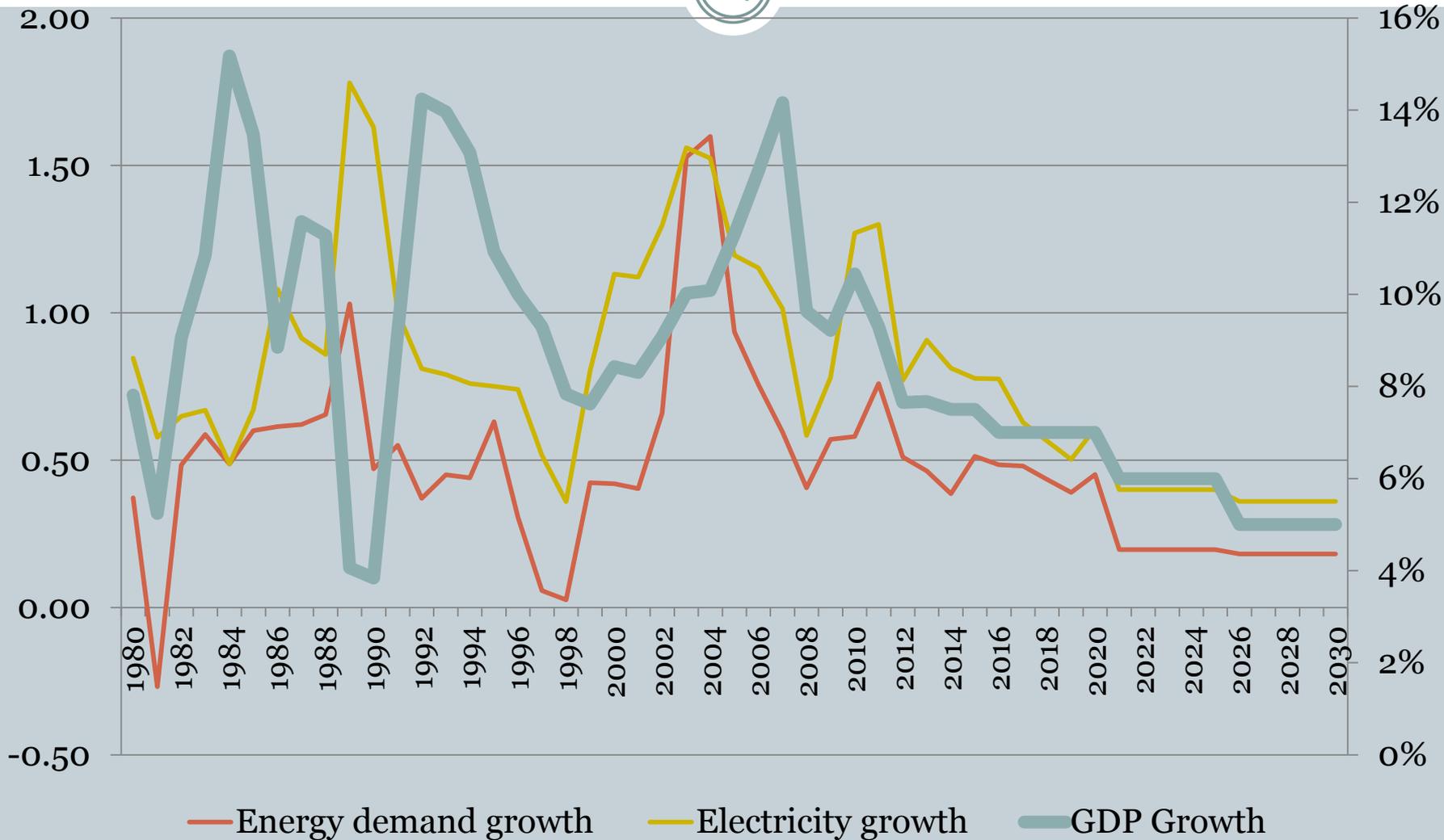
# China Energy Demand Outlook 2011-2020

