



New Horizons for China Petrochemical Industry



2019

Report series of China energy and petrochemical industry

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1

Increasing Petrochemicals Capacity of China

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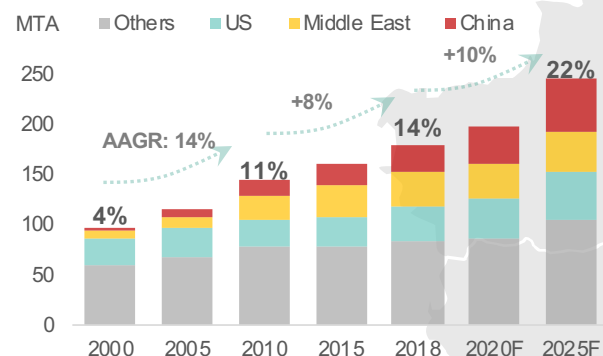


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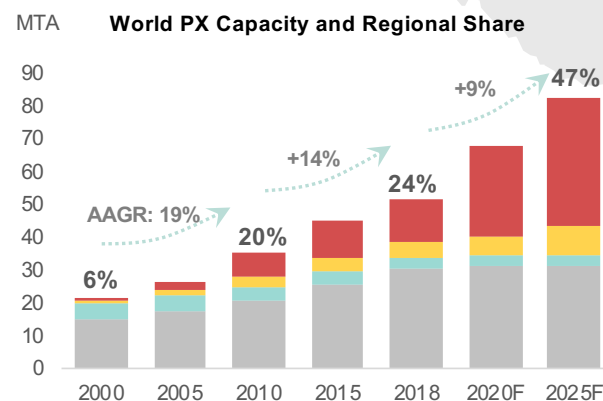
Petrochemicals Giants Cooking Up Major Expansion for China

Capacity of ethylene and PX of China has reached 25MTA and 13.8MTA in 2018, which is expected to reach 53MTA and 40MTA by 2025, both ranking the 1st in the world.

World Ethylene Capacity and Regional Share



World PX Capacity and Regional Share



Bohai Gulf

2025
C2 13.5/24%
PX 13.3/30%

Yangtze River Delta

2025
C2 15.3/27%
PX 20.2/45%

Pearl River Delta

2025
C2 6.4/11%
PX 2.0/4.5%

Announced Integrated Projects 2019-2025

2020: Hengli PC
2021: North Huajin PC
2021: RISUN

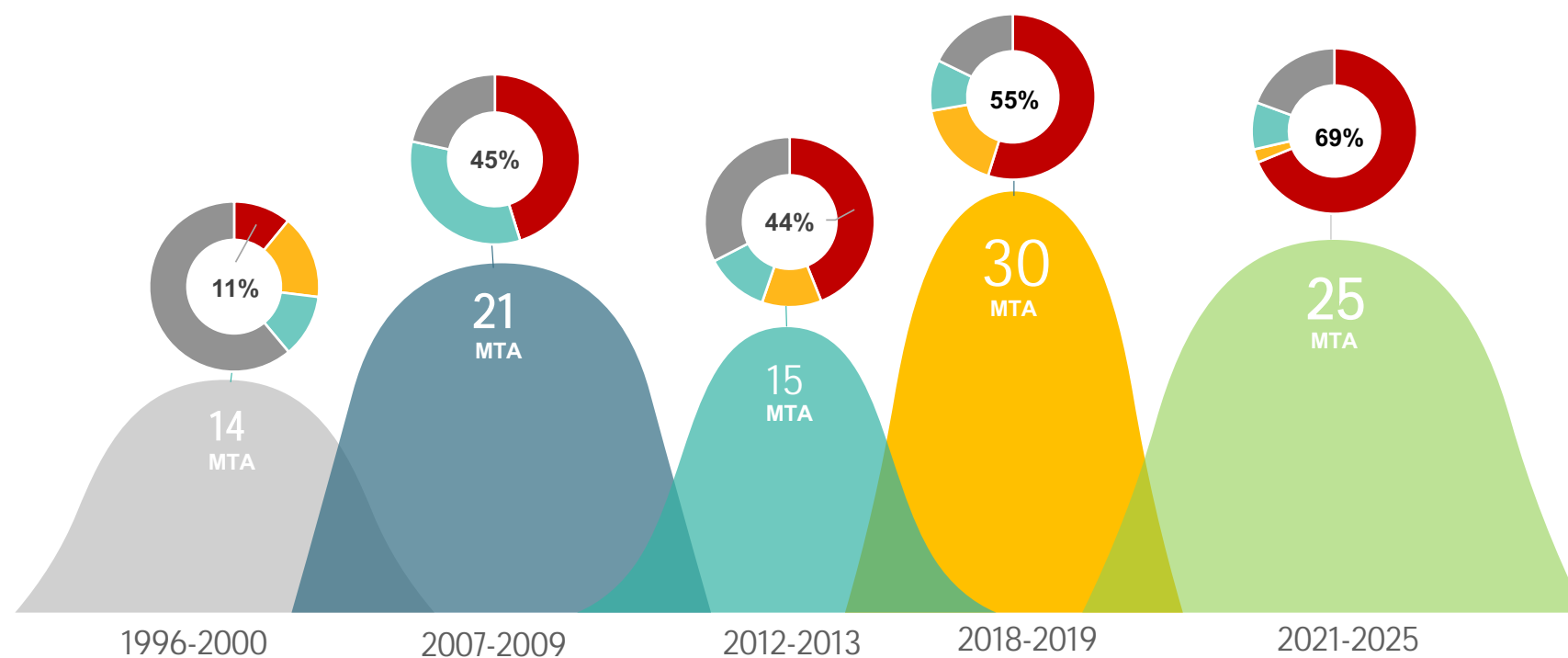
2019: Zhejiang PC Phase I/II
2021: Shenghong PC
2020-2025: ZRCC

2020: Gulei PC
2020: Quanzhou PC
TBD: FHC & SABIC JV

2018: CNOOC & Shell JV
2020: ZRPC
2021: CNPC
2023: ExxonMobil OTC Project
2020-2025: Hainan Refining & Chemical

China Empowering the World Capacity Growth

China alone contributes 50-70% of the new capacity during another two round of expansion in 2019 and 2023.



Note: Basic chemicals including ethylene, propylene, butadiene, benzene, toluene, PX and methanol

■ China ■ Middle East ■ US ■ Others

Average Annual New Capacity of Basic Petrochemicals

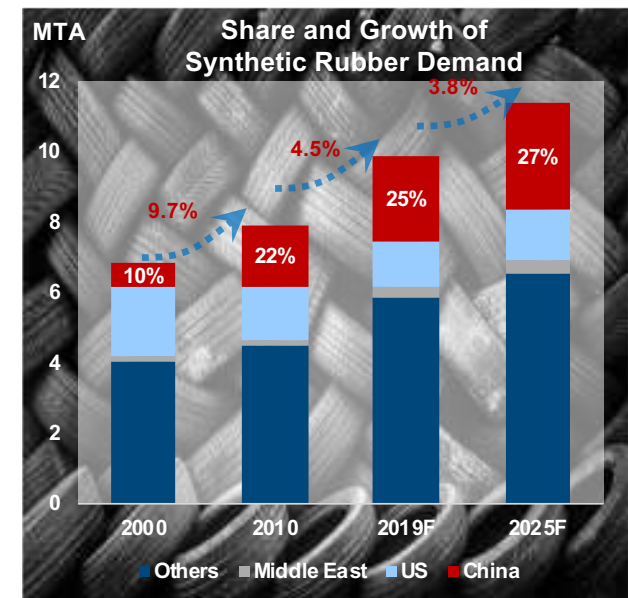
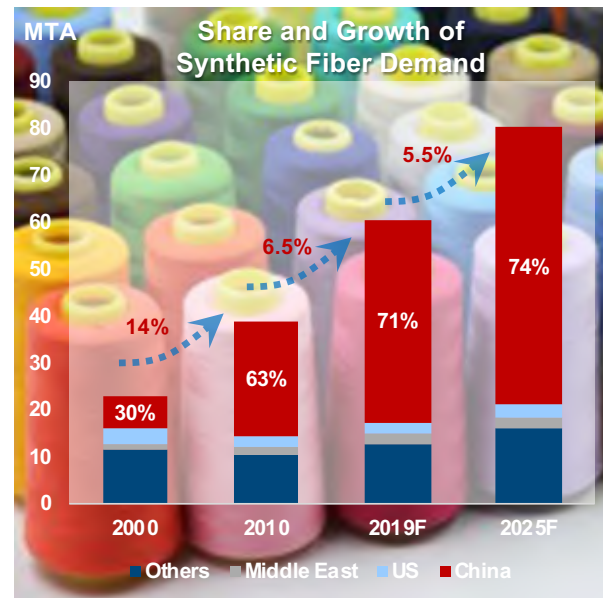
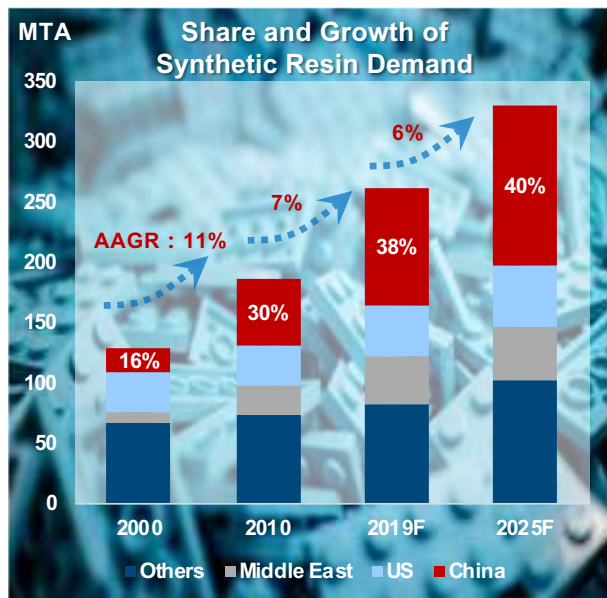


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Booming Petrochemicals Market of China

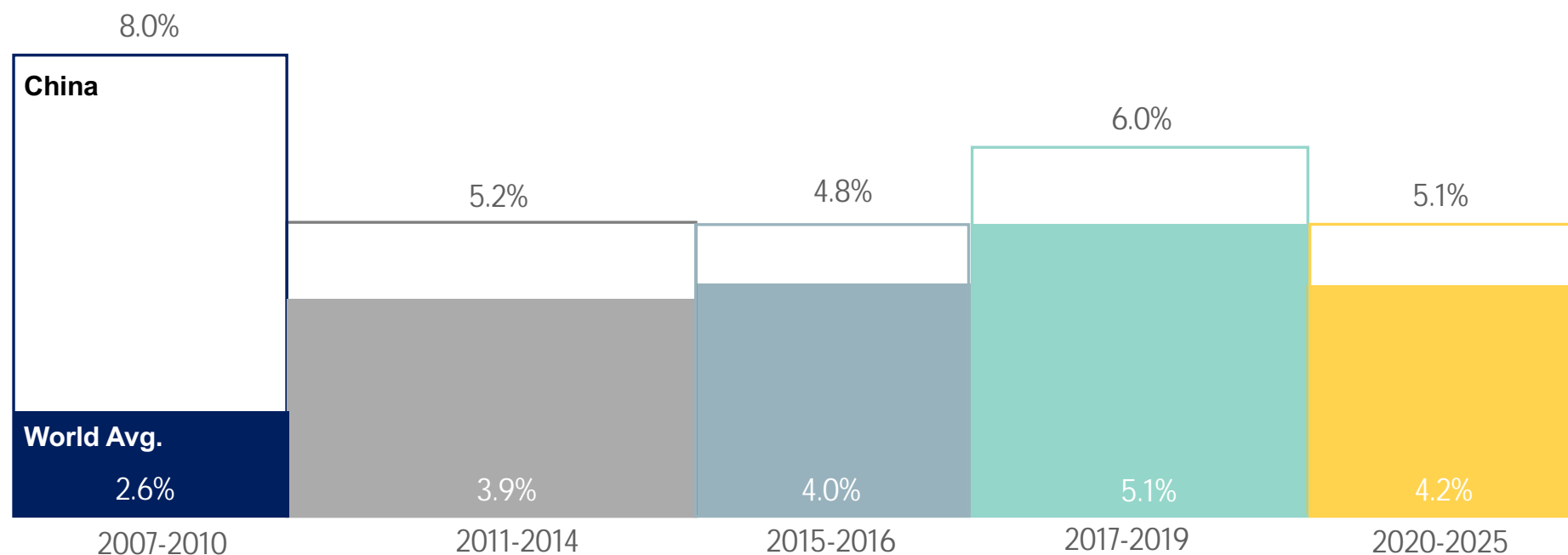
China Still the Largest Petrochemicals Market

China still holds the largest share of world petrochemicals demand, which is expected to maintain a high growth after the recent booming period. Demand of synthetic resin, fiber and rubber is expected reach 135MTA, 60MTA and 3.2MTA respectively by 2025.



