

# China's Energy Transition and Development Path



# 2019

Report series of China energy and petrochemical industry

**Zuoxian Luo**

March 20<sup>th</sup> 2019



# CONTENTS



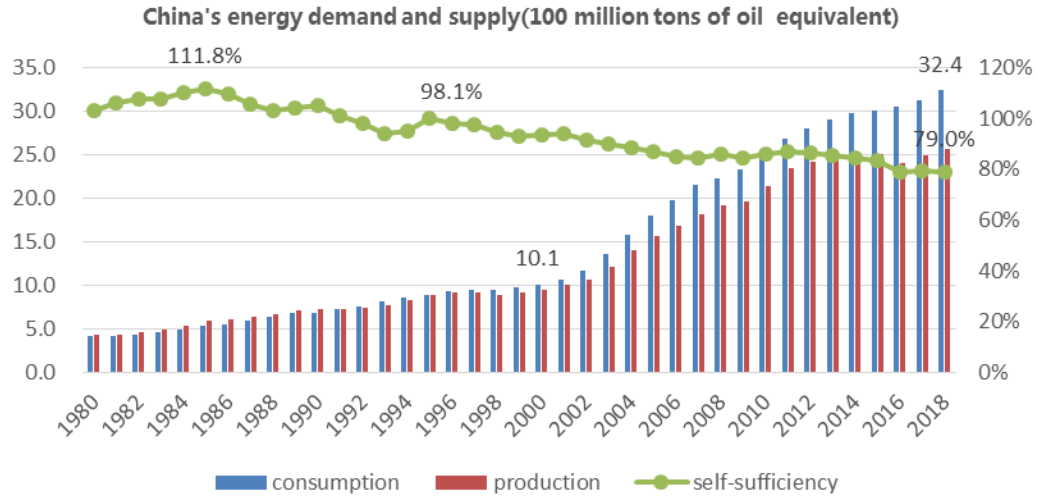
1. **Evolution of China's Energy Supply and Demand Structure**
2. **Coal Demand and Development Trend**
3. **Oil Demand and Development Trend**
4. **Gas Demand and Development Trend**
5. **Non-fossil Energy Demand and Development Trend**
6. **Future Energy Demand and International Cooperation**



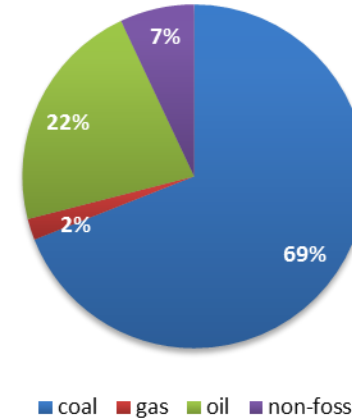
# 1 Evolution on China's Energy Supply and Demand

---

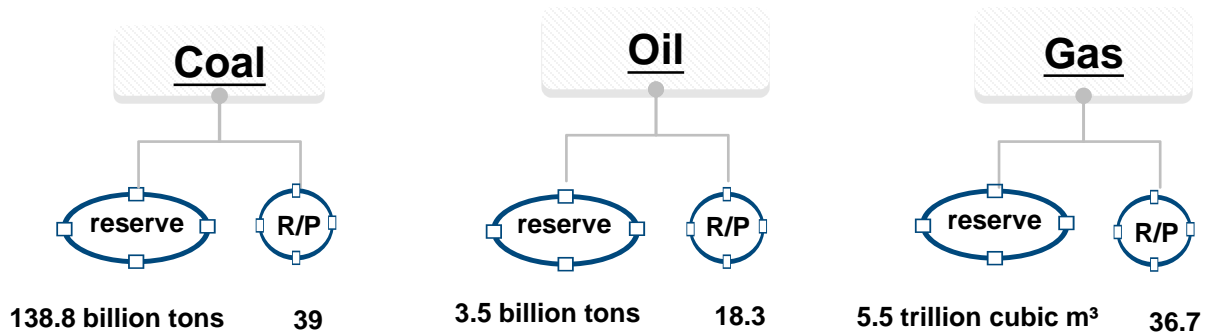
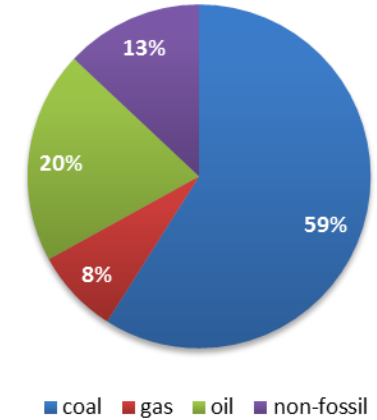
# Energy production and consumption have maintained growth and energy self-sufficiency has declined



Primary energy proportion,2000

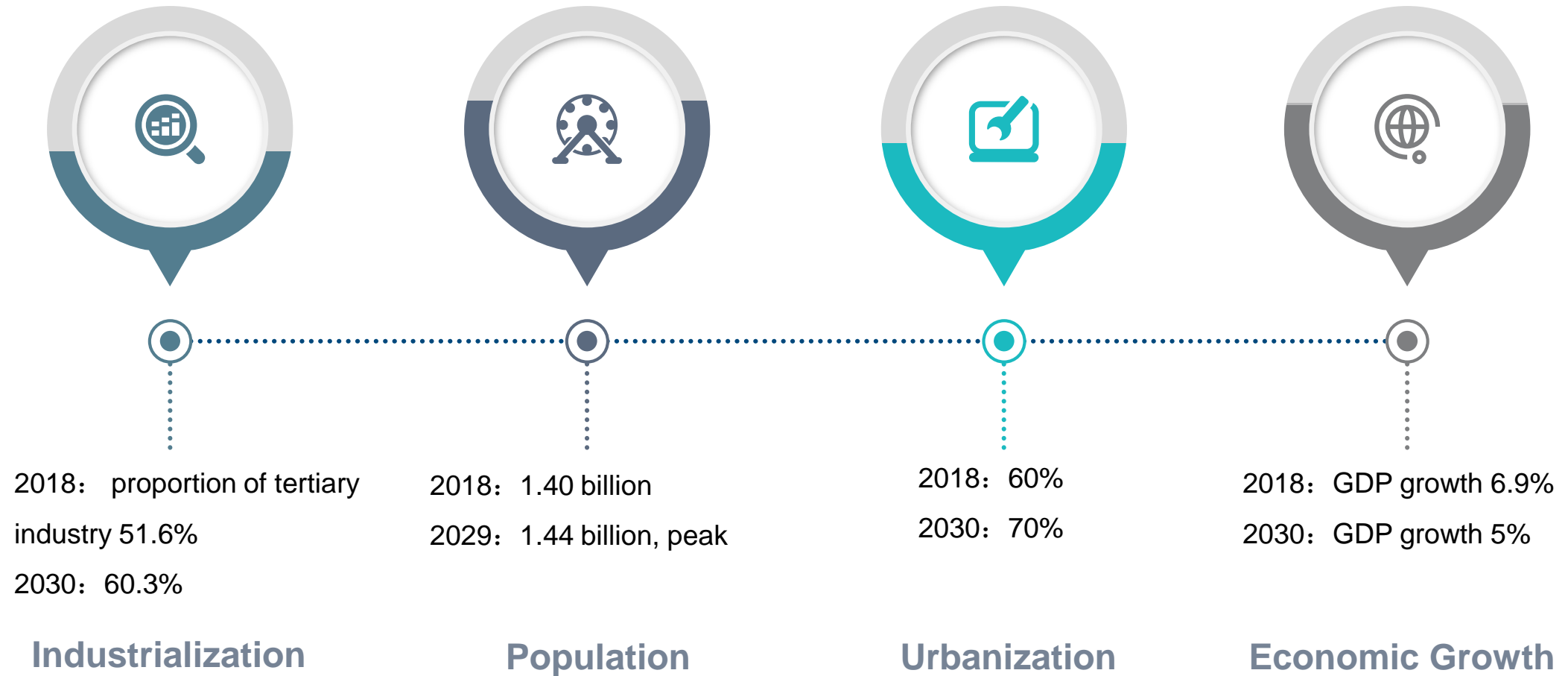


Primary energy proportion,2018



- Energy consumption grew; Supply stable;
- Self-sufficiency rate : **111.8% (1985) to 98.2% (1992), 93.7% (2000) and 79% (2018).**
- Domestic oil and gas production is stable.
- Growth of oil and gas consumption replaces coal.
- 2018, coal consumption dropped to **59%**, 10 % lower than in 2000.