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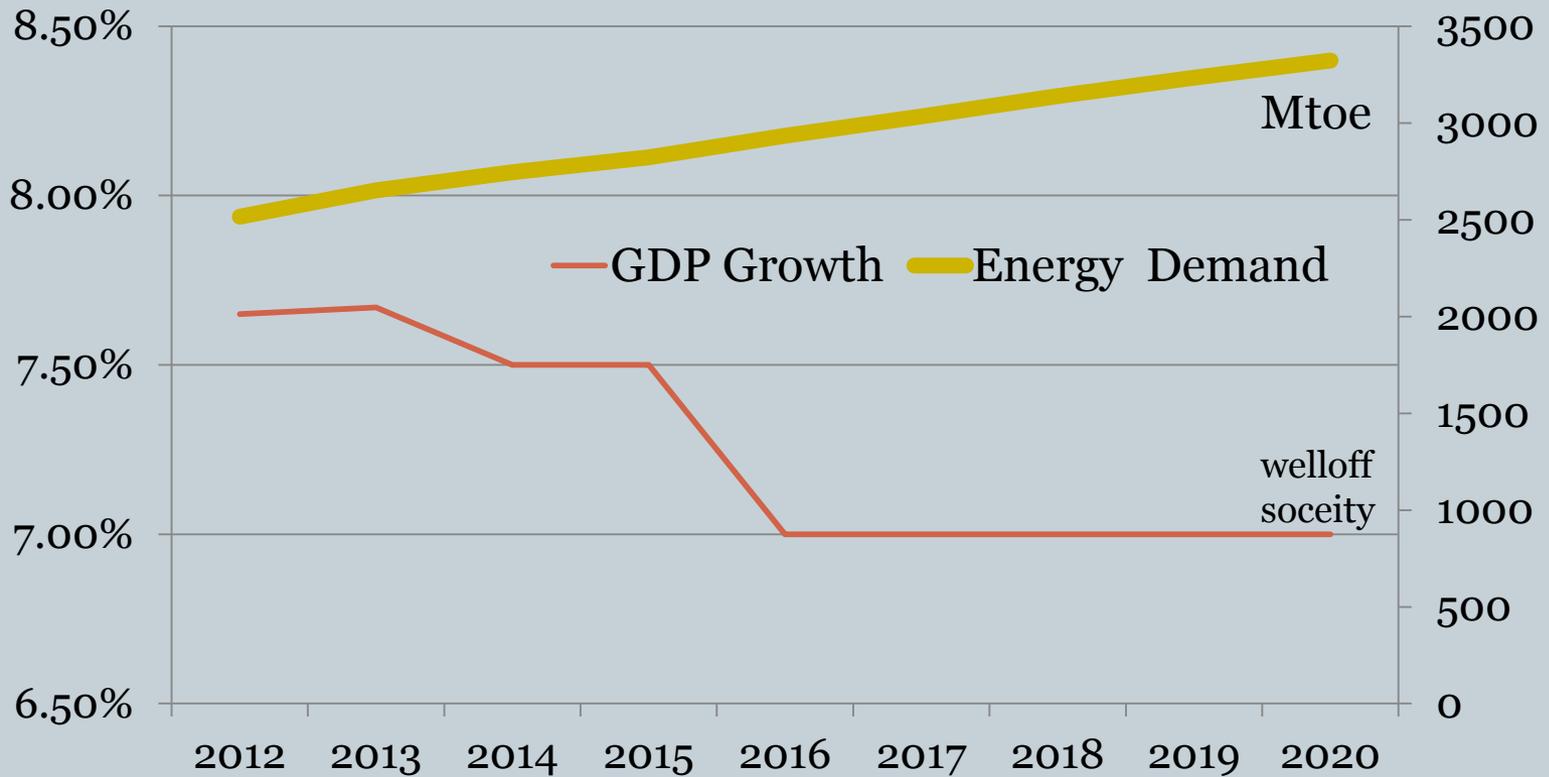
# Energy Elasticity