China Driving the World Demand Growth

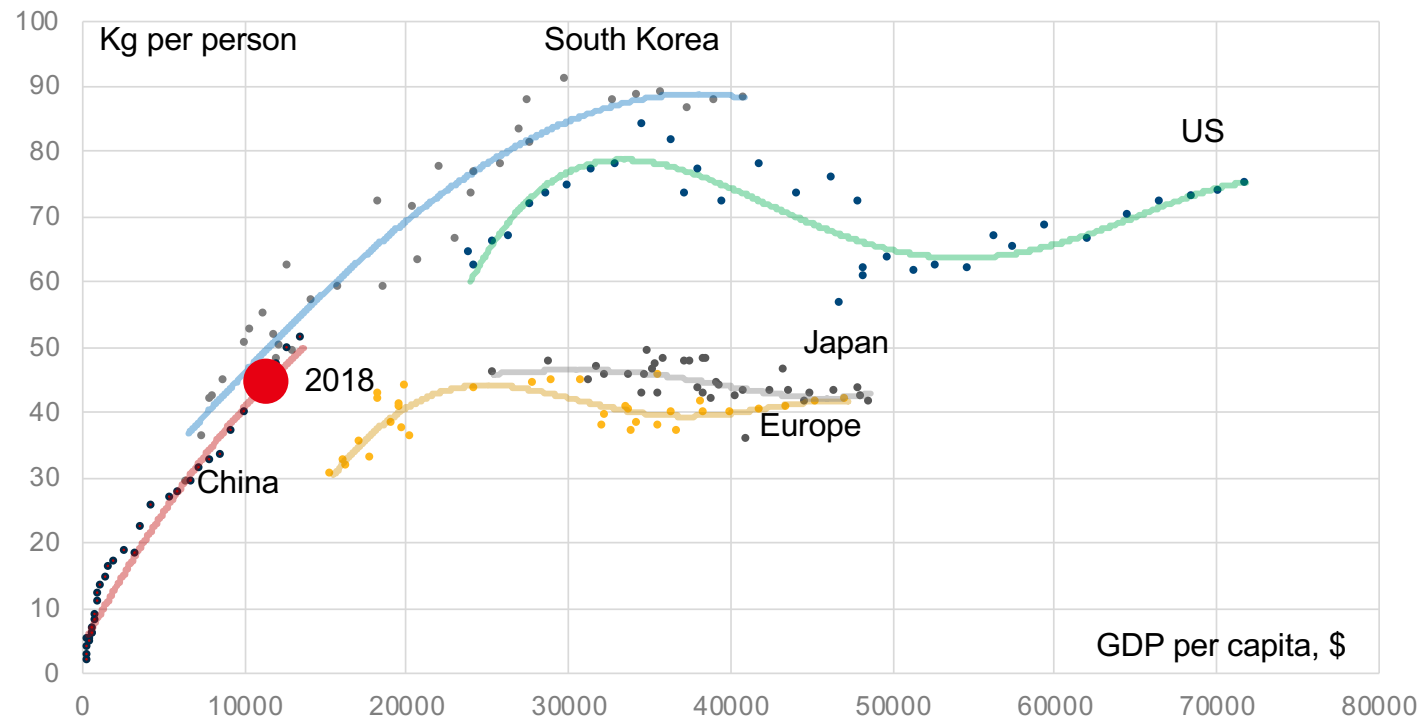
World petrochemicals demand are recovering from years before, growth of which outruns the world GDP. China, as a key driver, is expects to hold 1% higher than the world average demand growth by 2025.



AAGR of World Synthetic Resin, Fiber and Rubber Demand

Consumption Still Shows Great Potential

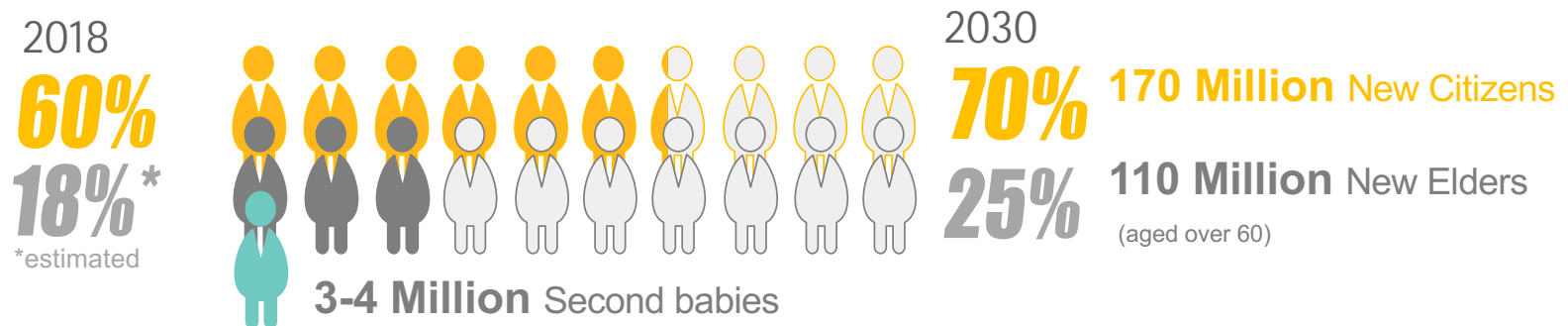
China per capita consumption of petrochemicals is catching up with Japan and Europe in the coming years. But 43kg(in equivalent ethylene) still has a long way to go compared with South Korea(89-90kg) and U.S.(70-80kg).



Consumption per capita of Equivalent Ethylene vs GDP per capita from 1990-2025

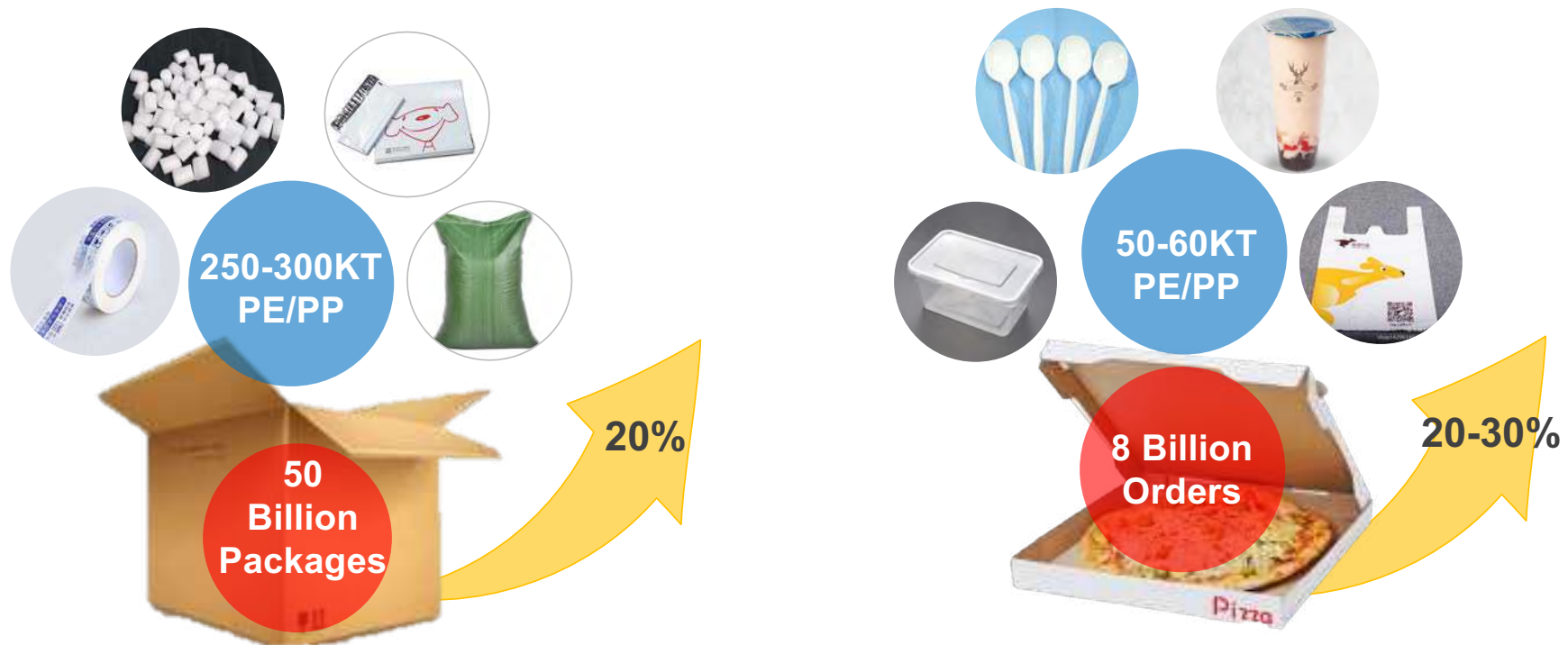
Aging Population VS Massive Urbanization

Massive urbanization is the best answer to the aging problem. Besides the second baby boom, we will see 170 million new citizens moving to cities by 2030, which means at least 250 billion \$ new consumption and 2750 billion \$ new investment.



Explosive Growth of E-commerce Boosting the Polymers Demand

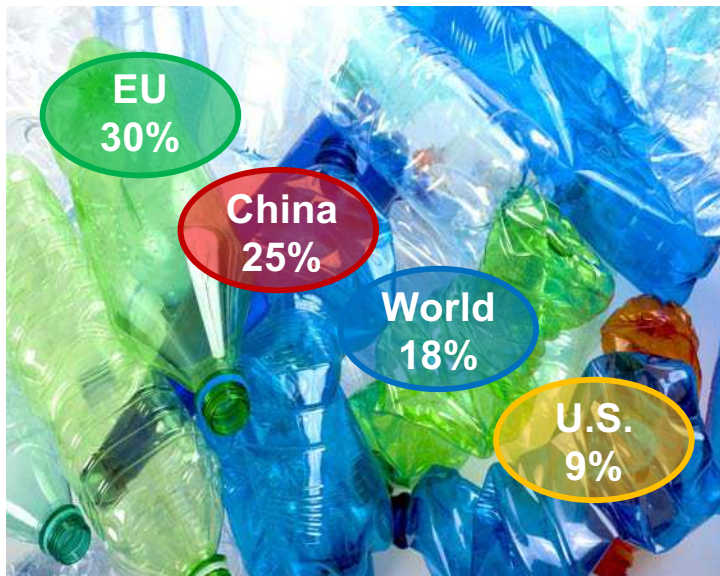
Billions of online orders and catering services are creating a whole new area for polymers consumption, which is growing by 20-30% each year and increasing the demand of polyolefins by 1-2%.



Fast Delivery and Catering Services Boosting the Polymers Demand

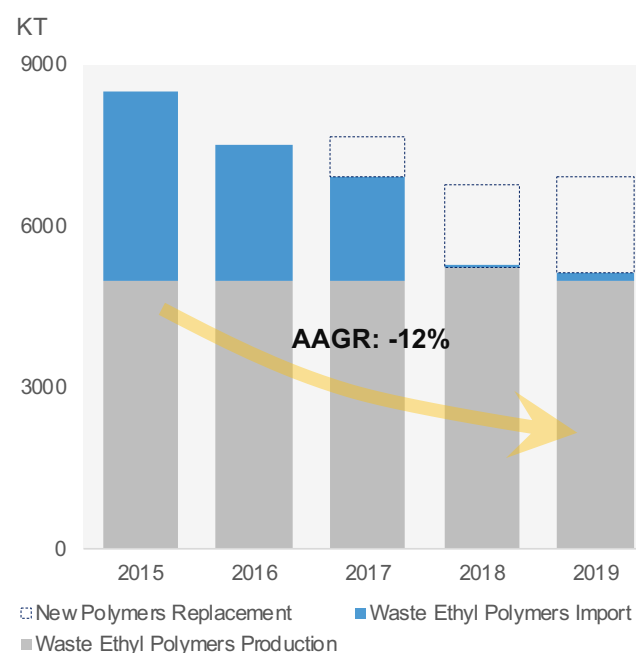
New Demand from Environmental Protection Business

Recycling rate of China has been much higher than the average of the world, which makes it harder to get significantly improved in years, together with waste plastics import ban, increased the virgin PE demand by 0.7-1.0 million ton. While air-pollution control regulation has driven the natural gas pipeline demand by 10%.

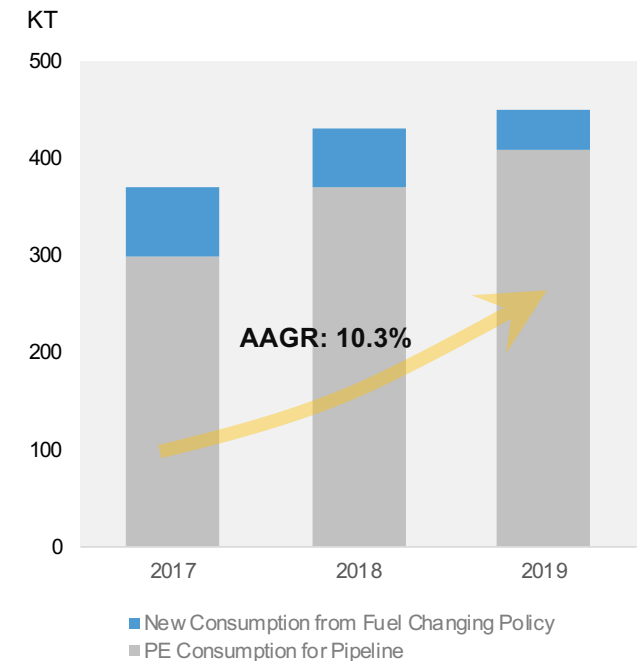


Sources: Roland Geyer, Jenna R. Jambeck, Kara Lavender Law

Recycling Rates of Non-Fiber Plastics



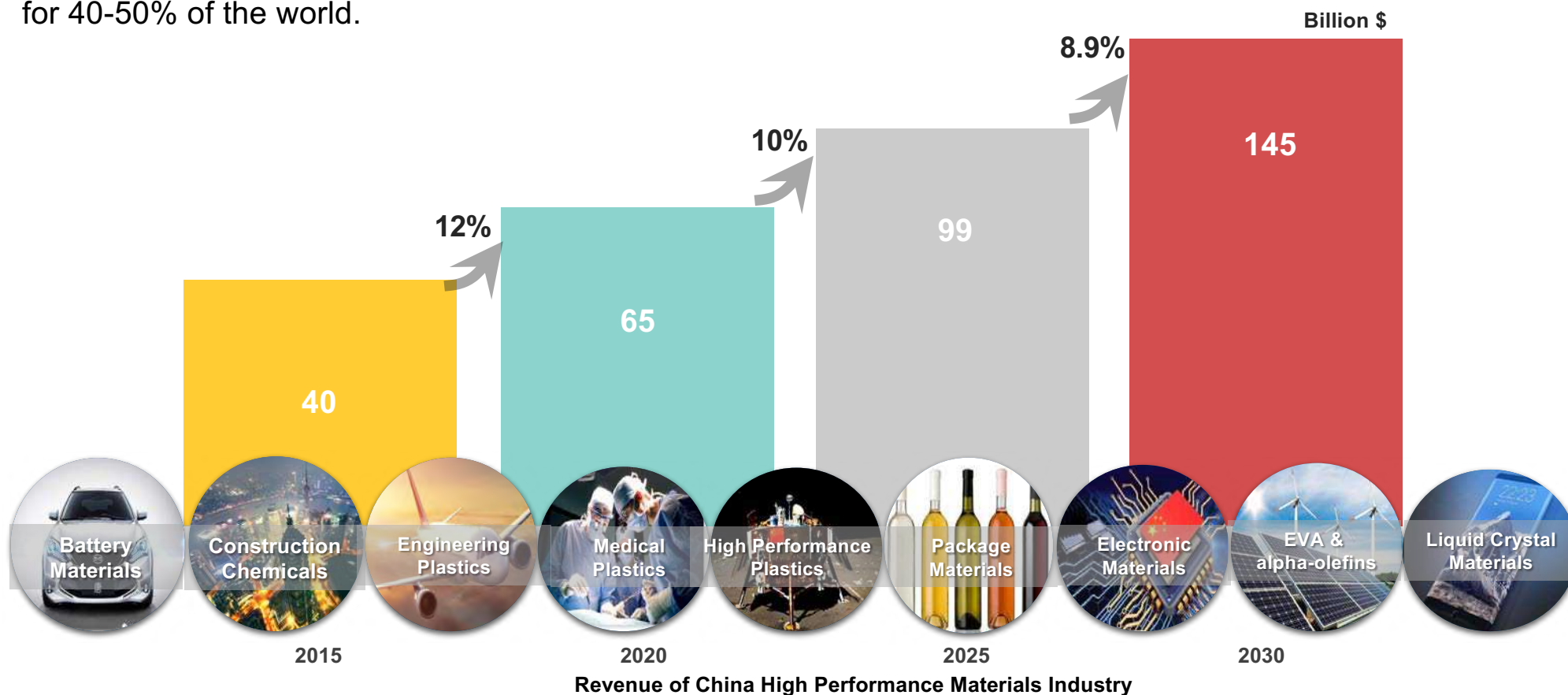
Waste Polymers Import and Domestic Production