## China Key economic development indexes estimated



# Targets for 2030 within the framework of China's energy revolution

**Total Energy Demand: 4.2billion toe**

**Greenhouse gas per unit of GDP: reduces 60%-65% than 2005**

**Terminal energy consumption : electricity increases to 30%**

## ○ Energy consumption revolution

2020/2030,energy demand : below 5/6 billion tce  
(3.5/4.2 billion toe).

## ○ Energy supply revolution

Added energy is mainly from clean energy

## ● International cooperation

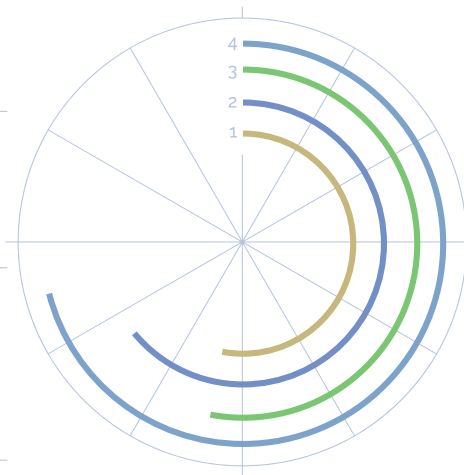
Overseas cooperation; one belt one road energy corridor

## ○ Technology revolution

Energy-saving technologies; smart energy technologies

## ○ Energy system revolution

- Effective and competitive energy market system;
- Market-oriented pricing mechanism;
- Energy legal system.



Oil **17.8%**  **2.2% VS 2018**

Gas **13%**  **7% VS 2018**

Coal **47%**  **9% VS 2018**

Non-fossil **24%**  **11% VS 2018**

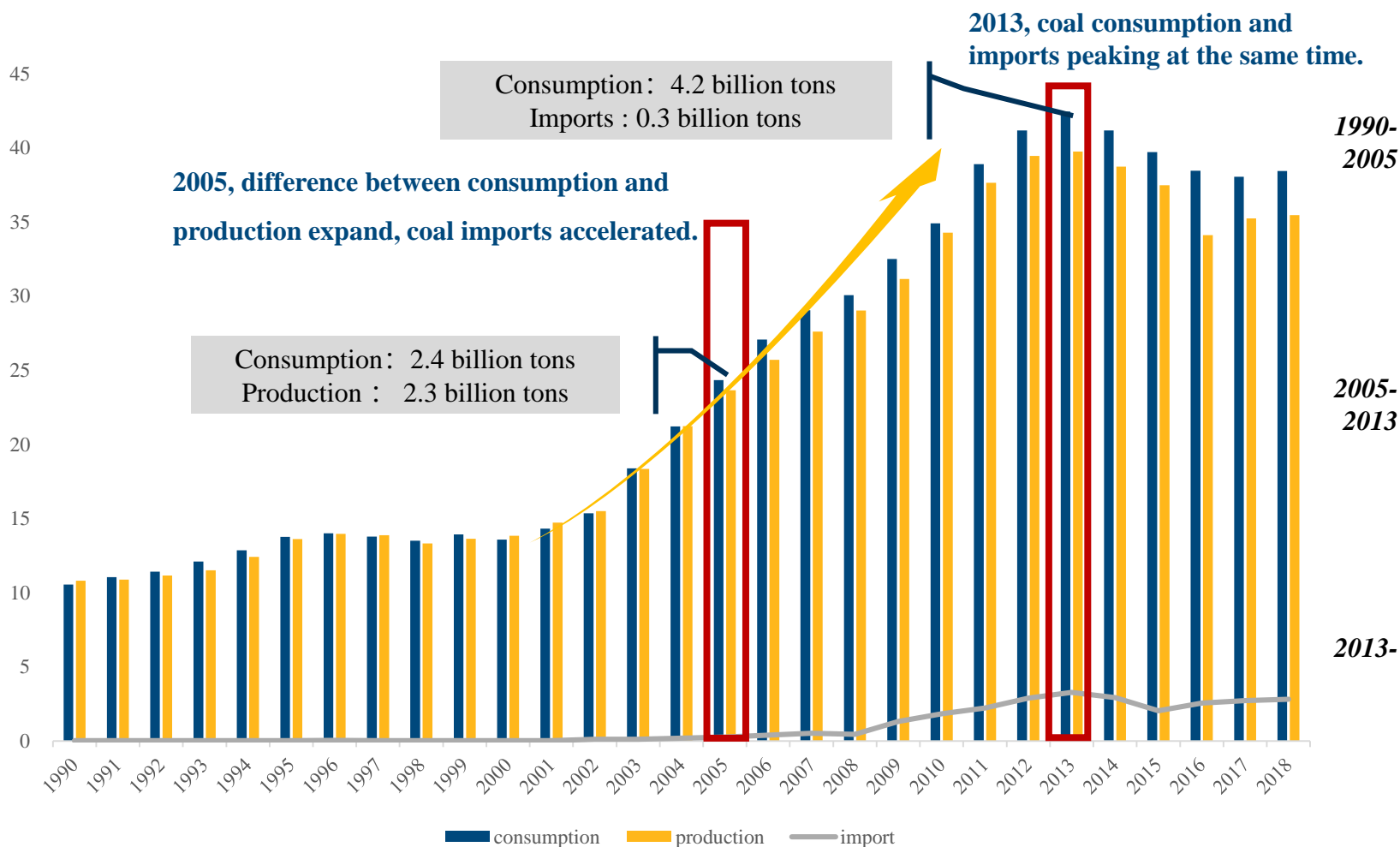


## 2 Coal Demand and Development Trend

---

## Coal consumption reached its peak on 2013

Coal consumption, production and imports (100 million tons)



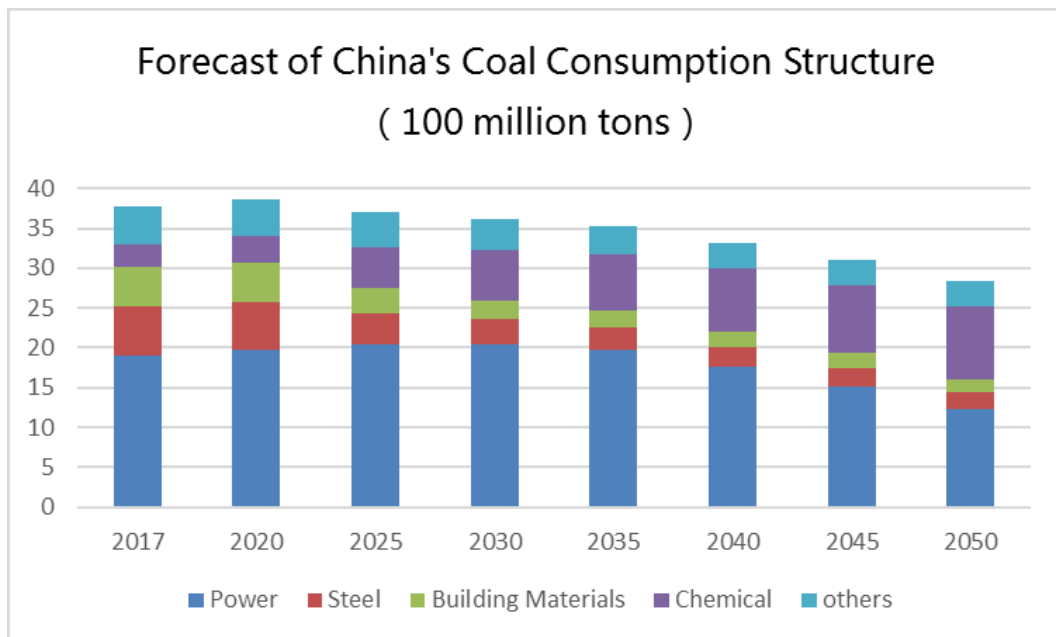
### Three stages of China's coal consumption since 1990

- 1990-2005**
  - Steady development;
  - Production exceeded consumption
  - Self-sufficiency
- 2005-2013**
  - Consumption increased
  - Imports increased
- 2013-**
  - Energy conservation
  - Emission reduction
  - Energy structure transition
  - Cutting the backward capacity
  - Encourage the import of high-quality coal

Since 2005, China's dependence ratio on foreign coal remained between **6%** and **7.5%**. The external dependence ratio of 2018 is **7.3%**.