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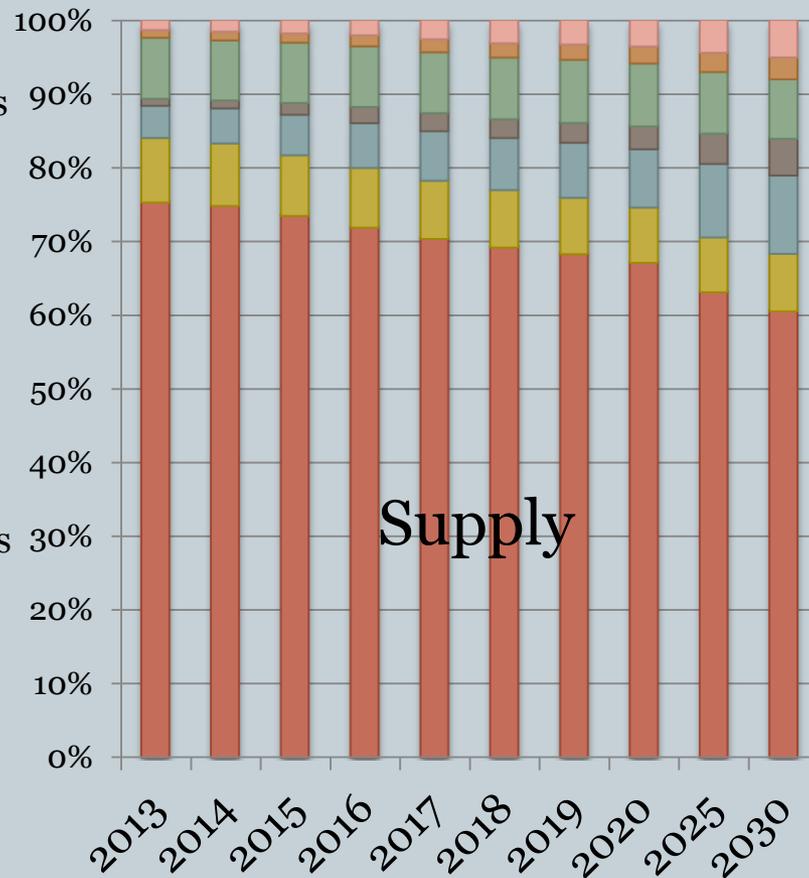
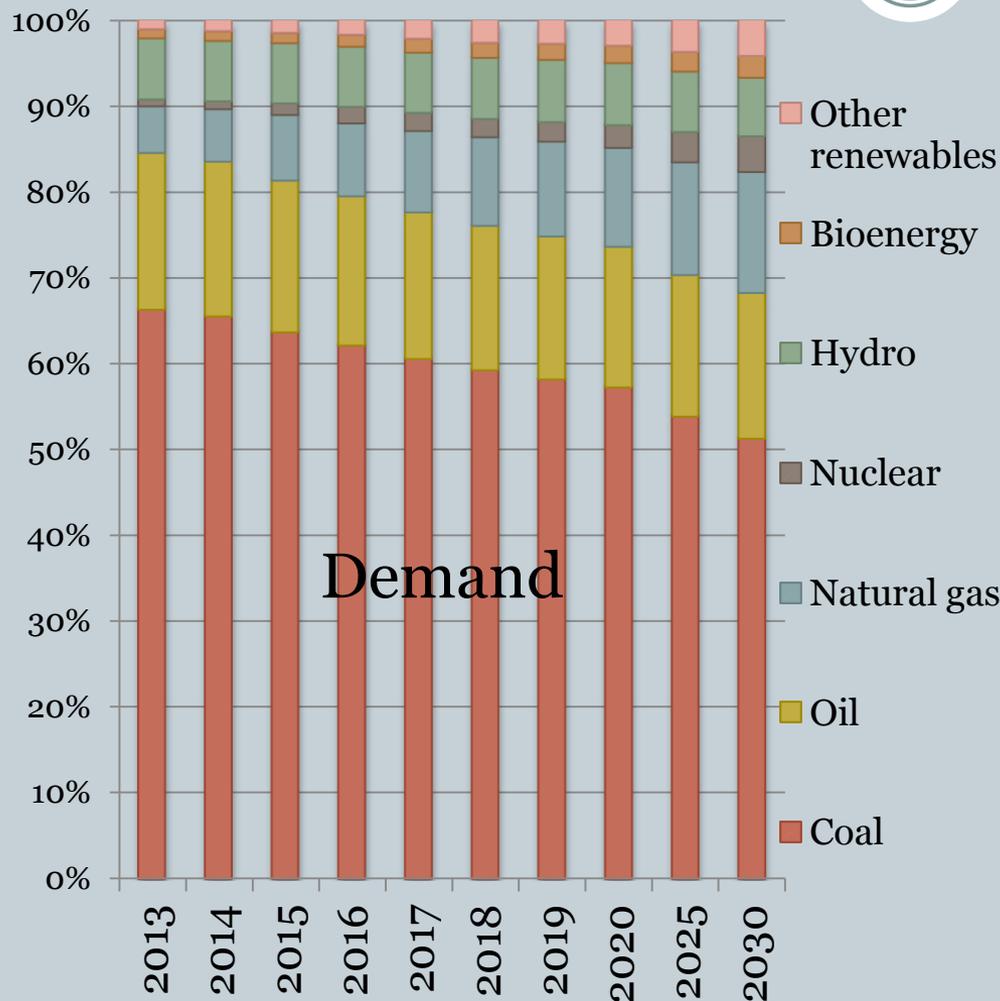
# GDP and Energy Demand