Natural Gas Pipeline Demand for Polyolefins

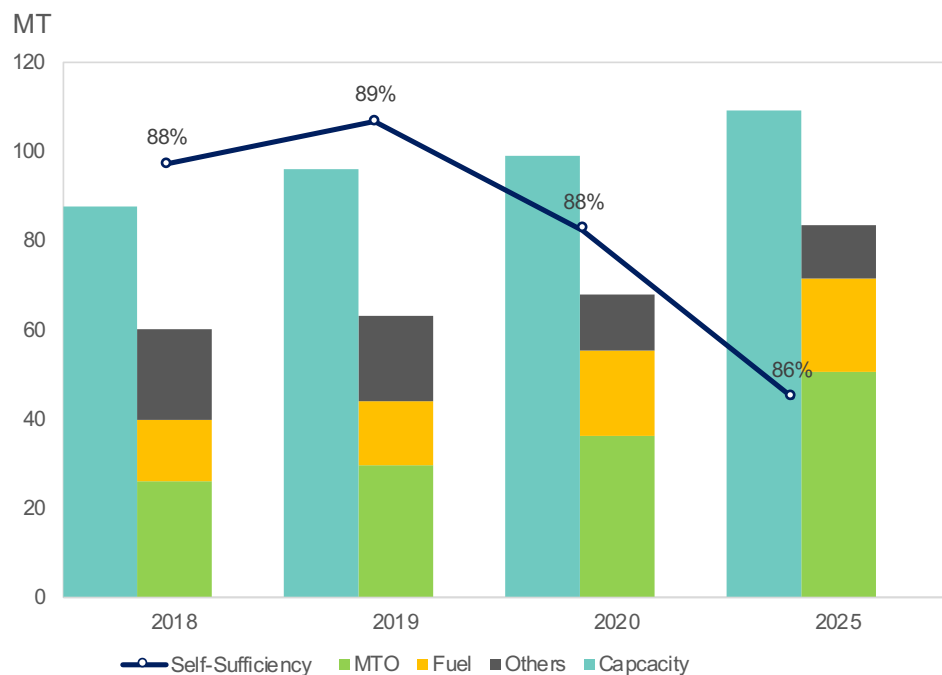
A Prosperous Outlook for High Performance Materials

Consumption upgrading promotes the high performance materials demand. A more than 10% growth will be expected in the coming years, and the revenue of this area will reach 145 billion \$ by 2030, accounting for 40-50% of the world.



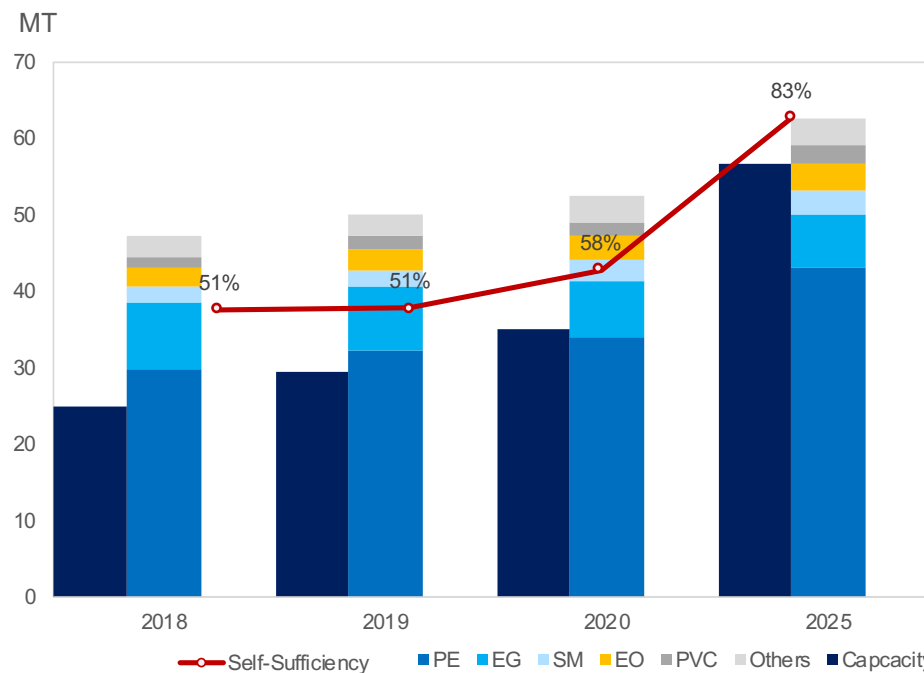
C1/C2: Large Import Still There

Methanol effective supply cannot fully meet the fast growing MTO and fuel demand, net export approaching 10 MT. Self-sufficiency of ethylene is rocketing, while more than 10MT of equivalent ethylene still has to be imported.



Note : Self-Sufficiency Rate=Production/Demand

Methanol Supply and Demand of China

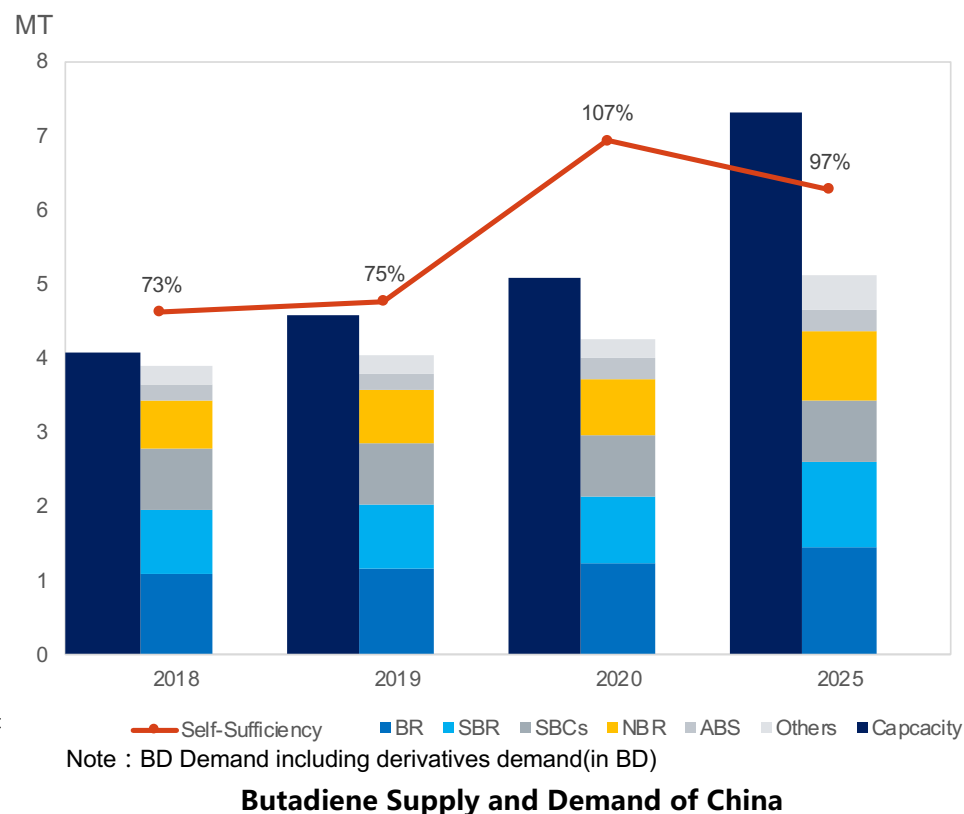
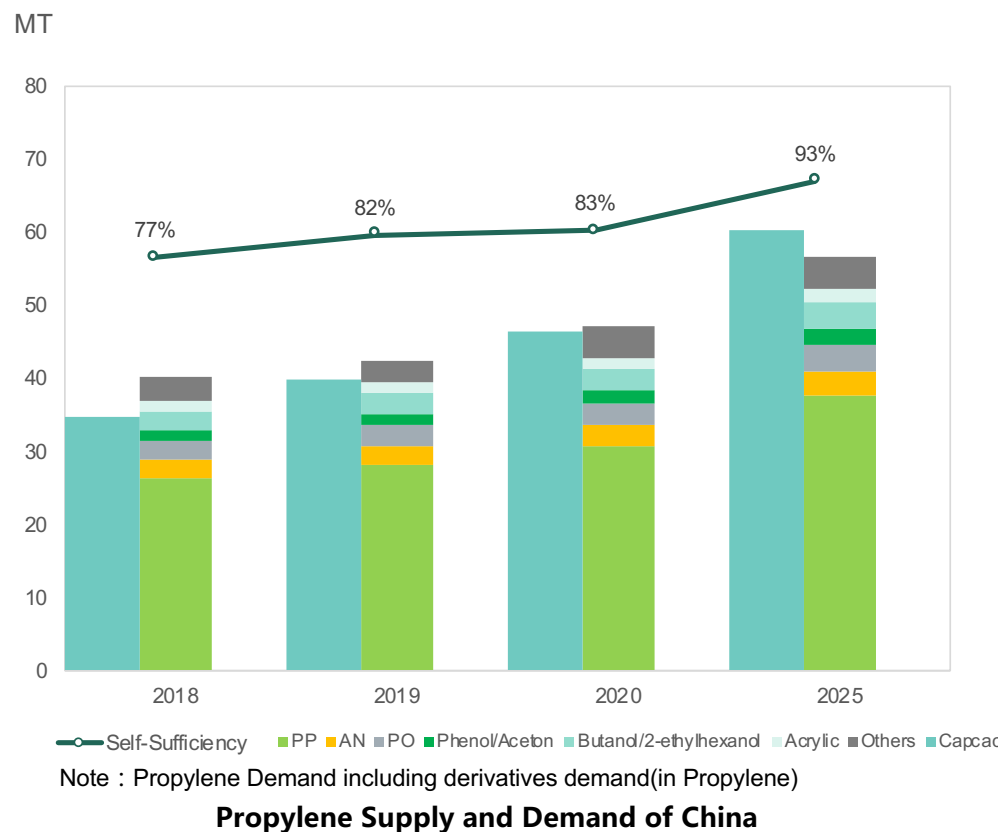


Note : Ethylene Demand including derivatives demand(in ethylene)

Ethylene Supply and Demand of China

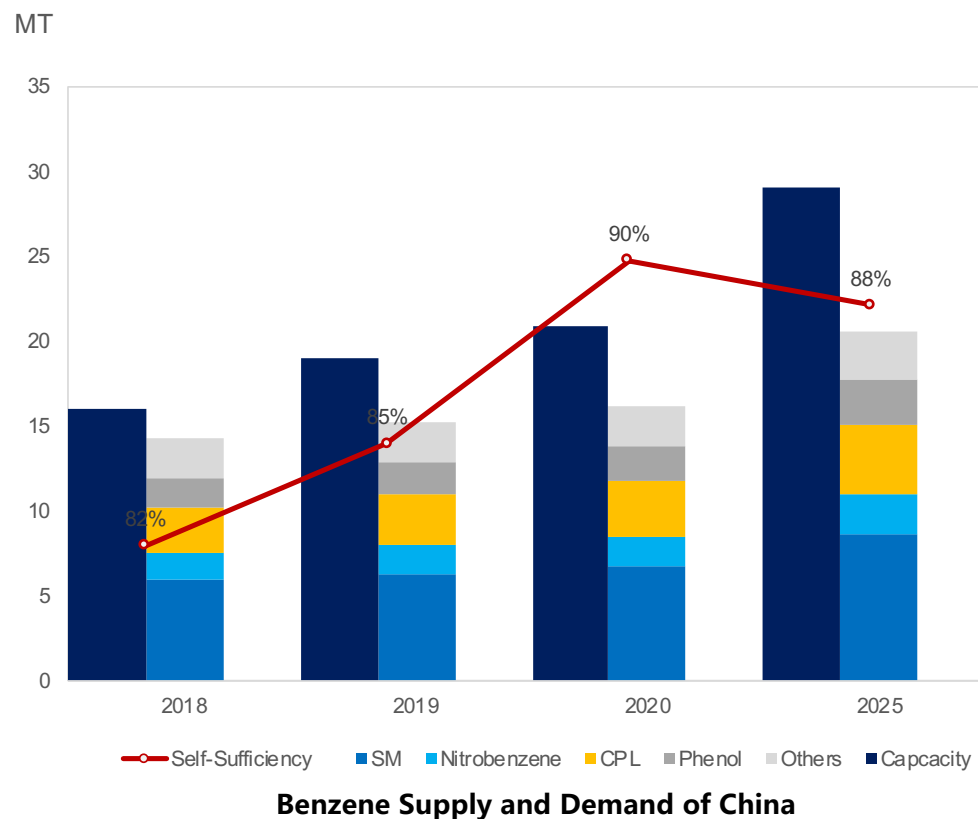
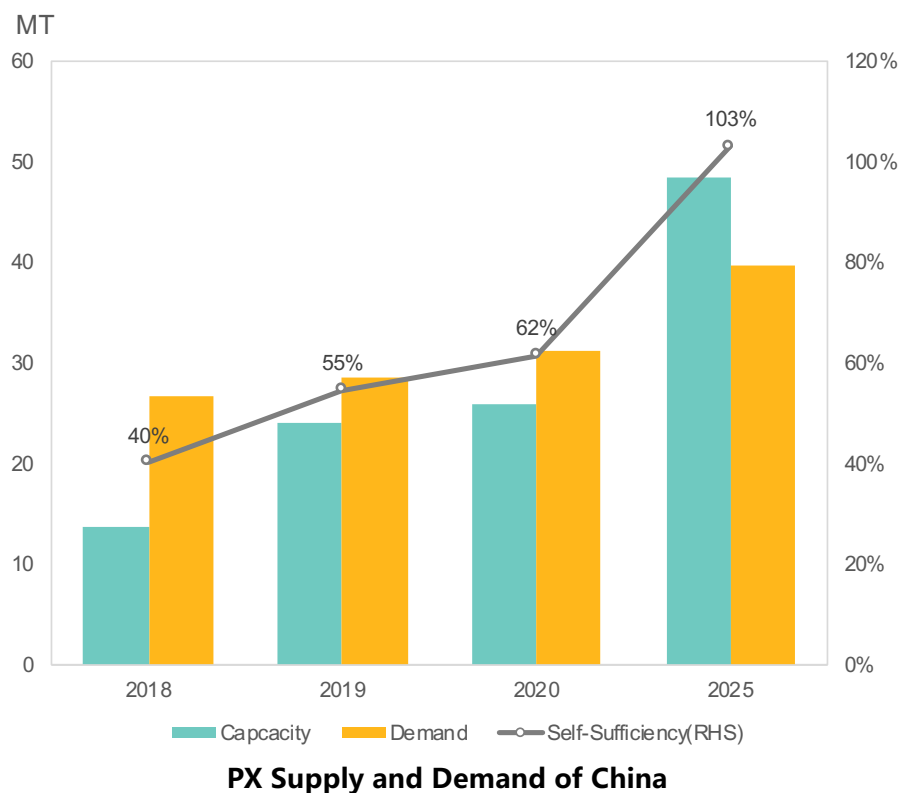
C3/C4: Balance is on the Horizon