## Coal demand will decline in the future.



### Power generation

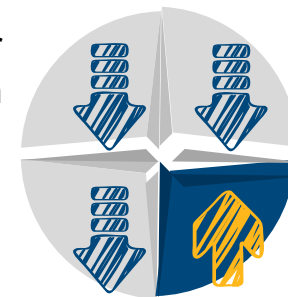
- ✓ progress in RE power storage technology and support system for grid
- ✓ 57% of total coal used for power in 2035 and 45% in 2050.

### Steel

- ✓ entering stable stage
- ✓ 10% of coal demand in steel in 2030, 7% in 2050.

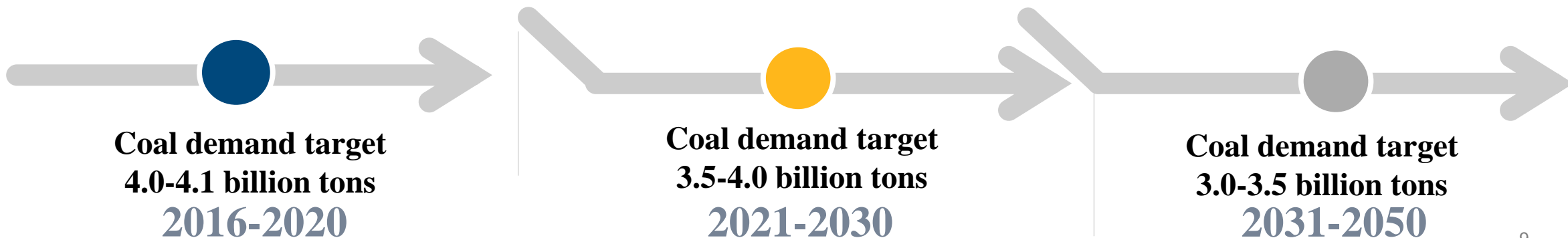
### Building materials:

- ✓ Slower development step.
- ✓ **13%** of coal used in 2017, and 6% in 2050.



### Chemicals

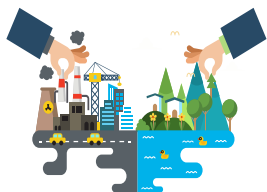
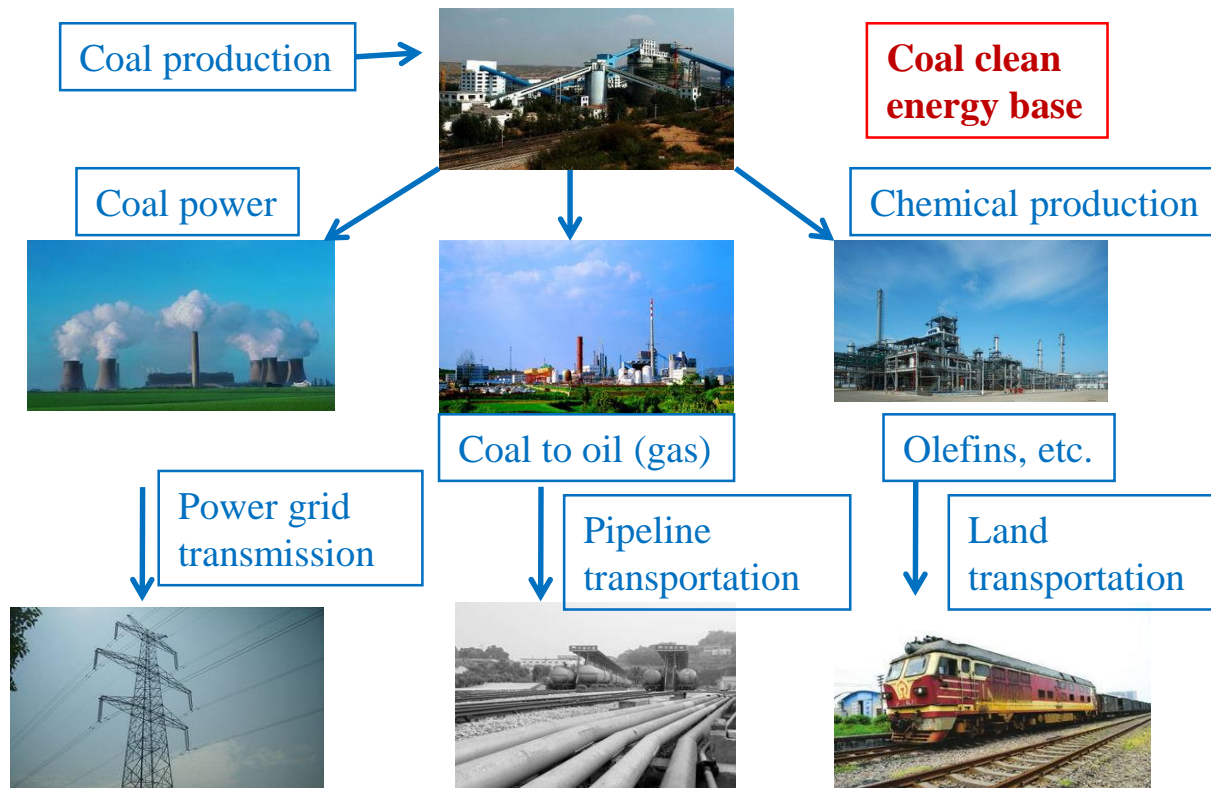
- ✓ Modern coal chemical industry develop
- ✓ Increase from **7%** in 2017 to **30%** in 2050.



## Optimization of coal industry is to mainly promote construction of integrated base

**Base construction:**  
coal production, chemical conversion,  
electricity, building materials integrated

**International cooperation in science and  
technology promote base construction**



Around 2020, the output of **14 large coal bases** will be **3.7 billion** tons, accounting for more than **95%** of the total coal production.