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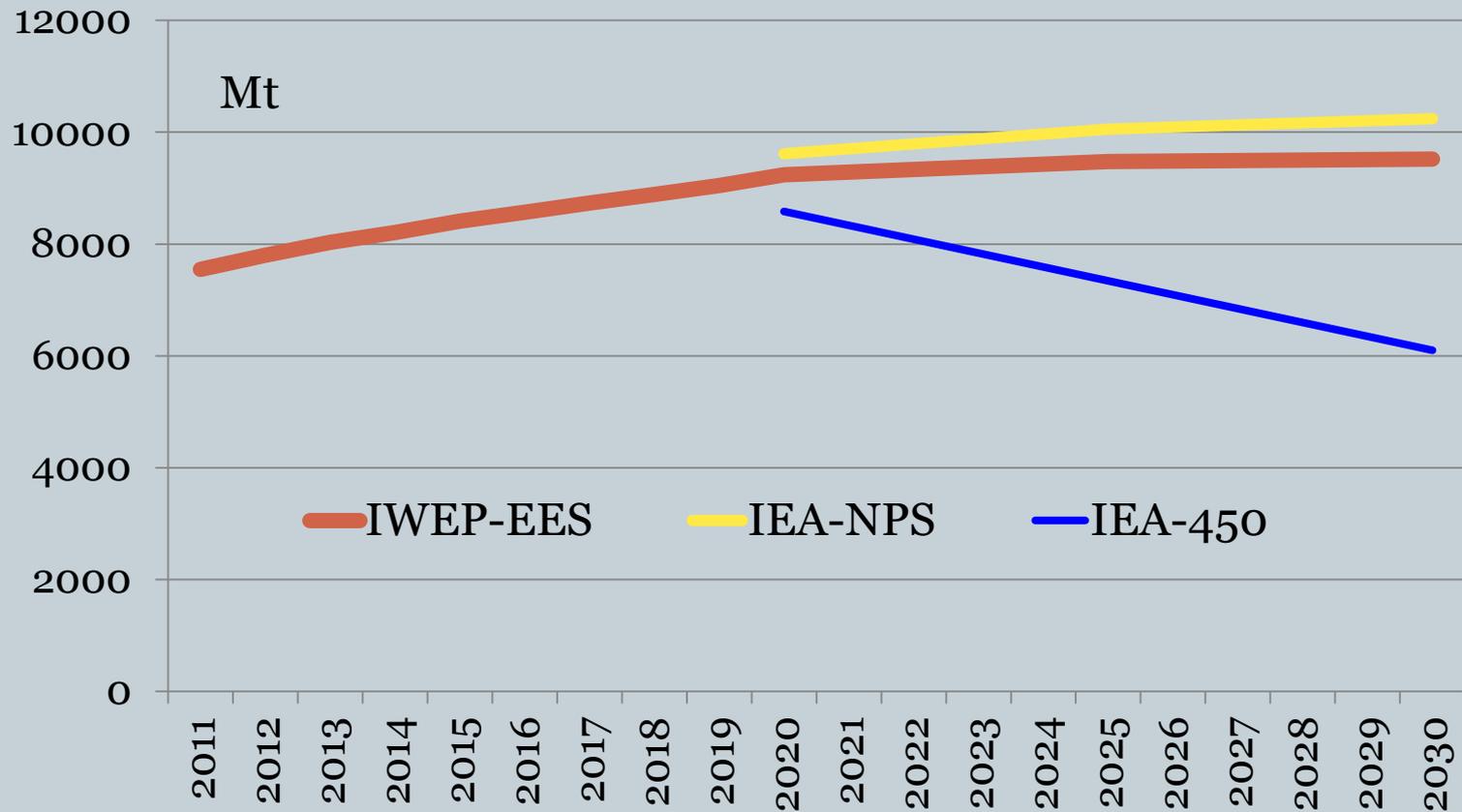
# Energy Mix – Demand vs. Supply

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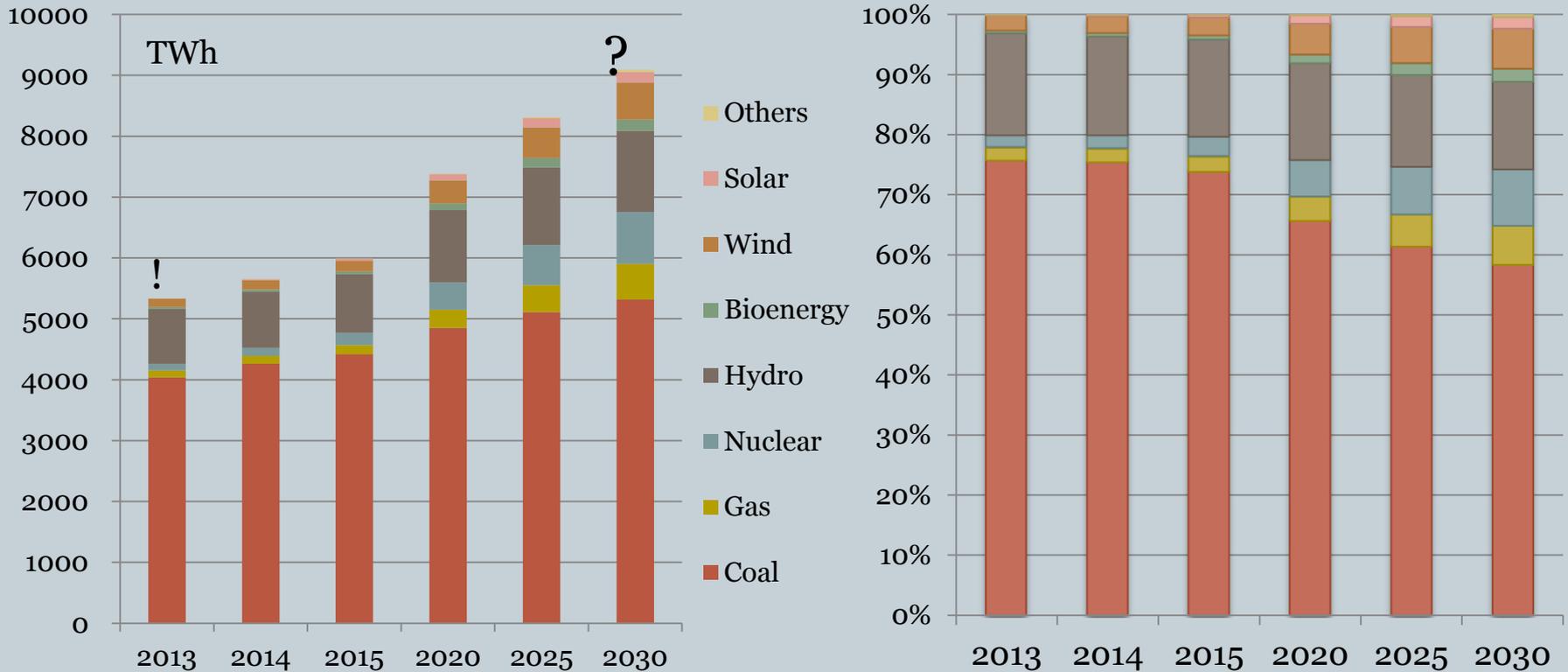
# CO<sub>2</sub> Emission – Fossil Fuel