Expanding propylene capacity and demand are getting near the balance point, while PP still needs import; Not only the large integrated projects but also the BDH has changed the whole landscape for butadiene.



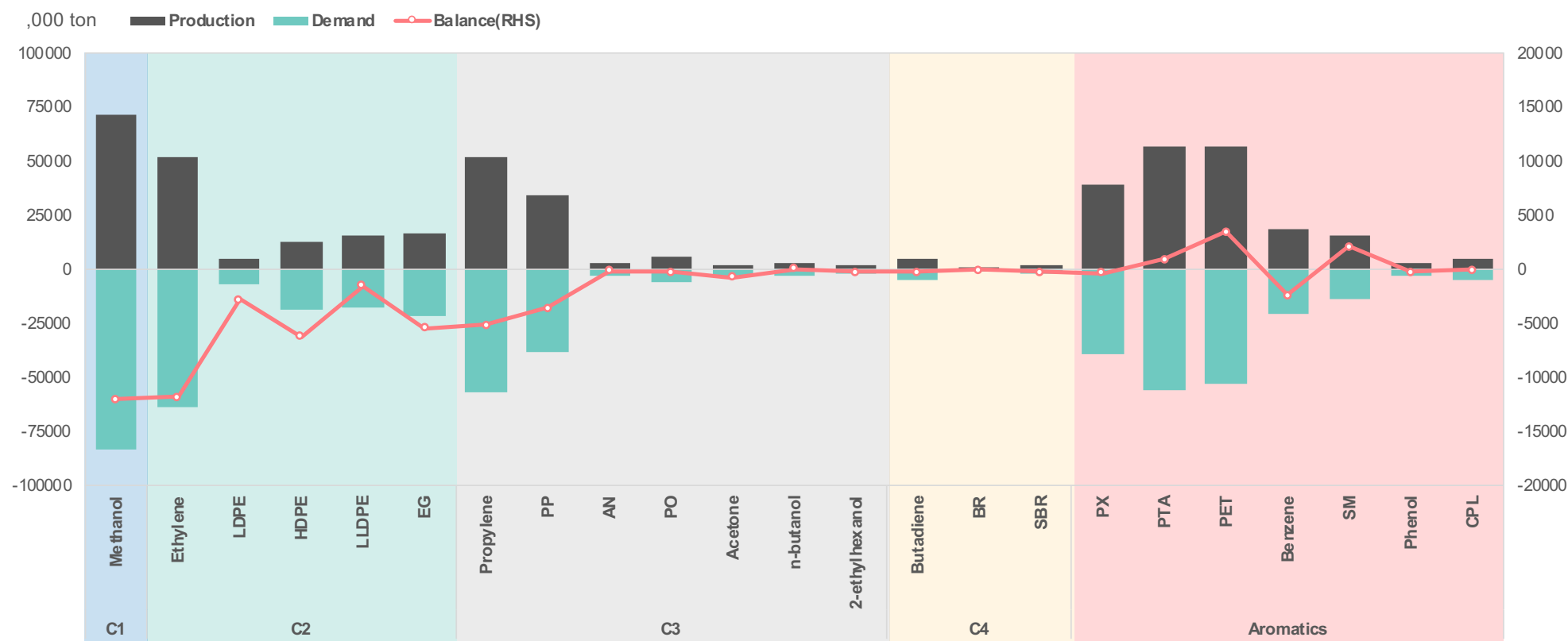
Aromatics: Nearing the Overcapacity

Extensive investment on PX has dramatically change the outlook for it, balanced or even overcapacity is expected by 2025. For benzene, import won't be absent, but potential increase of the capacity utilization clouded the market.



Balance across the Spectrum

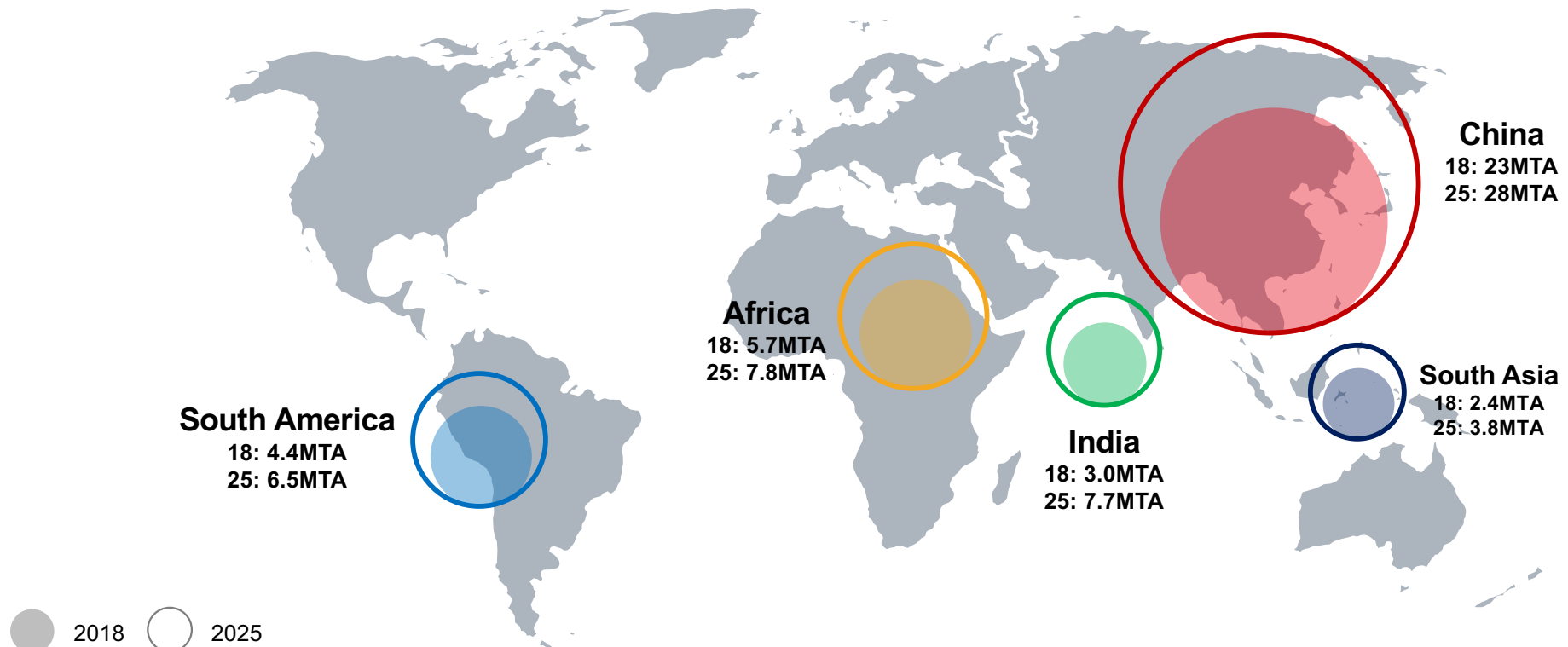
Polymers supply still cannot meet the demand by 2025, while some, especially the aromatics, will be facing the overcapacity pressure.



Balance of China Major Petrochemicals in 2025

Gap Still Widening Up

In 2018, China polymers gap reach up to 23 MTA, which will be increased by at least 5 MT by 2025. Far more incremental imports will be expected than other areas.



Note: Polymers including synthetic resins, fibers and rubbers

Polymers Balance Change of Major Import Areas from 2018-2025



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Trends and Challenges

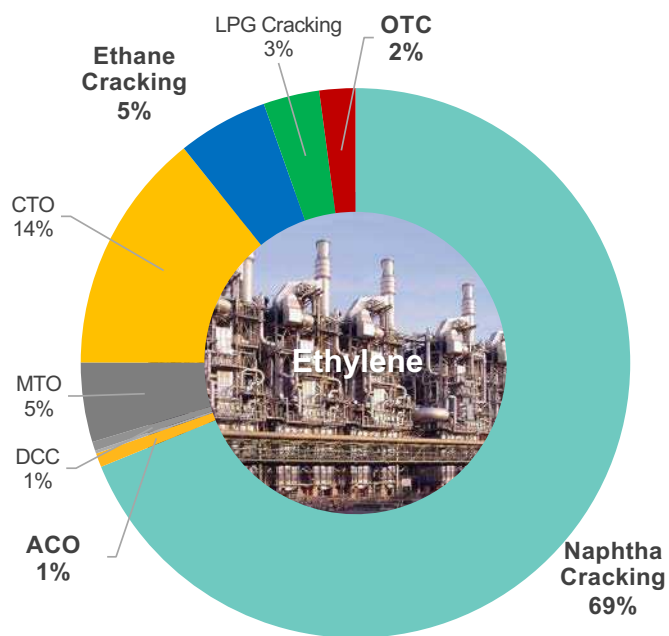
A Further Opening-up Market

A series of measures are implemented to reduce the market access barrier, which has attracted not only the domestic private investors but also the foreign investors, like Saudi Aramco, SABIC to join the game.

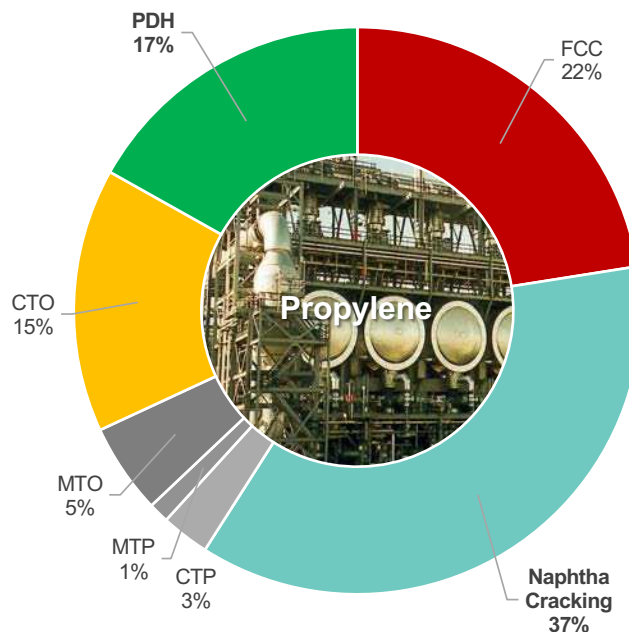


A More Diversified Market

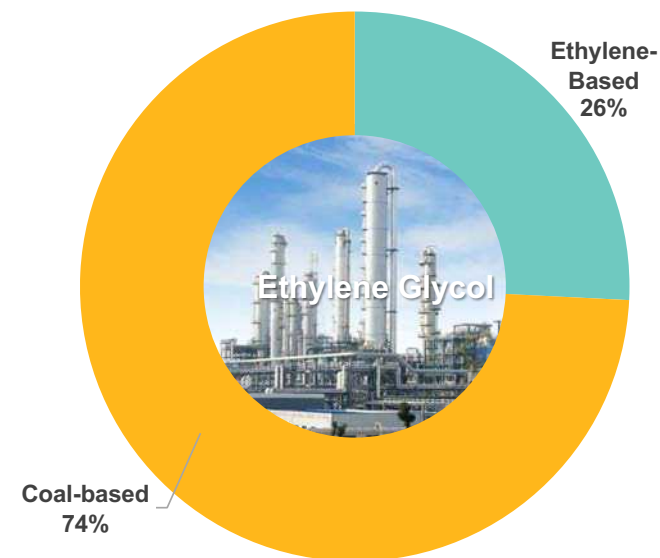
In 2019, Zhejiang and Hengli PC will bring the aromatics version of OTC on board, and ExxonMobil will bring the olefins version to Huizhou, China years later. Meanwhile the first ethane VLEC will arrive in China and the first ACO unit gets into production.