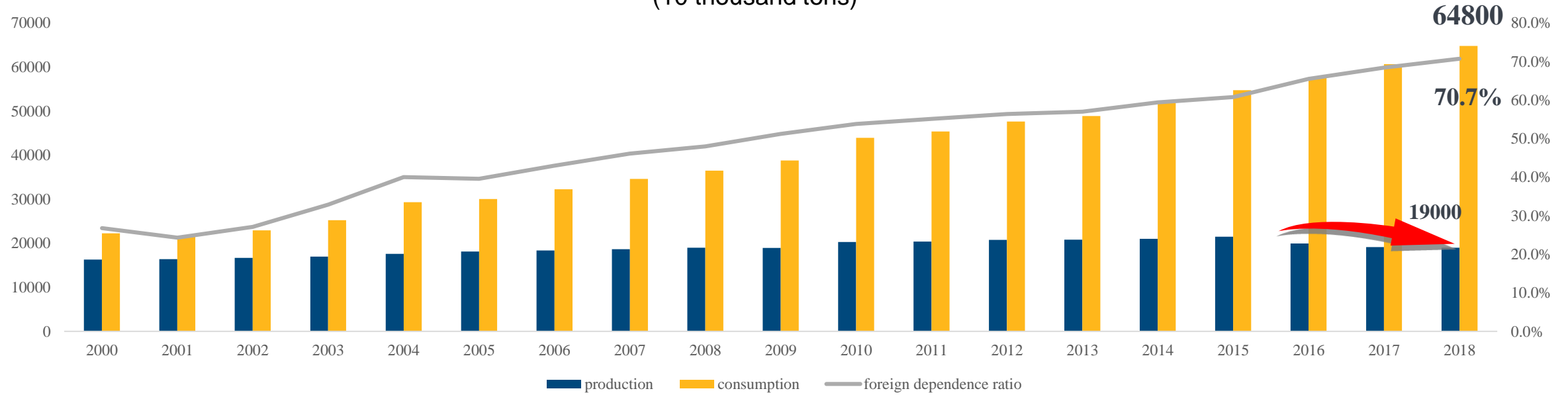


# 3 Oil Demand and Development Trend

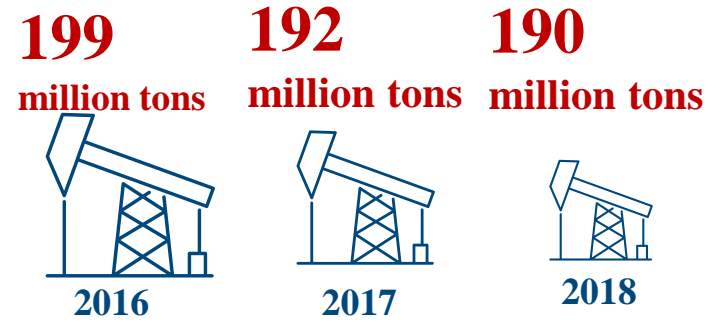
---

# Domestic production decrease and refining capacity increase led to external dependence ratio rise

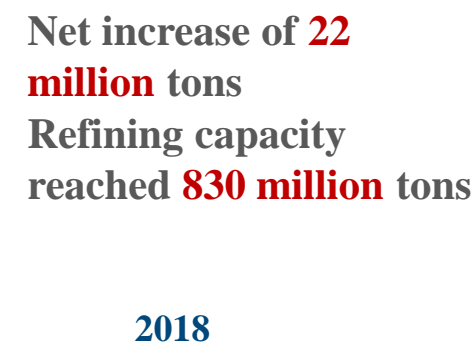
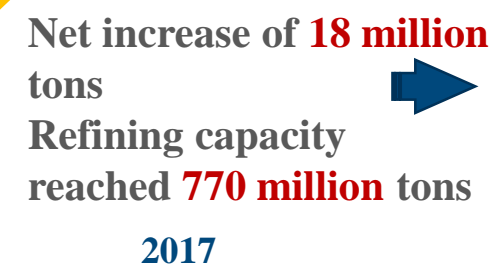
## China oil demand, supply and foreign dependence ratio (10 thousand tons)



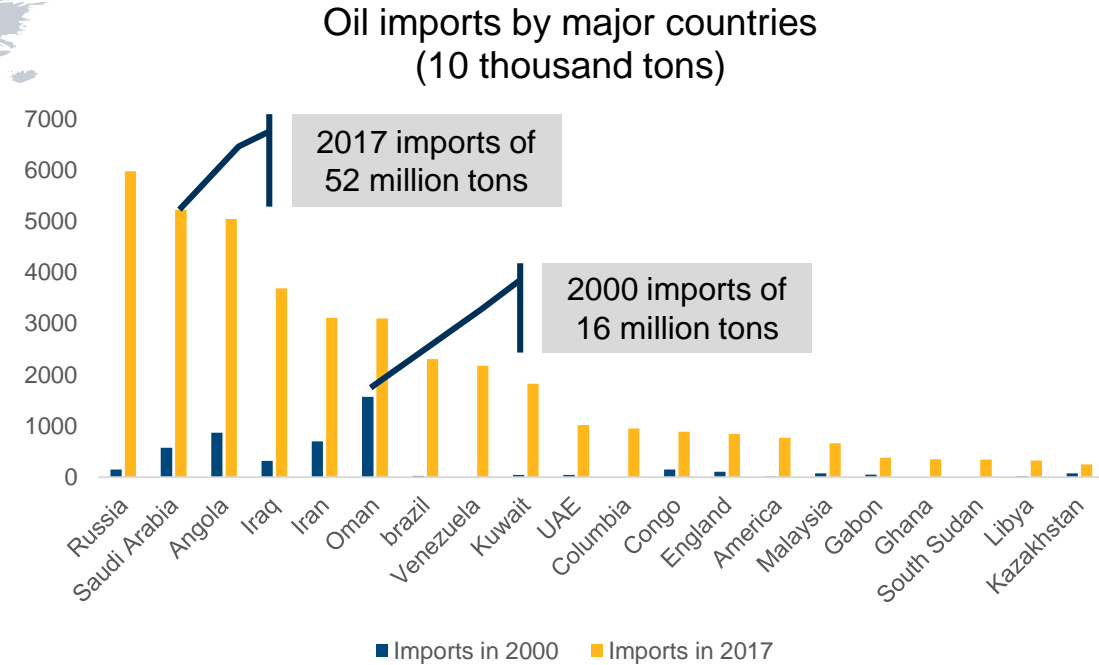
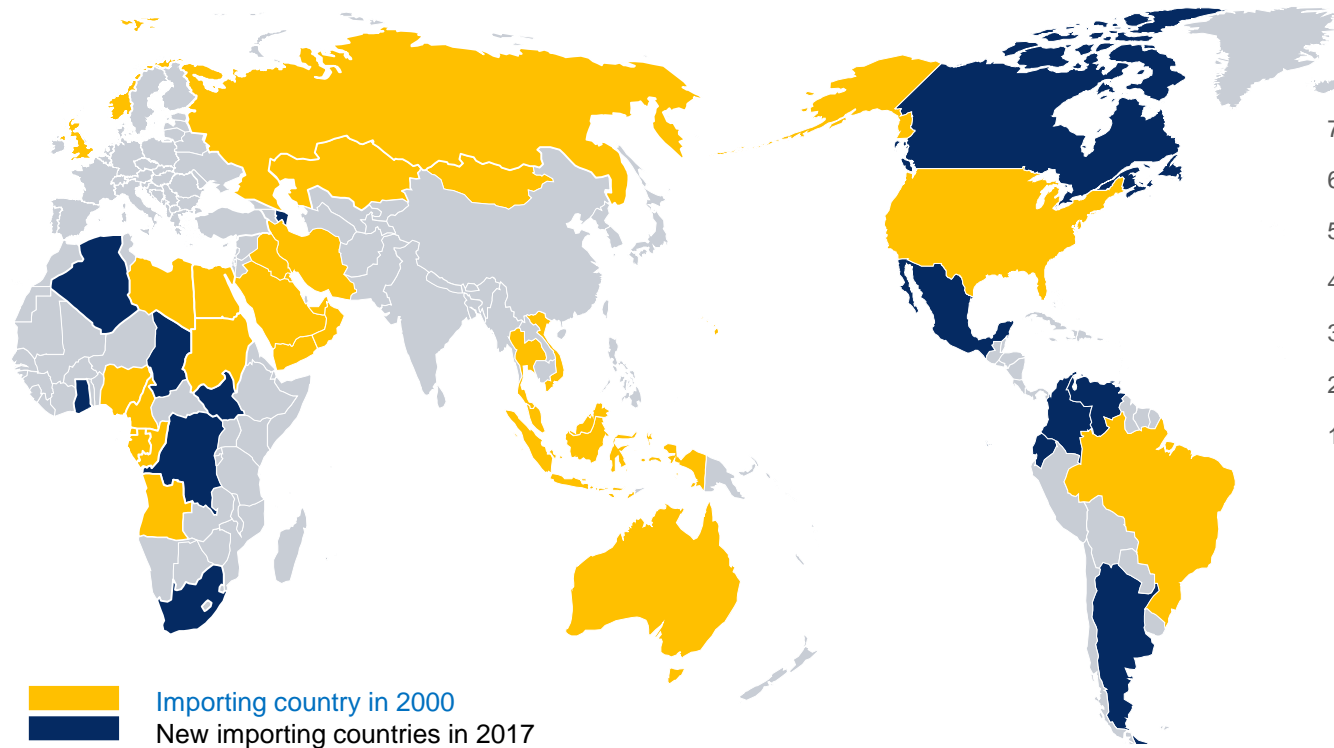
**Oil price down**