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# Electricity Use

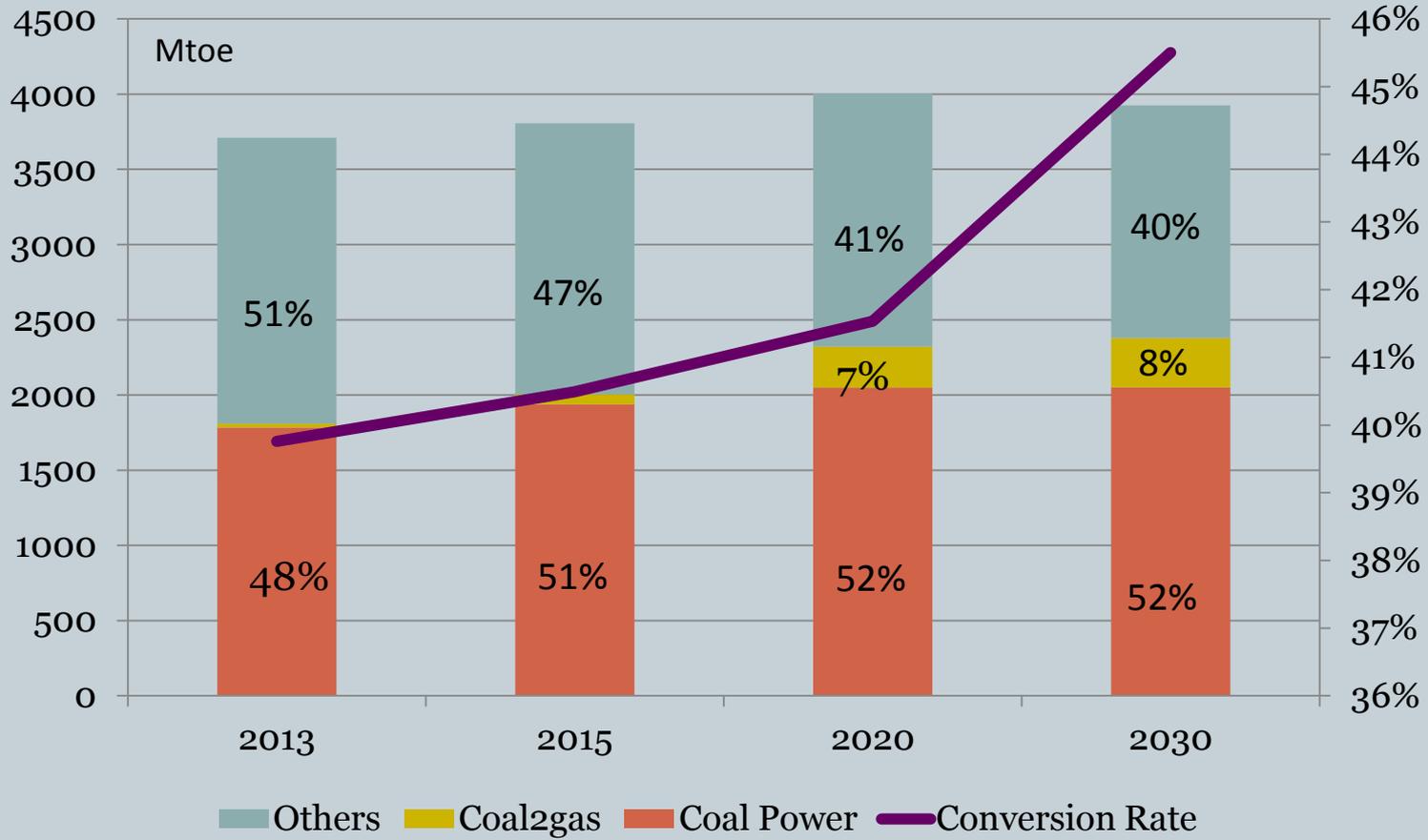
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- Reduction of emission from thermal power/coal-fired generation is targeted according to national restrictions on thermal power atmospheric pollutions (GB13223-2011: 5mg/m<sup>3</sup> for Dust, 35mg/m<sup>3</sup> for SO<sub>2</sub>, 50mg/m<sup>3</sup> for NO<sub>x</sub>)
- Near-zero emission (Clean Coal Power) for newly built coal power plants as reported by Shenhua Group by 07/2014