China Ethylene Capacity Share by Process 2025



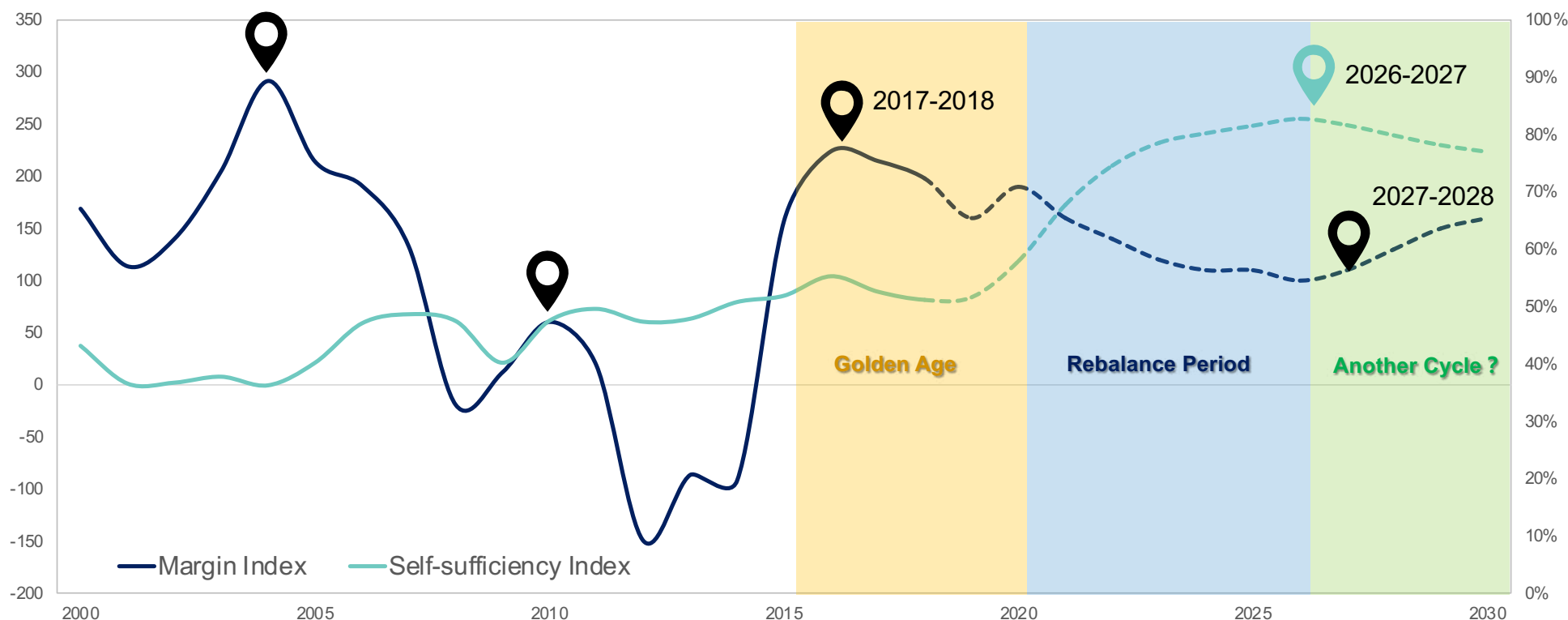
China Propylene Capacity Share by Process 2025



China Ethylene Glycol Capacity Share by Process 2025

Profitability Facing Temporary Downward Pressure

Overcapacity of some products will bring downward pressure to the overall profitability. As the rebalance goes on, the self-sufficiency will decline again and the profitability will get rebound sometime after 2025.



Margin Index and Self-sufficiency Index of China Petrochemical Market

Consolidation on the Way

Stricter environment regulations and fierce competition are forcing the disadvantages out of the games. Rapid decreasing small companies/units and climbing concentration ratio indicate the on-going consolidation.



Takeaways

- As the largest producer and consumer, China petrochemical market to maintain a steady annual demand growth of 6-7% and a capacity growth of 9-10% before 2025.
- Opportunities are emerging from massive urbanization, consumption upgrading, infrastructure construction, e-commerce, environmental protection business and further opening up.
- China will take more imports from the Middle East and U.S., as the polymers gap of China will be widening up by 5 million tons by 2025.
- Steady economy and huge demand will help the market to get rebalanced quickly. And a rebound is expected sometime after 2025.

Q&A



China Refining Industry Outlook and Oil Demand Peak



2019

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Transformation and upgrading of refining industry in China under a new round of investment





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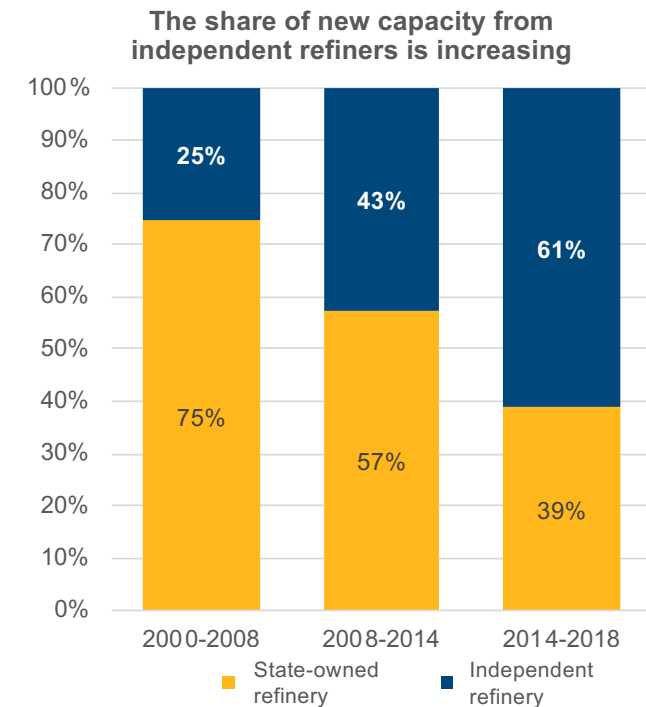
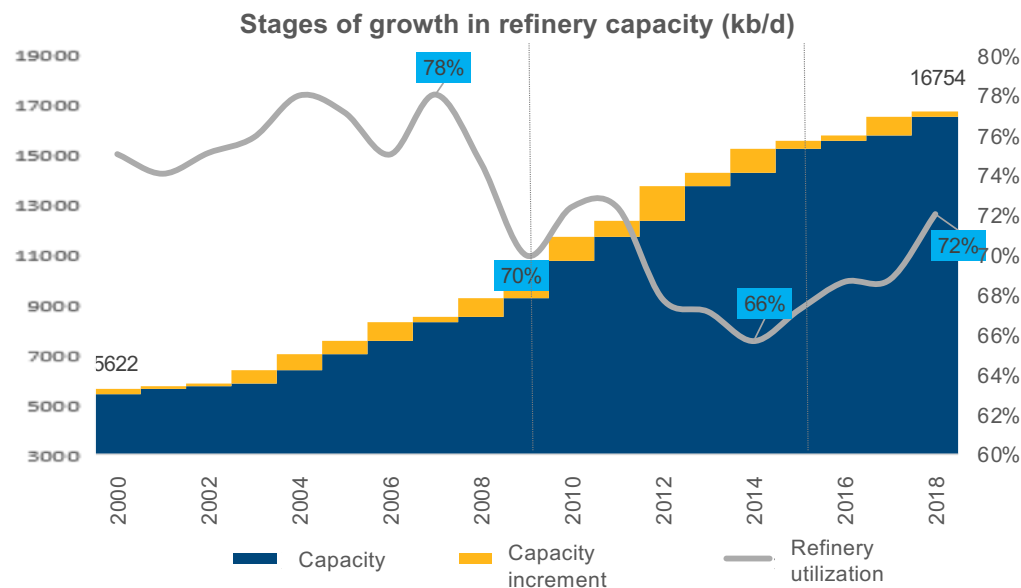
**The refining industry in China
ranking among the top in the world**

The refinery capacity in China ranks among the top in the world, and is still in expansion

State-owned refineries increased capacity to meet the growing rigid demand.

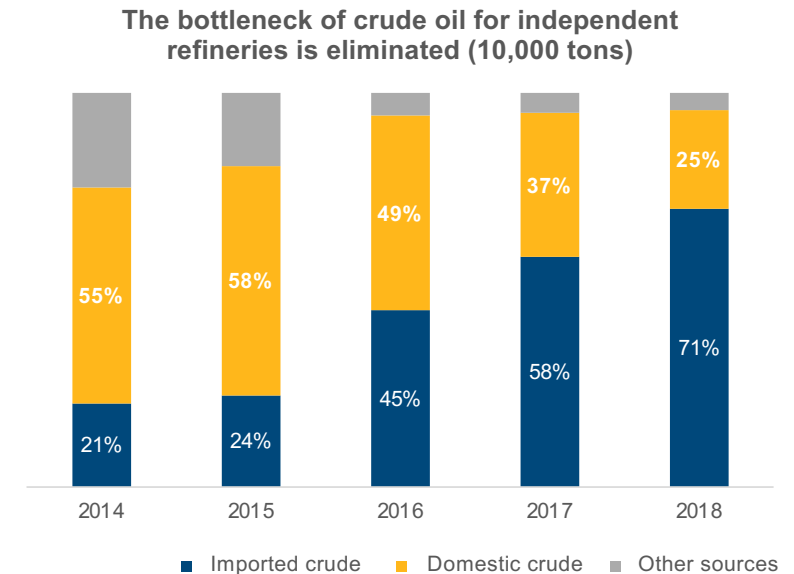
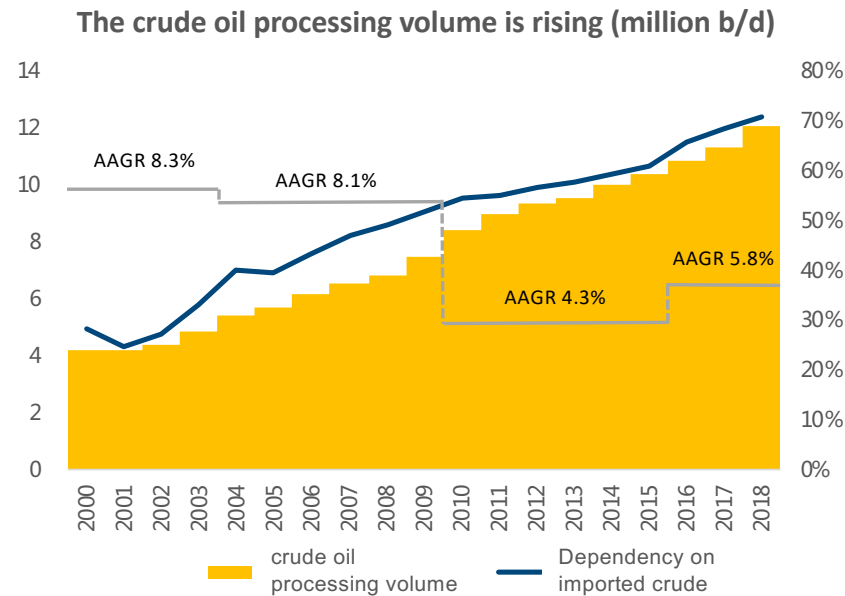
Independent refiners began to accelerate their expansion.

Structural adjustment is coming.



- In 2018, China's refinery capacity came to 16.8 Mb/d. New capacity mainly came from independent refiners.
- In response to the upgrading of oil quality, refineries in China are becoming increasingly complex.

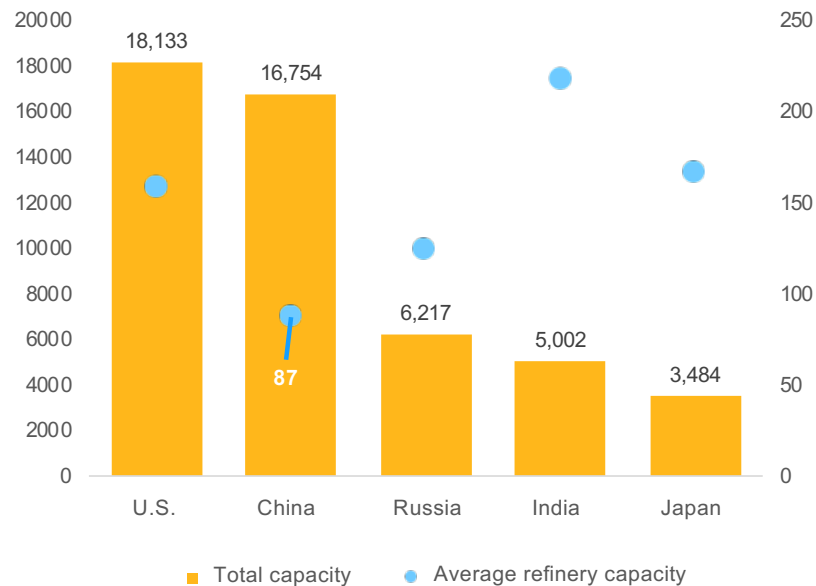
The increasing crude oil processing meets domestic demand



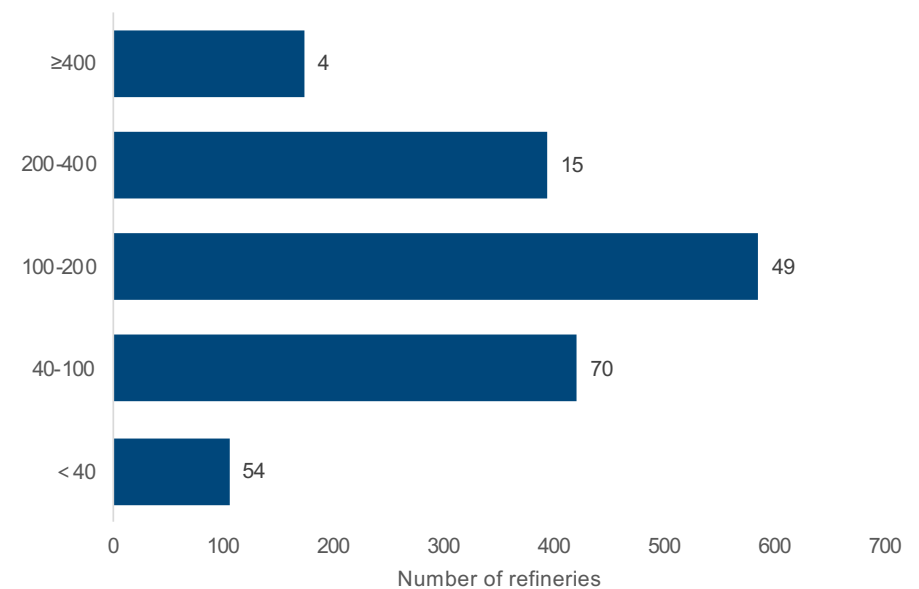
- By 2018, China's refining throughput was 12.1 Mb/d, and the dependency on imported crude oil came to 70.8%.
- Since the release of imported oil quotas in 2015, the growth rate of refining throughput has risen from 4.1% to 5.4%.
- The utilization rate of independent refineries increased from 30% in 2014 to 60% in 2018, and the share of imported crude oil in processing feedstock increased from 21% to 71%.