**Refining capacity growth**



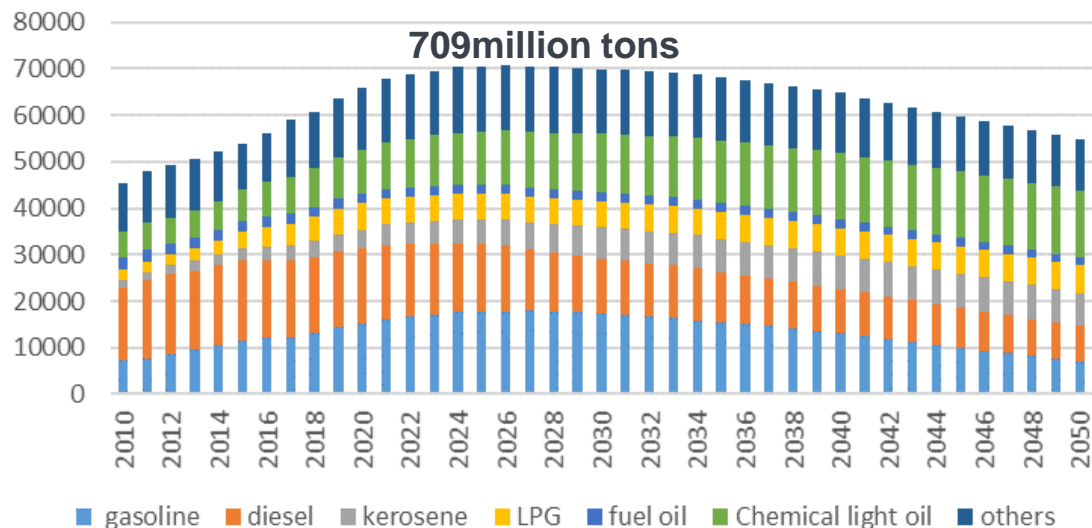
## China has more oil trade partners in the world



- 2000: 30** importing countries, covering the Middle East, Africa, Europe/former Soviet Union, the Americas and the Asia-Pacific region. The import volume was led by the **Middle East**, nearly **38 million tons**, far exceeding other regions.
- 2017: 43** importing countries, **13** of which were added and mainly **from Africa, America and Europe**. Most of the new imports came from **the Middle East and Europe**, with **Saudi Arabia** increase more than **45 million tons**.

The oil demand will reach its peak with over 700 million tons around 2027.

China's oil consumption and forecast  
(10 thousand tons)



Data sources: EDRI

➤ **Gasoline:** replaced by electrification; a decade of growth

➤ **Diesel:** replaced by gas in urban buses, and truck transportation.

➤ **Aviation kerosene:** Driven by annual growth rate of passenger turnover.

**By 2030:**



China's population:  
**1.44 billion**



Energy efficiency :  
**the world's advanced level**



Urbanization level:  
**70%**



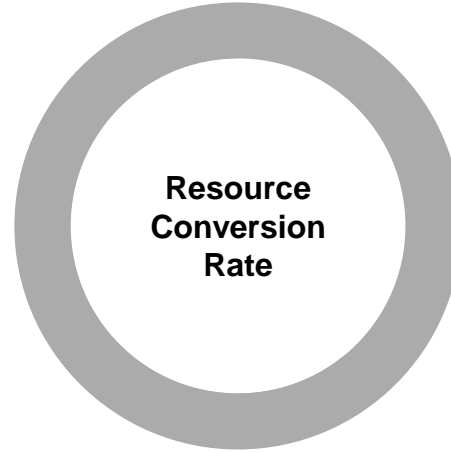
Number of electric :  
**50-80 million ; 1/4** of the total.

# Domestic supply: widen E&P fields and EOR technologies



**Resource**

- ✓ Rich in petroleum
- ✓ 35% proven, and has potential



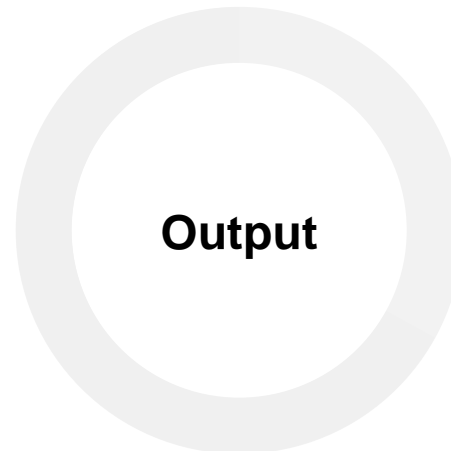
**Resource Conversion Rate**

- ✓ Resource conversion rate is Low
- ✓ Improving recovery and conversion rate through technological progress



**Unconventionals**

- ✓ Shale oil and oil sands are rich.
- ✓ The State Key Laboratory of Shale Oil has been set up .