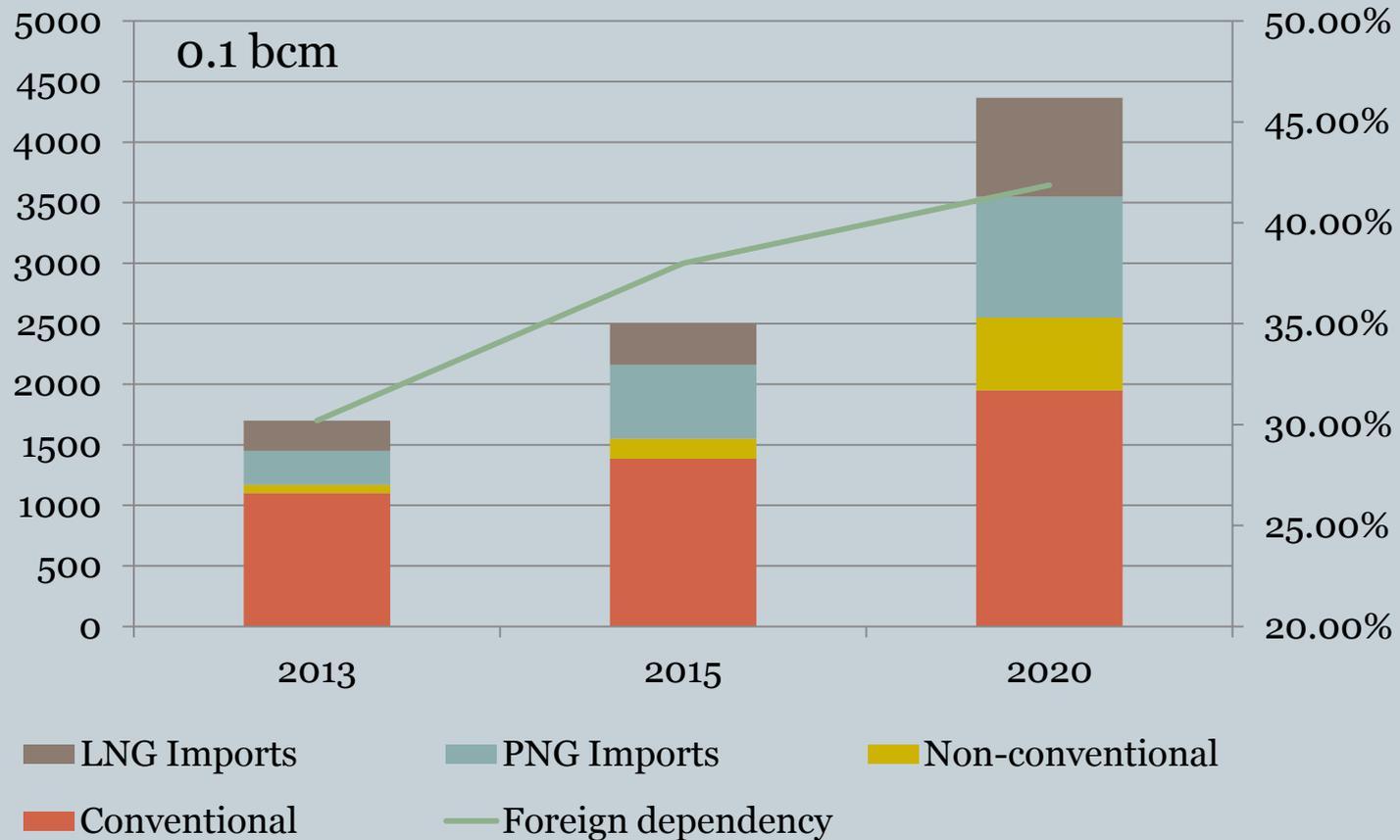
# Clean Coal vs. Use Efficiency

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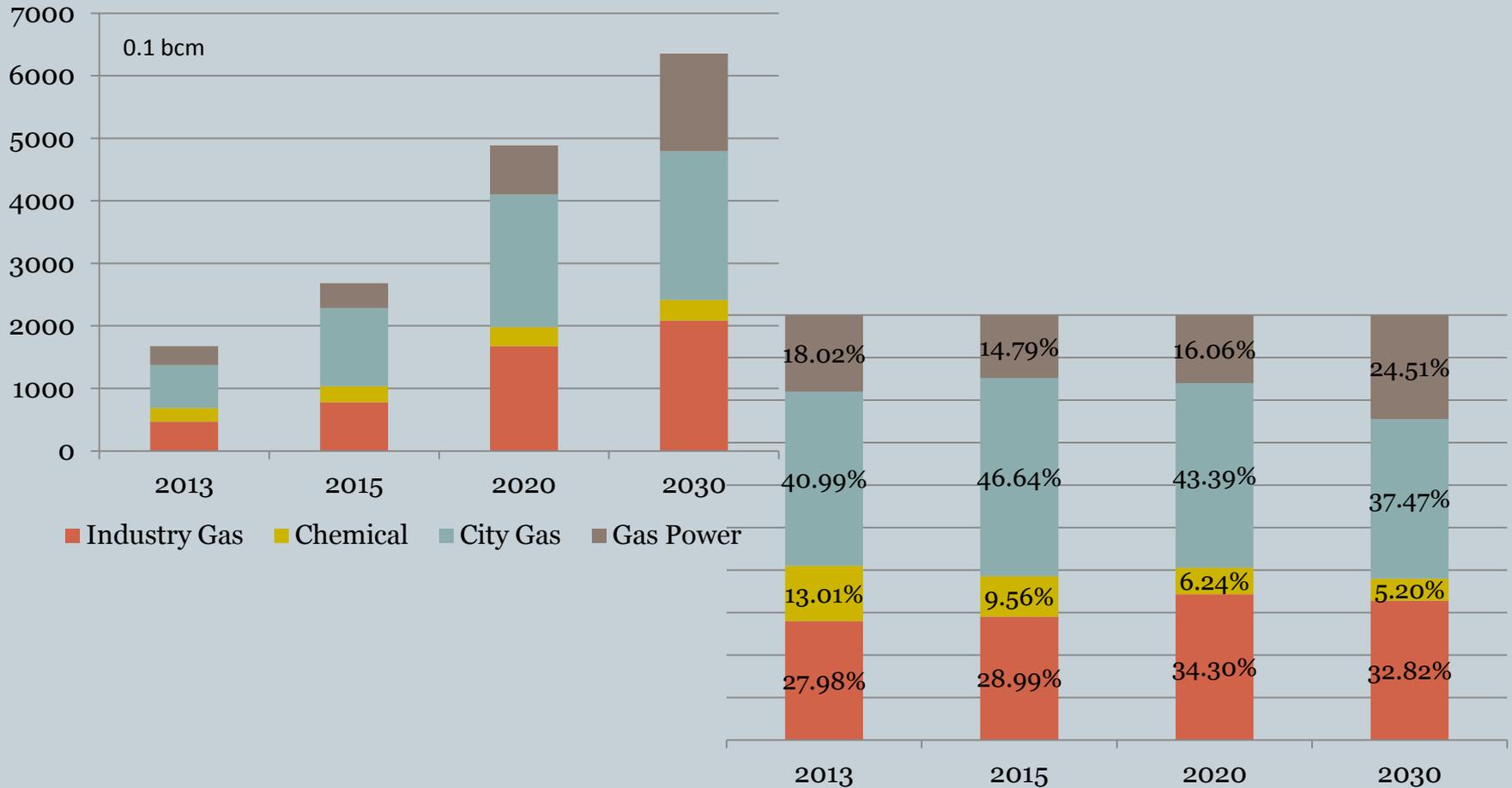