Urgent issue: large numbers of refineries with small average capacity

The top 5 oil refining countries (1,000 b/d)



2018 China refinery capacity distribution(1,000 b/d)



- By 2018, the average refinery capacity in China was only 87 Kb/d, which is only half of the global average level.
- Excluding the outdated capacity of less than 40kb/d, the average utilization rate could be around 82% in 2018.

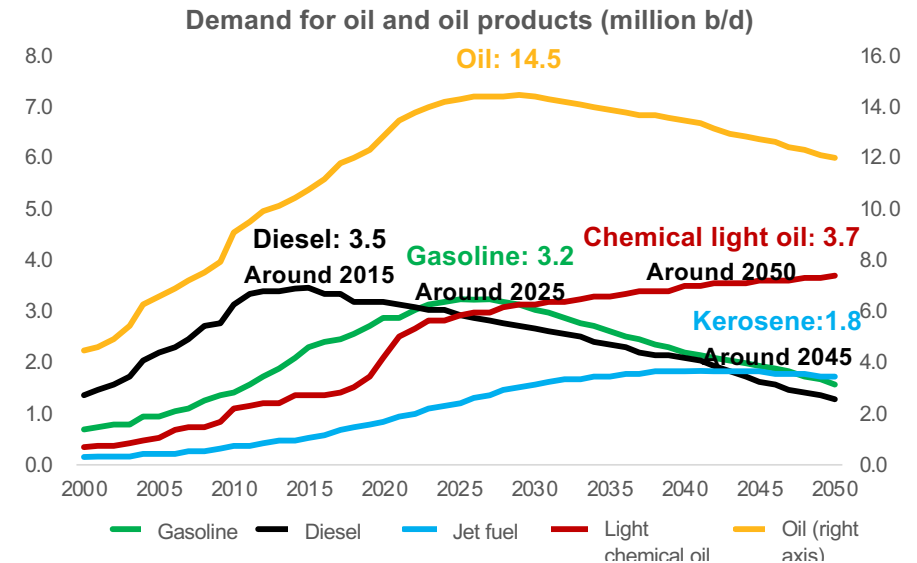
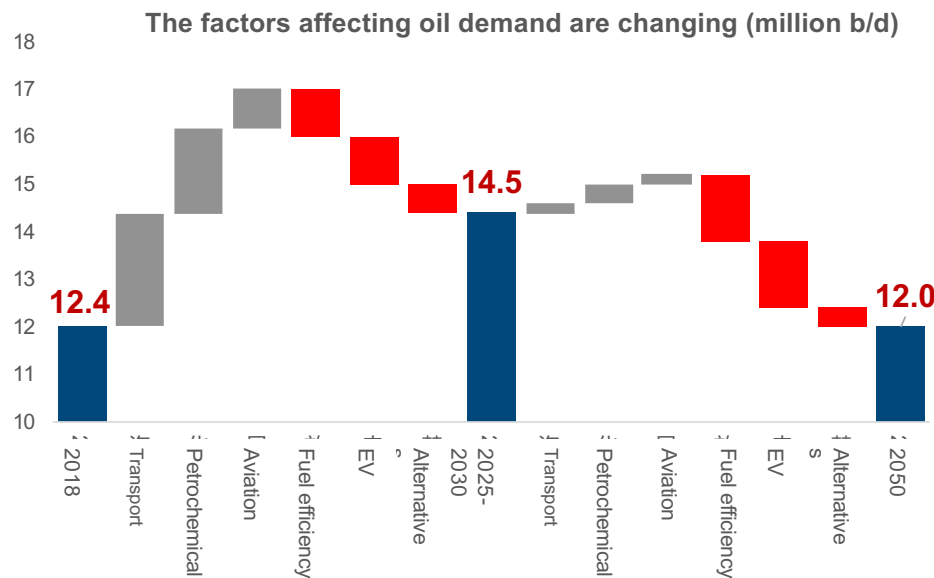


**In the future:
Oil demand growth shifting from fuel-driven to
petrochemical feedstock-driven**

Outlook for demand-The key driver for China oil demand is shifting from fuel to petrochemical feedstock

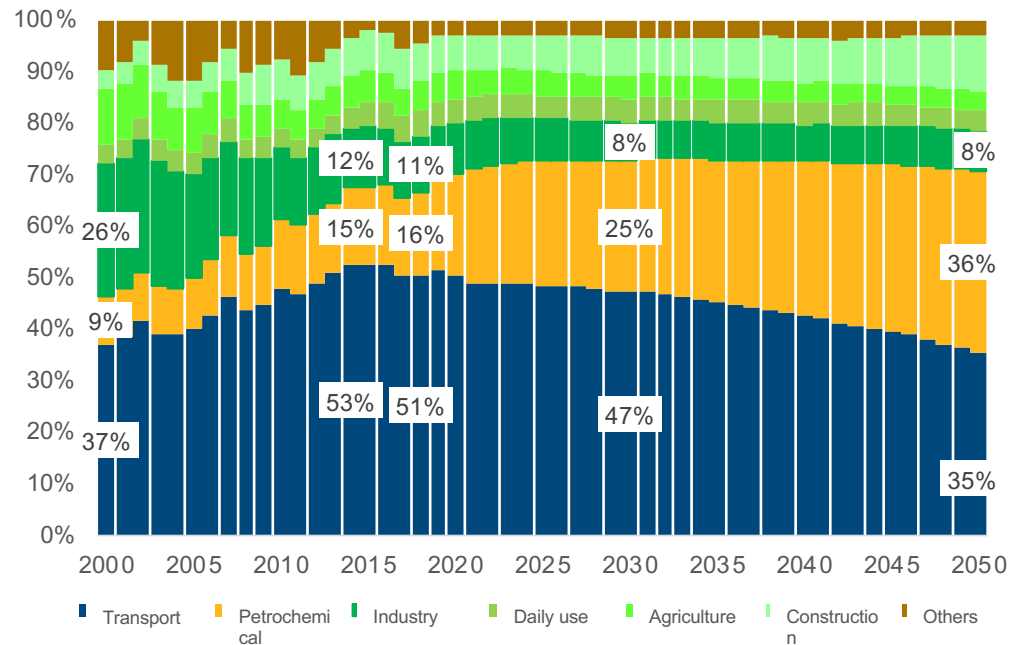
The rough picture:

- The future oil consumption will peak due to factors such as economy, population, fuel economy and EV deployment.
- Compared with the relative rigid demand of jet fuel and petrochemical feedstock, gasoline and diesel are more likely to be replaced.
- There is still uncertainty about vehicle fuel economy improvement and the development of electric vehicles.



Driver shifting--Fuel-oriented oil consumption in China is decreasing

The trend of oil consumption structure in China



Industry:

Oil consumption declines while NG and electricity use increase in the advanced stage of industrialization.



Petrochemical industry

In order to meet the growing demand for "clothing and daily use", oil consumption is increasing.



Transportation

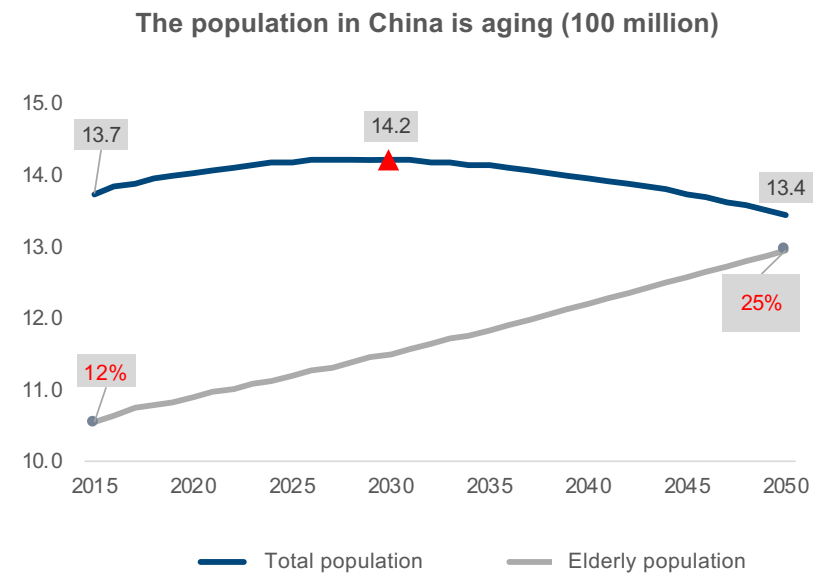
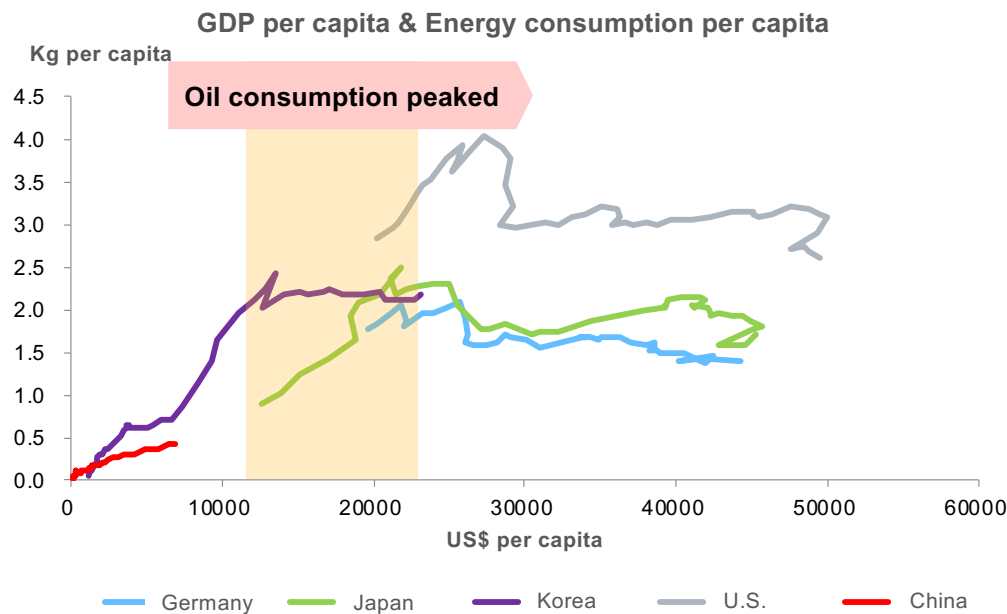
2000-2014: The growth in car ownership drove the growth of oil consumption.

2014-2030: Commercial vehicle ownership trends to be saturated and fuel economy is being improved.

2030-2050: Travel modes will change and the development of EV will accelerate.

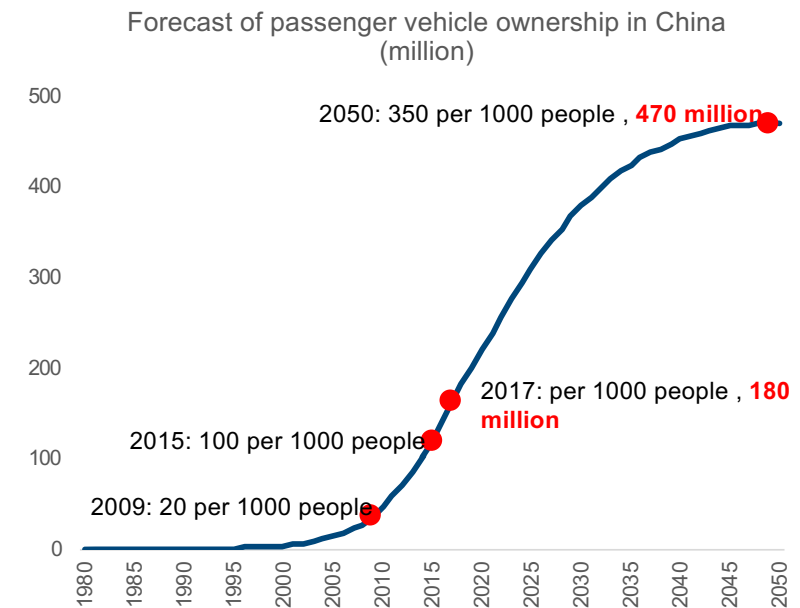
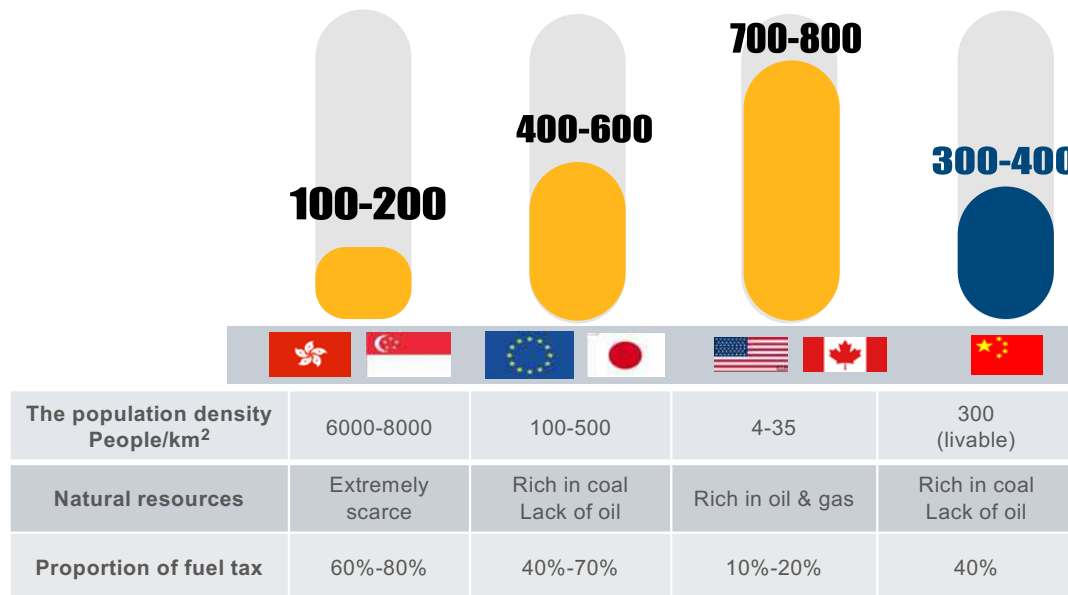
- China's oil demand reached 12.4 million b/d in 2018. What's more, the oil consumption structure has changed or is about to change.
- Instead of transportation fuel, petrochemical feedstock will become the major refining product by 2050.