**Output**

- ✓ Diversified investors
- ✓ Oil production will have space for growth

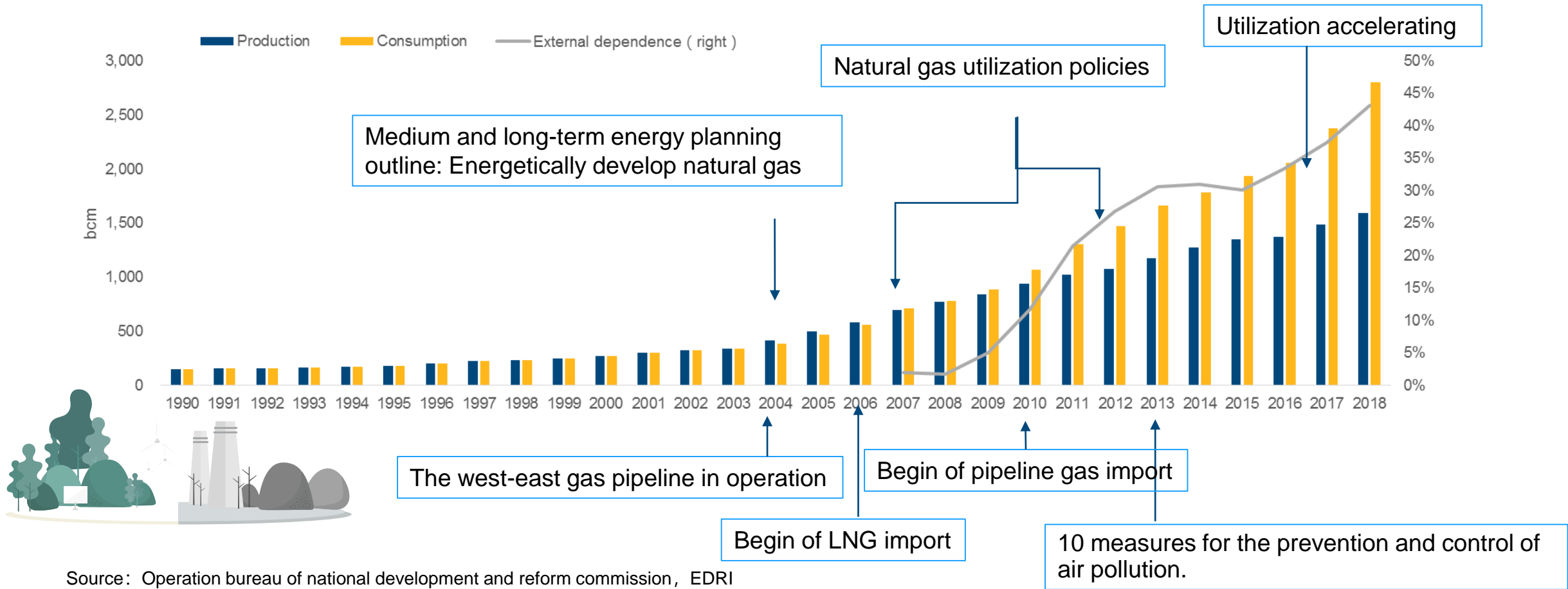


# 4 Natural Gas Demand and Development Trend

---



# Natural gas demand is growing rapidly, with the External dependence exceeding 40%



Source: Operation bureau of national development and reform commission, EDRI

## First stage(before 2000)

- Utilization around of field
- Industrial gas is dominant

## Stable demand(2000-2010)

- Cross-regional utilization
- City gas demand growth

## Period of Rapid demand

- Import accelerate
- Channels and domestic pipeline
- Optimization of demand

## Diversified imports, more gas trade partners, quick LNG import growth

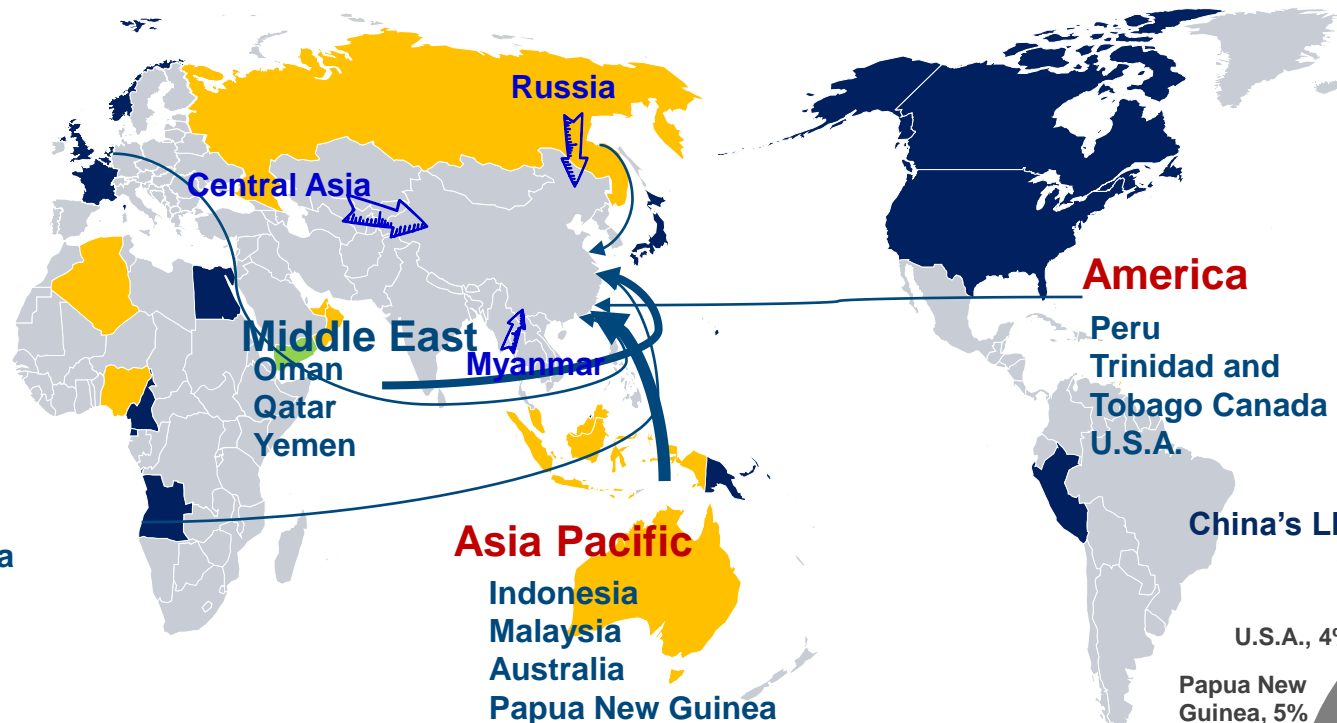
### Map of LNG and pipeline gas import of China

#### Europe

Belgium  
U.K.  
France  
Netherland  
Norway  
Russia

#### Africa

Algeria  
Angola  
Cameroon  
Egypt  
Equatorial guinea  
Nigeria



■ New exporters in 2018   
 ■ Exporters in 2012   
 → Imported from Yemen only in 2012

→ Countries and regions of pipeline gas import

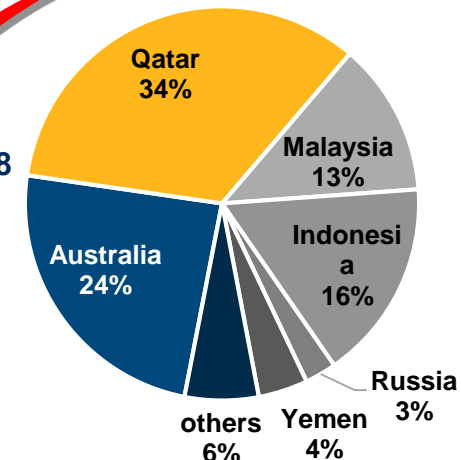
✓ China has imported LNG from more than **20 countries** in 2018.



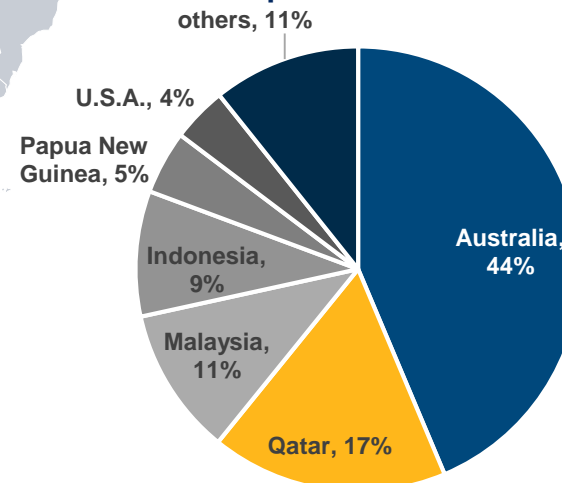
✓ **2006-2007**, 85% came from long-term contracts in Australia  
 ✓ The rest from spot contracts in Oman, Algeria and Nigeria.

✓ **2012**, mainly from Qatar, Australia, Indonesia, Malaysia, Yemen and Russia.