# Golden Age of Gas in China

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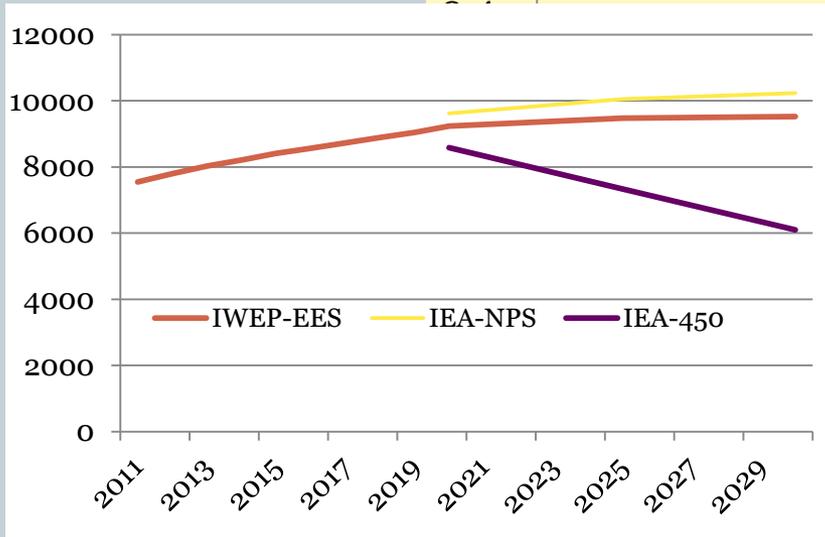
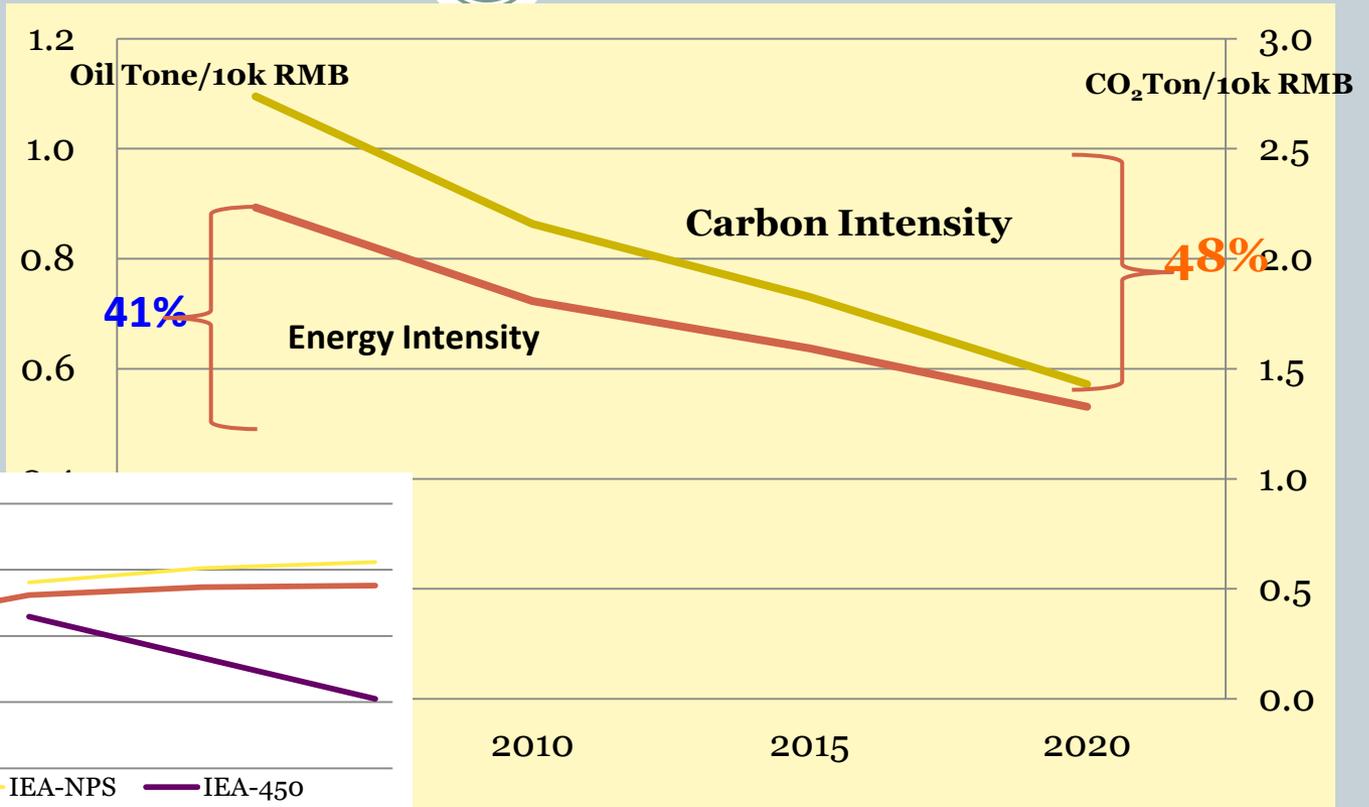
# Gas Consumption