Macro driver- Large potential of per capita consumption and the gradually emerging demographic impact



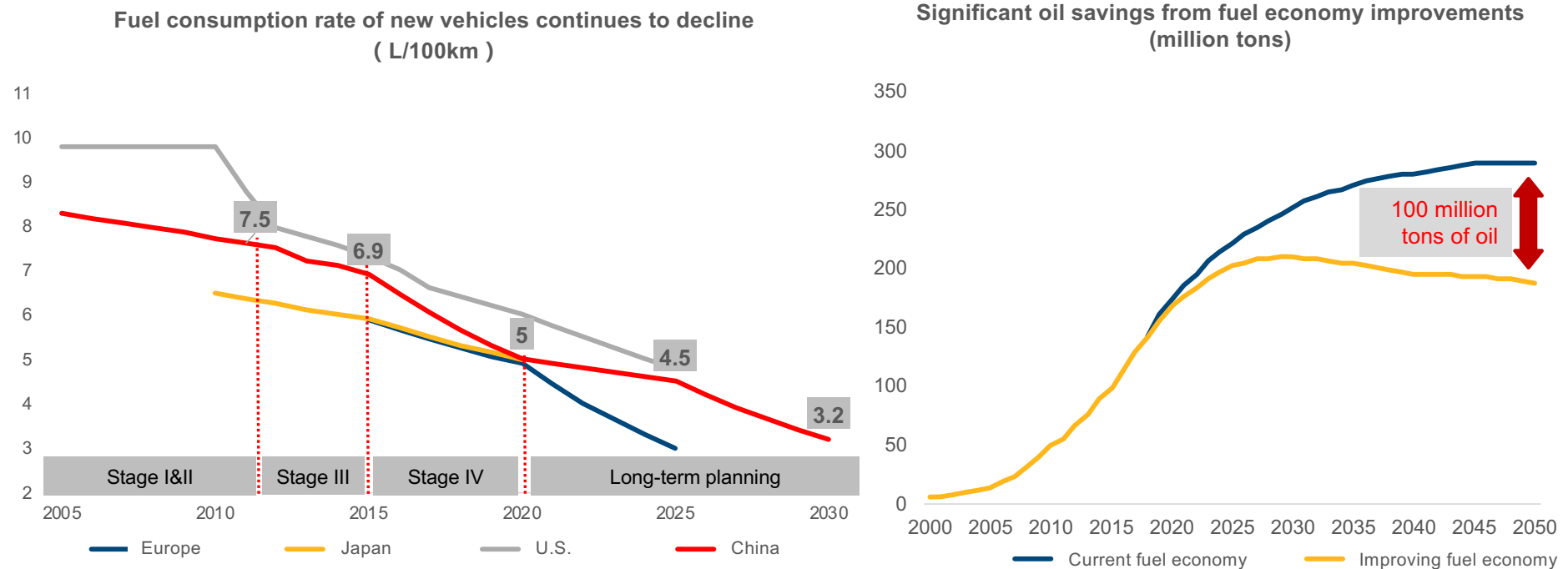
- Compared with other countries, the energy consumption per capita GDP of China is still rising.
- In the future, China's GDP growth will slow down, but the quality of economic growth will be improved.
- The fertility rate is declining in China and the population will peak before 2030.

Industrial driver-Broad prospects for China auto industry in the take-off period



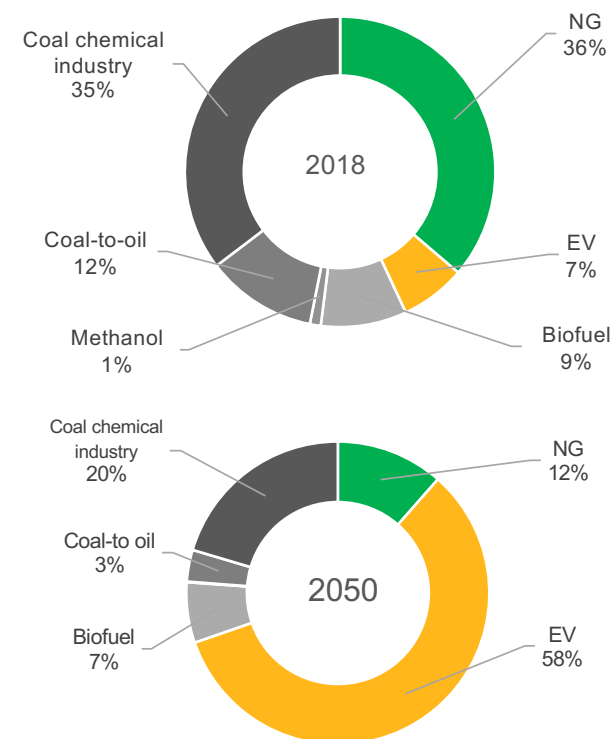
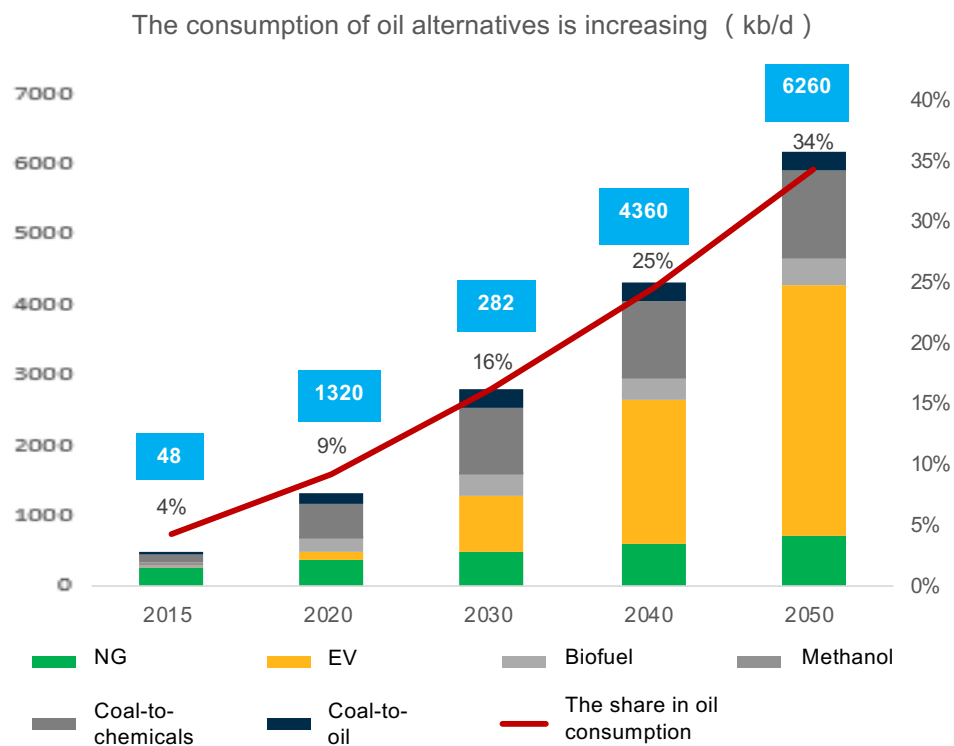
- Currently, the vehicle ownership in China was 130 vehicles per 1000 people, which is still in the take-off period of auto industry compared with developed countries.
- Considering the high density of population and the lack of oil and gas resources in China, the saturation level of vehicle ownership will not be too high. Even so, the vehicle ownership will still double that of now by 2050.

Industrial driver-Improved fuel economy offsets the growth in transportation fuel demand



- Compared with Japan and Europe, China still has great potential to improve the fuel economy. Downsizing and hybrid technologies are feasible.
- If the fuel economy target of China is on schedule, it will save about 100 million tons of oil by 2050.

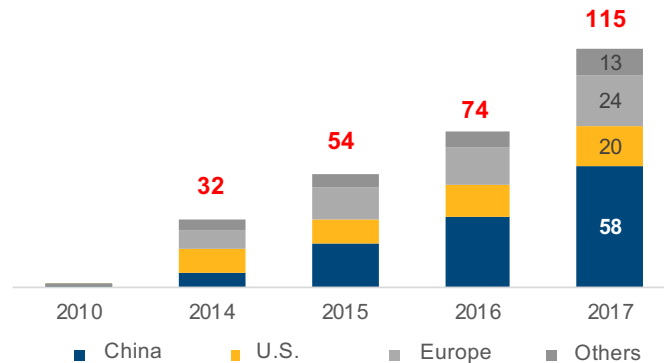
Alternative driver-Diversity of oil alternatives



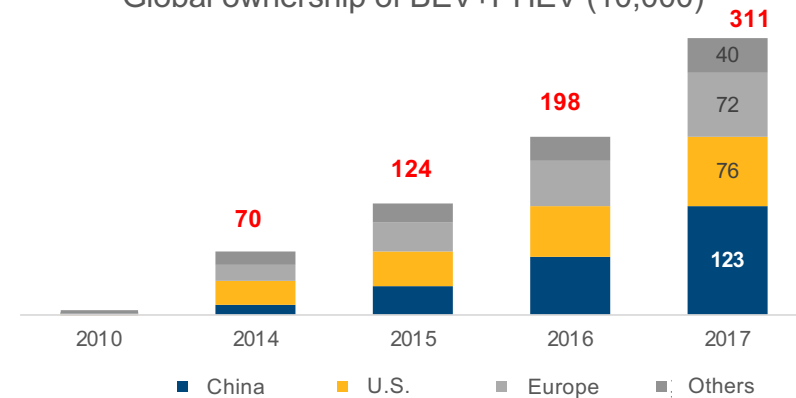
- Currently, natural gas and coal-to-liquid, coal-to-olefin are the main oil substitutes.
- After 2025, electric vehicles will replace natural gas as the first alternative.

Electric vehicles-The leading role of China in the global market ①

Global sales of BEV+PHEV (10,000)



Global ownership of BEV+PHEV (10,000)

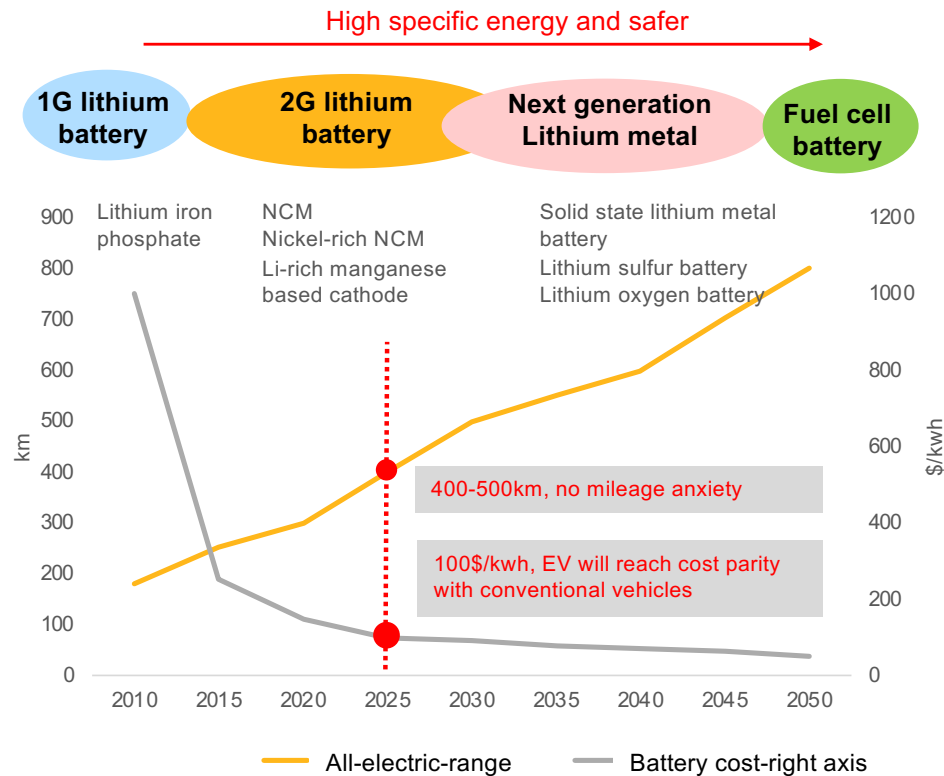


Targets for EV development in major countries

Country	2020	2025	2030	Technology roadmap
China	5 million Penetration rate: 7%	20 million Penetration rate: 15%	80 million Penetration rate: 40%	Mainly BEV
US	1.2 million	/	/	BEV & PHEV
Japan	/	/	Penetration rate: 50%-70%	BEV, HEV & PHEV
Germany	1 million	/	5 million	BEV & PHEV
France	2 million	/	/	Clean energy vehicles
UK	1.6 million	/	/	Ultra-low emission vehicles
Norway	400,000	100% zero emission	/	BEV/HEV/PHEV/FCV

- In 2018, China EV sales accounted for about half of global EV sales.
 - EV Sales: 1.26 million, market penetration rate: 4%
 - EV ownership: 3.1 million, accounting for 1.6% of the total domestic vehicle stock
- With clear government targets, EV may become the direction for the future auto industry in China.

Electric vehicles-The decisive period: 2025-2030 ②



Technology roadmap for EV development

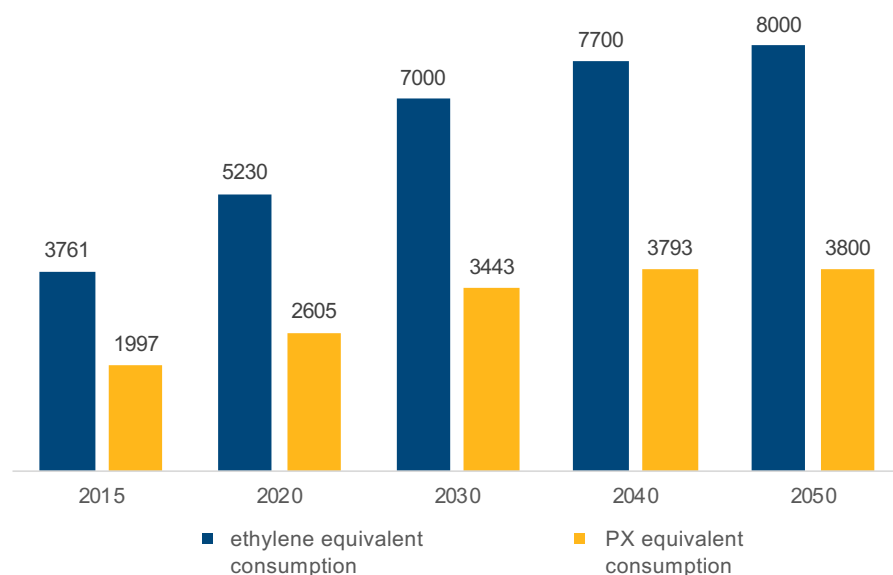
Battery material <ul style="list-style-type: none"> Scarcity of lithium and cobalt resources Technology progress 	Tax reform issues <ul style="list-style-type: none"> fuel tax Purchase tax reduction for EV
Technologies for car sharing <ul style="list-style-type: none"> Sensing techniques Infrastructure such as high-precision maps Revisions of policies and regulations 	Infrastructure <ul style="list-style-type: none"> Charging facilities Charging service economy Impact of peak charging load on the grid

- 2025: EV will reach cost parity with conventional vehicles, which makes large-scale promotion possible.
- After 2030: Level 5 autonomous driving will be ready to be commercialized.
- There is still uncertainty in the development of EV.