#### China's LNG import structure in 2012

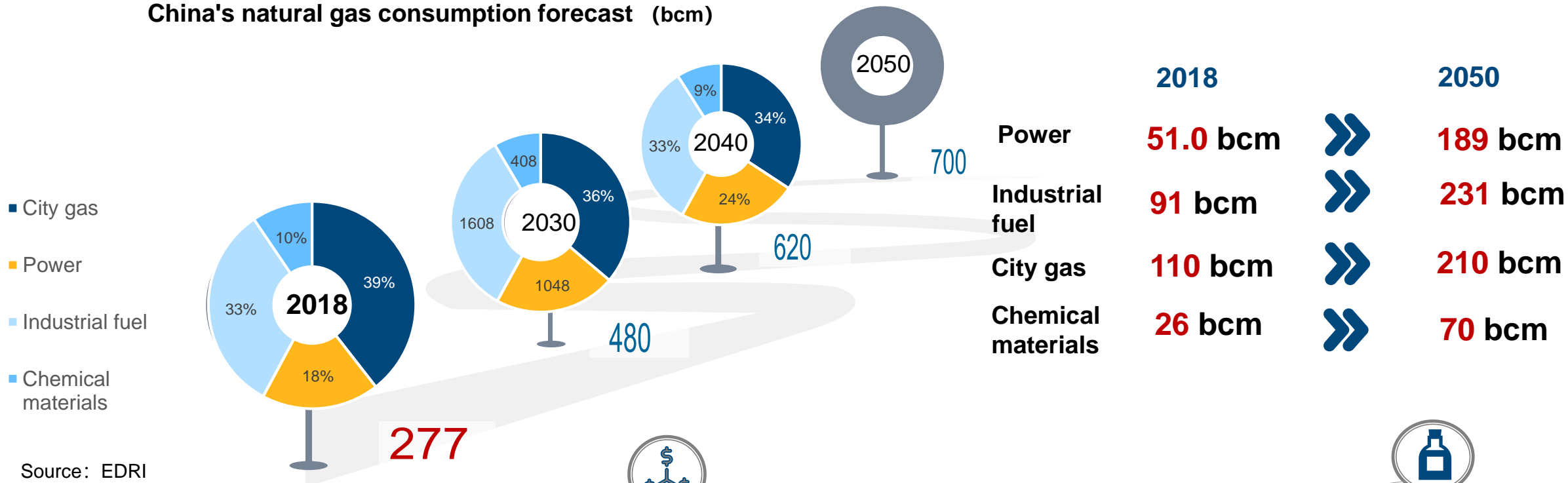


#### China's LNG import structure in 2018



## Medium and long-term gas demand structure will be stable

### China's natural gas consumption forecast (bcm)



**POWER:** If gas turbine technology can be mastered, fixed cost of gas power plant will be reduced from **90%** to **30%**.



### INDUSTRIAL FUEL

Emission reduction  
Efficiency improvement  
Promoted to nationwide



**CITY GAS:** Rate of gasification : **80%**

Gas in public transportation and freight logistics be promoted.



### CHEMICAL MATERIALS:

Growth will be slower.

## Key Projects for Natural Gas



### Upstream E&P

Increase investment to discover more reserves and output.



### Pipeline network interconnection

Key natural gas infrastructure connectivity projects for 2019 have been launched.



### Gas storage

Increase working gas storage capacity underground



### LNG Terminals

Keep quick pace on construction of LNG terminals,.



# 5

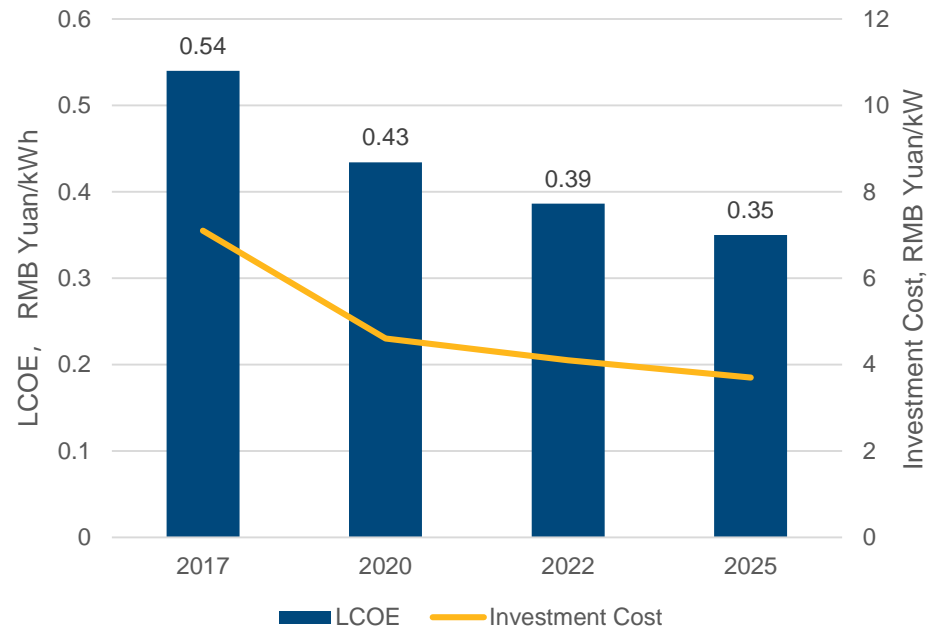
## Non-fossil Energy Demand and Development Trend

---

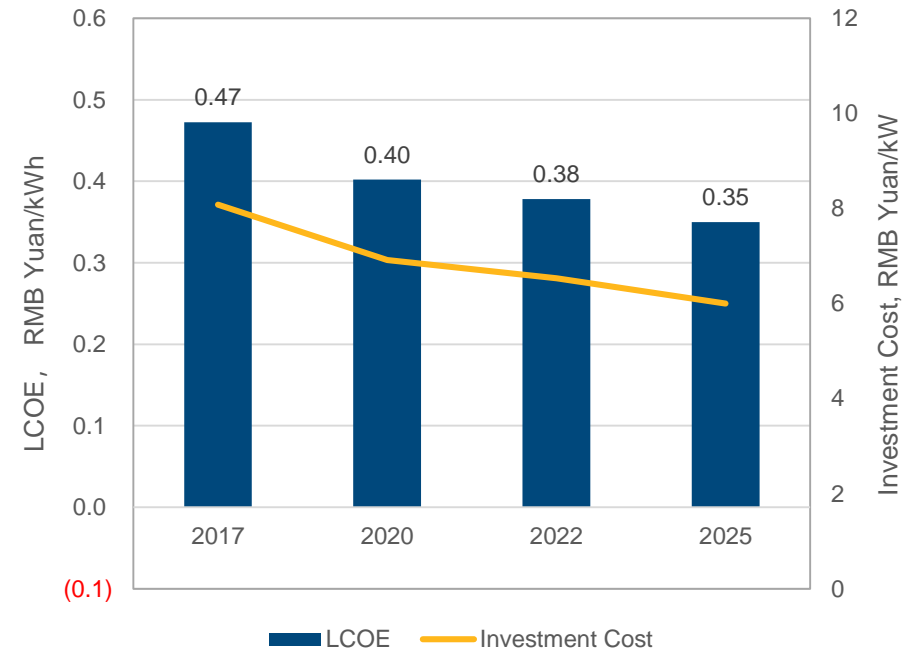
## Technological advancements enhance Non-fossil energy's competitiveness

- ✓ From 2017 to 2025, China's large solar photovoltaic and onshore wind power investment costs will be reduced by about **50%** and **30%**
- ✓ LCOE cost of electricity will be reduced by about **35%** and **25%** respectively.