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# Energy and Carbon Intensity

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# III. Conclusions

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- China energy demand is reviewed at slower growth (at 2.06%) to 2020 than last year, while energy supply will keep pace up, accordingly. But the gap between the two remains large.
- CO<sub>2</sub> emission will continue to grow but level off a bit than expected.
- Electricity consumption is growing with some uncertainties. Coal, as a quality source of power generation, is expected to be main source but debate remains at present and subject to clean coal technology innovation and policy incentives into the future.
- City gas and industrial fuel will be main sectors of natural gas usage in China while gas fired generation remains at lower level.

# III. Conclusions

- Growing energy trends mirror its nature, issues and the future, which could be either a fortune or nightmare, depending on its policy and development patterns.
- Our outlook, based on our best understanding of existing policies and relatives, indicates a possibly sustainable prospects that would have greater repercussions on the entire world.
- There are a series of policy options. For instance, reduction of coal use by certain sector and percentage is a policy option. However, both clean coal and efficiency are central solutions and key to optimize its energy mix, comparing with gas, nuclear, renewables. Currently, renewables is subject to cost reduction, business models and utilization.
- The 13<sup>th</sup> Five Year Plan (2016-2020) will be a critical to Chinese expected Energy Revolutions (in production, consumptions, technology and management system), which could come with further economic reforms including industrial restructuring, efficiency enhancement, plus police incentives.
- With our existing GDP growth inertia, we will build our expected well-off society in 2020. However, seriously polluted well-off is NOT acceptable. We have laid out a set of requirements, expectations and options for all stakeholders to react at home and globally, accordingly, smartly and sustainably.

# Xiaojie Xu

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- Xiaojie Xu, the Chief Fellow of the annual World Energy China Outlook and heads up the World Energy Division (since April 2009) at Institute of World Economics and Politics, Chinese Academy of Social Sciences in Beijing; a Member of the World Economic Forum's Global Agenda Council on Energy Security, an Editorial Board member of the Journal of World Energy Law and Business, a senior advisor to China Energy Fund, a standing member of petroleum economics sub-committee of China Petroleum Society; Previously, had worked at China National Petroleum Corporation (CNPC, 1983-2009) and was the Director of Institute of Overseas Investment Research, CNPC (2000-2009), has been advising the National Energy Administration on oil and gas policy and international energy policy, and CNPC, CNOOC and some other state owned energy companies on global expansion specializing in geopolitical, economical, commercial, regulatory, and contractual review, business development and risk management; is the author of Petro-Dragon's Rise, what it means for China and the World (English, European Press, 2002) and Energy Black Swan: Global Games for Hydrocarbon Resources and Chinese Options (in Chinese, 2011) along with numerous writing and speeches on energy investment, corporate strategy and governance, and geopolitics of energy in both Chinese and English. Graduated from Zhejiang University in 1983.