China's large Photovoltaic station installed cost and LCOE



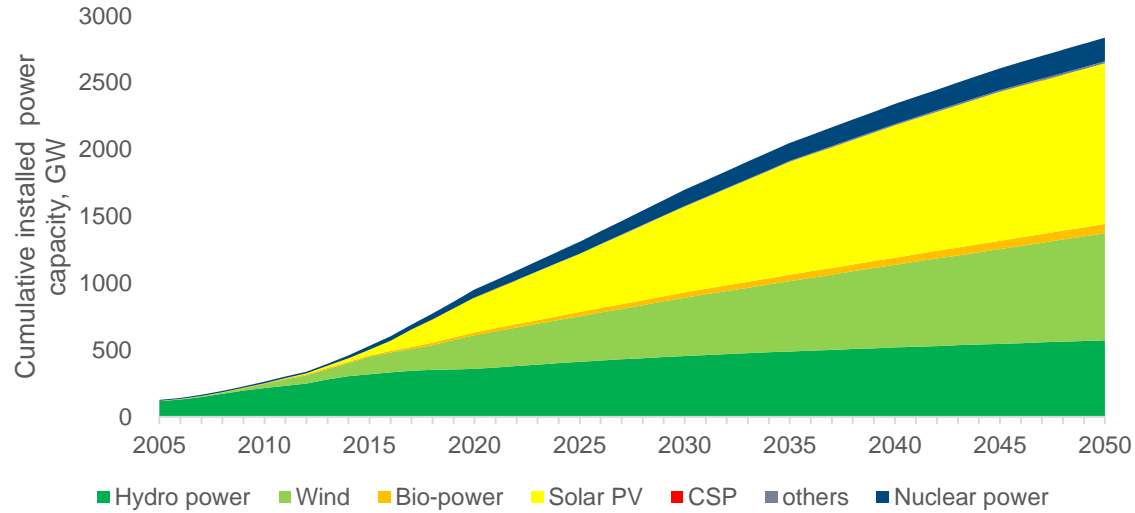
China's onshore wind power station installed cost and LCOE



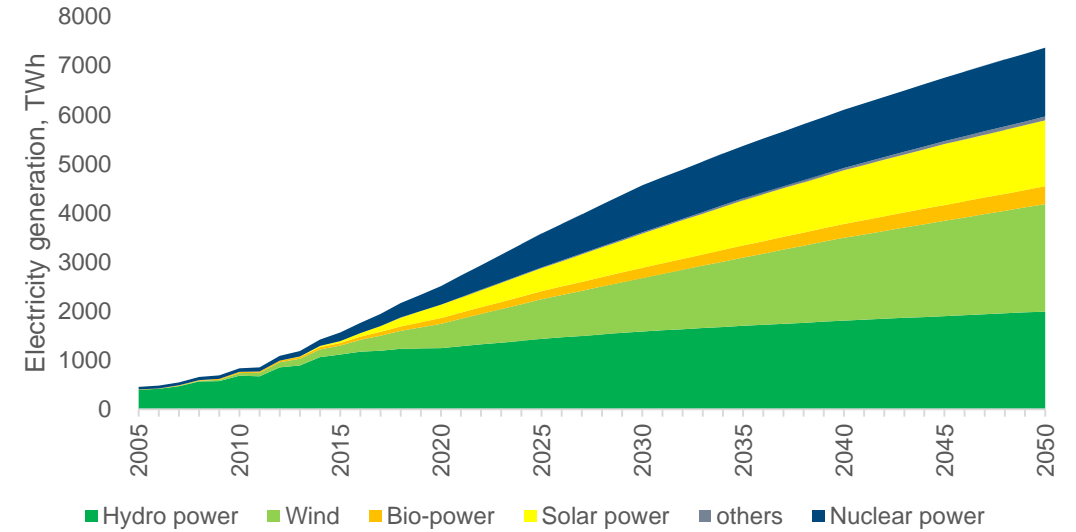
Note: National average, LCOE: Levelized Cost of Electricity. Data sources: Chinese State Grid Energy Research Institute, IRENA

## Non-fossil energy: China's electricity generation capacity will keep fast growing

China's Non-fossil energy cumulative installed power capacity



China's Non-fossil energy electricity generation



- 2018, China's non-Fossil energy cumulative installed power capacity is **780 GW**, **40%** of the total installed power capacity, generating **2200 TWh** of electricity, **30%** of total electricity generation.
- 2050, China's non-Fossil energy cumulative installed power capacity will be over **2800 GW**, generating **7300 TWh** of electricity.

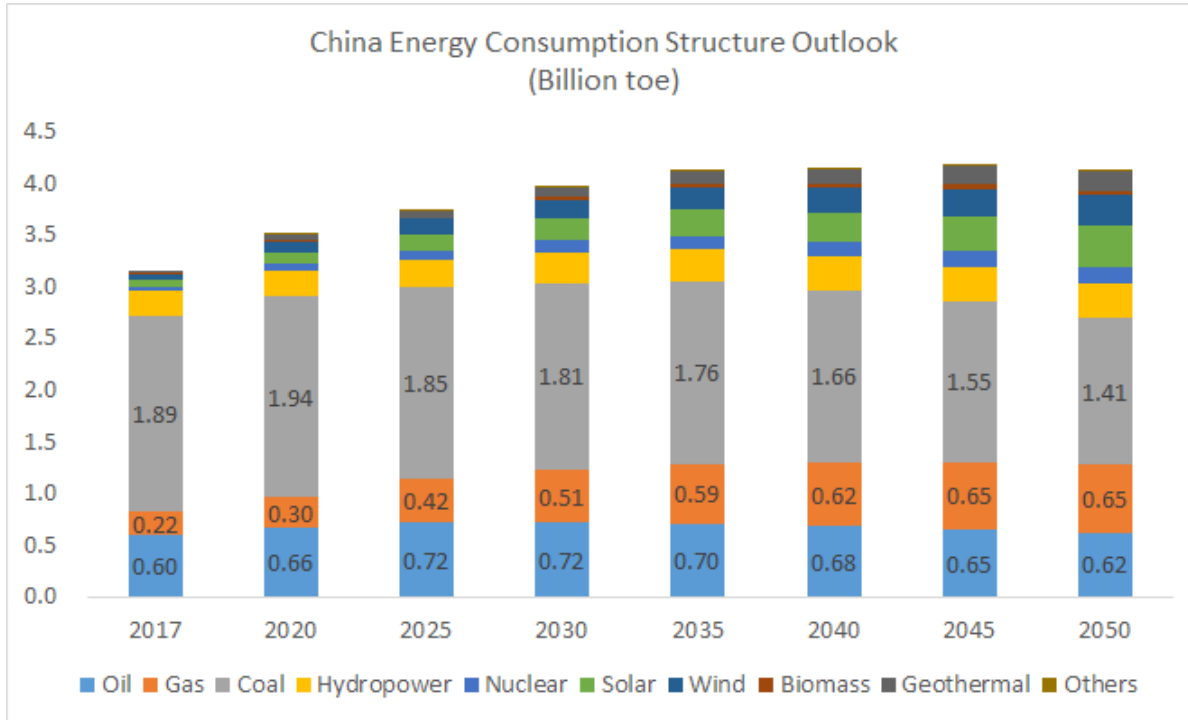


# 6 Energy Demand & International Cooperation Outlook

---



# Outlook on China Medium-Long Term Energy Demand



## ✓ China's energy transition :

- Coal demand reduction; clean use of coal
- natural gas demand increase
- stable oil demand;
- non-fossil energy keep growth



### Total energy

- peaking around 2045
- **4.2 billion toe**



### Coal

- continues to **decline**
- **34%** of total by 2050



### Oil

- Peaking around 2030
- **720 million tons**



### Natural gas

- Peaking around 2050
- **700 billion m<sup>3</sup>**



### Non-fossil

- **1.4 billion toe** by 2050,
- **35%** of total
- Main energy source

# Chinese companies' overseas business will maintain steady development

## Upstream

- ✓ More than **30** oil and gas companies have overseas business
- ✓ More than **200** oil and gas projects in **50 countries**

## Refining

- **12** overseas refining projects
- Total refining capacity of **73.6 million tons/year.**

## Chemical

**2010-2016,**

Keep growth in overseas investment

Total overseas investment : 200 billion yuan

## Engineering service

Market service in Russia, Central Asia, the Middle East and South Asia

## Trading

- More oil and gas trade partners
- Trading has become an important link



## China's booming oil and gas industry is providing opportunities for global enterprises

- ✓ International cooperation will enhance energy and chemical industries.
- ✓ More foreign enterprises are entering Chinese market.



### Oil and gas E&P

- Domestic upstream market will be further **open**
- **Cooperation field** diversified



### Pipeline

- **infrastructure construction** accelerating
- The new negative list of foreign investment **encourages multiple investment entities to enter**



### Refining & Chemical

- China is committed to building high-end, low-energy consumption petrochemical integration base.
- By 2020, build **7** domestic bases.



# Q&A