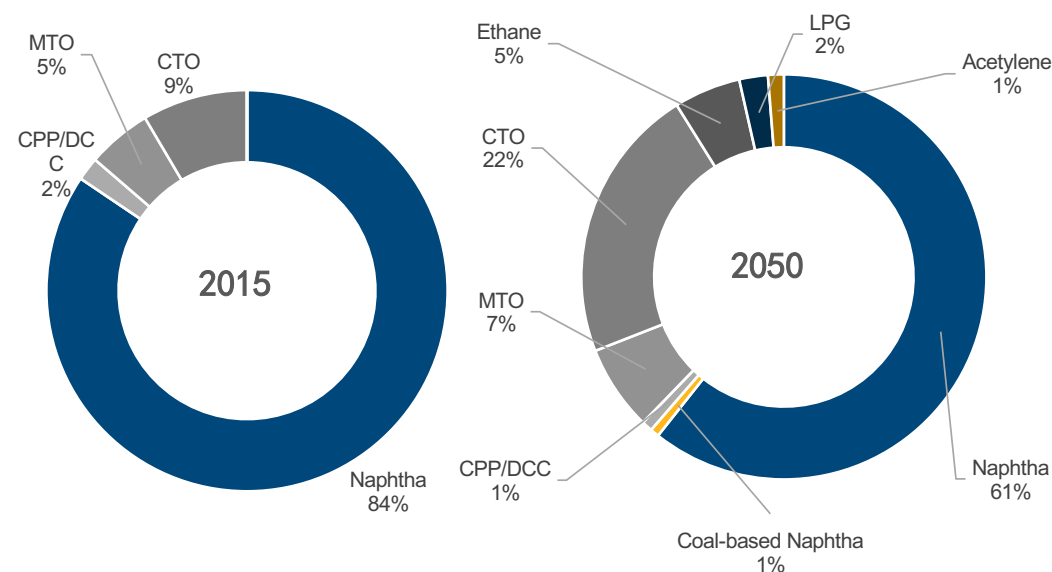
Industrial driver-Significant growth of oil demand in petrochemical industry



Ethylene and PX demand (10,000 tons)



Changes in feedstock structure for ethylene



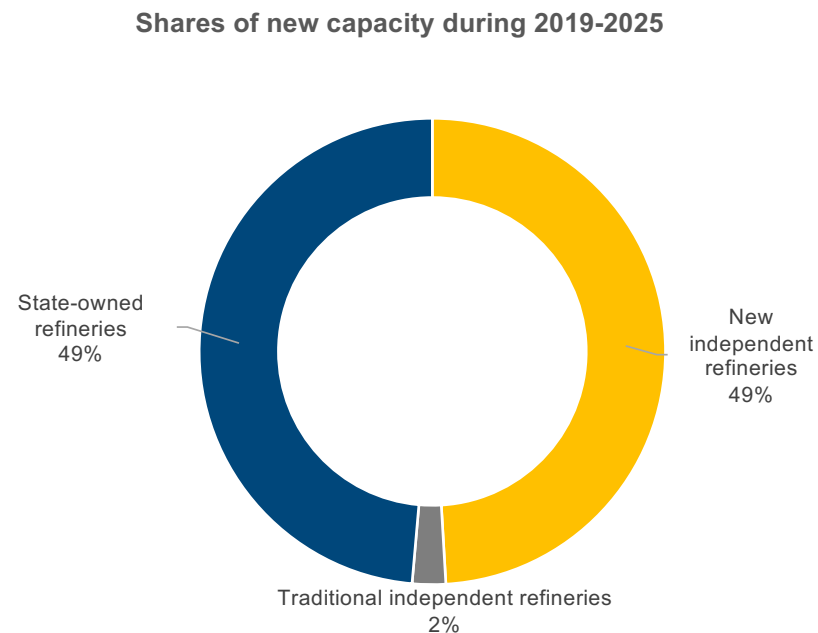
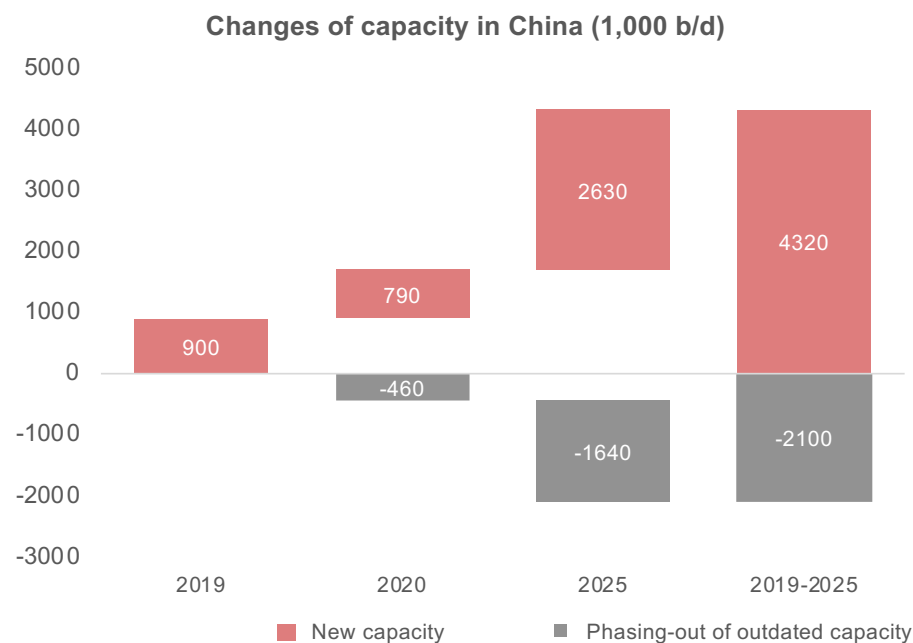
- In the future, with the improvement of living standards, auto, home appliances, textiles and real estate industries in China will continue to develop. Significant growth is expected in ethylene and PX consumption.
- Despite the diversification trend, Ethylene feedstock will still be dominated by petroleum-based feedstock.



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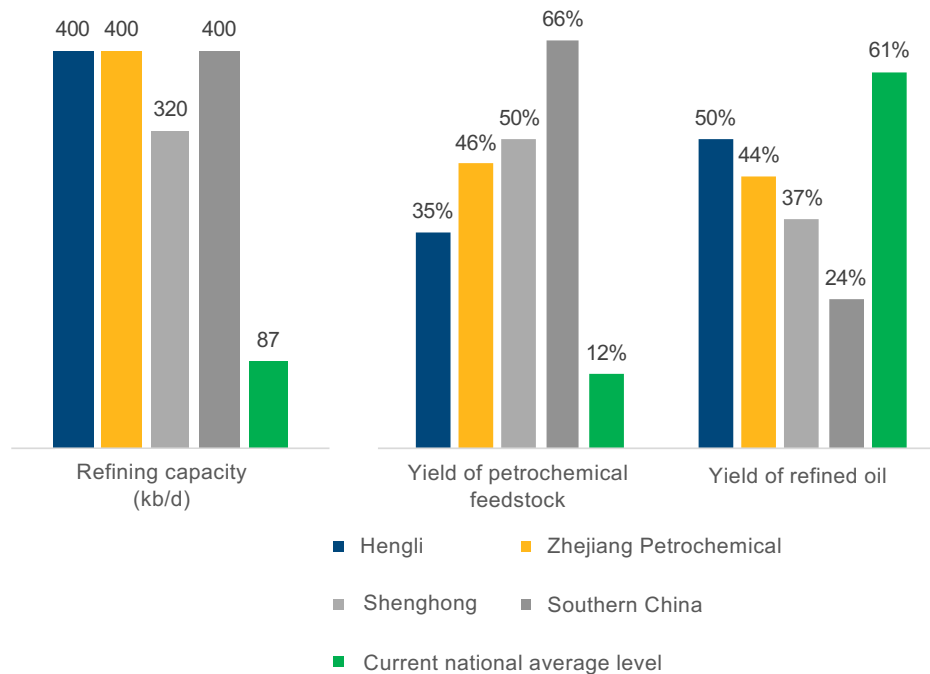
Transformation and upgrading of refining industry in China under a new round of investment

Advanced capacity will replace outdated capacity in the future

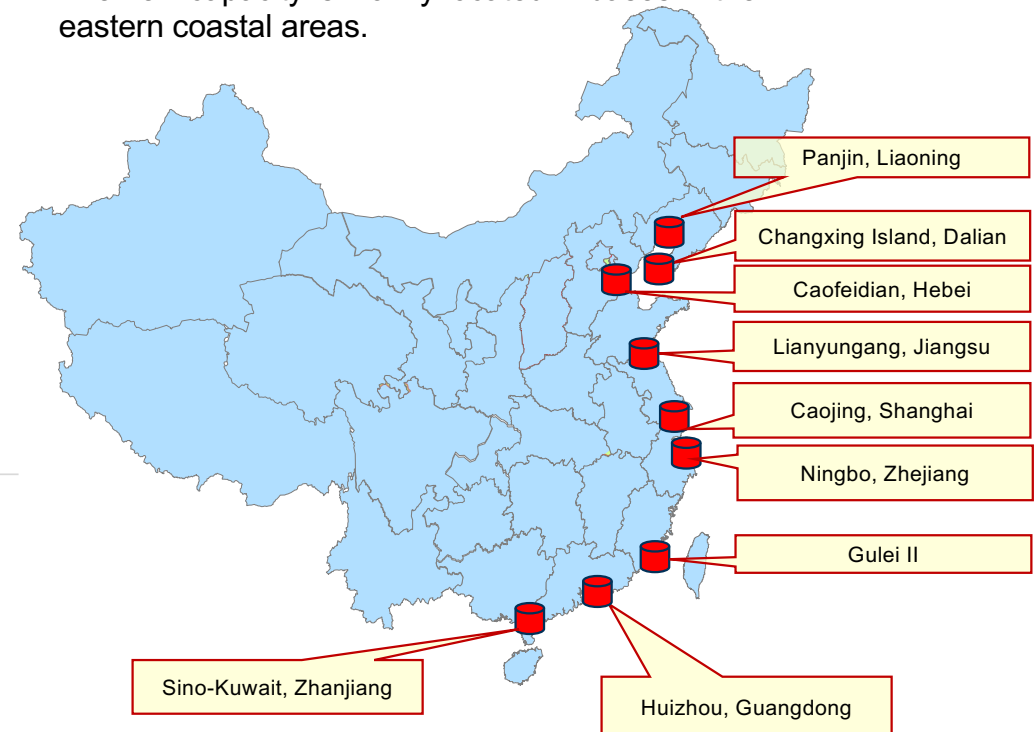


- China will have 4.32 million b/d new capacity and phase out 2.1 million b/d backward capacity before 2025.
- The total capacity will reach 18.8 million b/d by 2025.

New capacity will be more concentrated, larger and more integrated



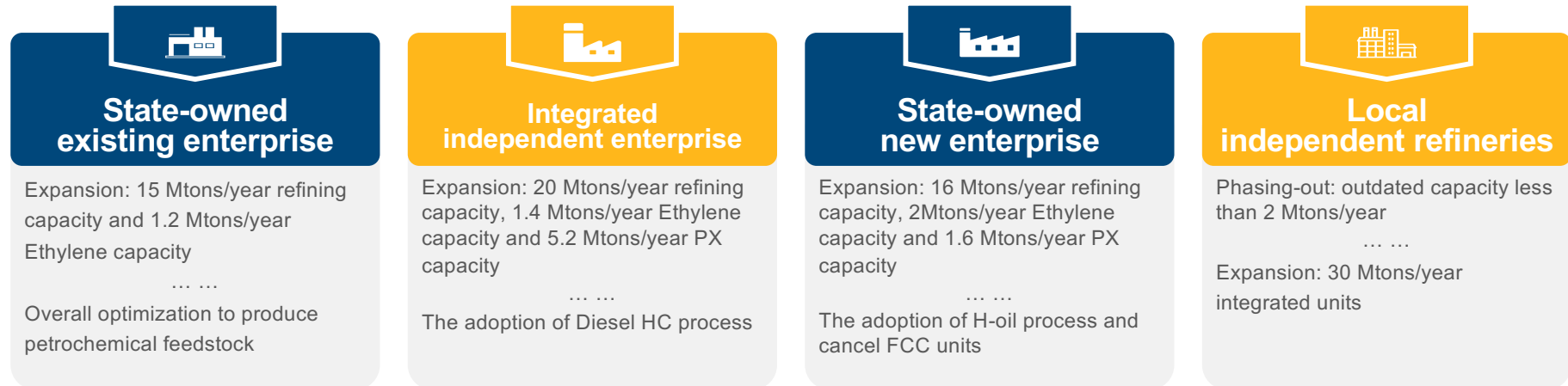
The new capacity is mainly located in bases in the eastern coastal areas.



- Under competition and the pressure of environmental protection, new capacity will be larger, more concentrated and integrated, and be more involved in the export market.
- Crude oil will be fully used in the processing.

Refineries are seeking a way out according to their own characteristics

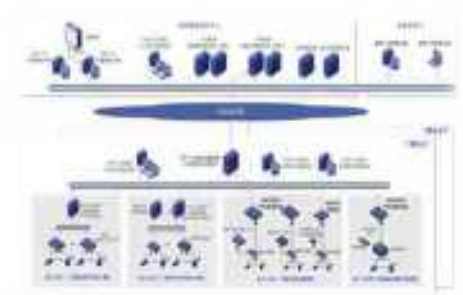
Transformation path



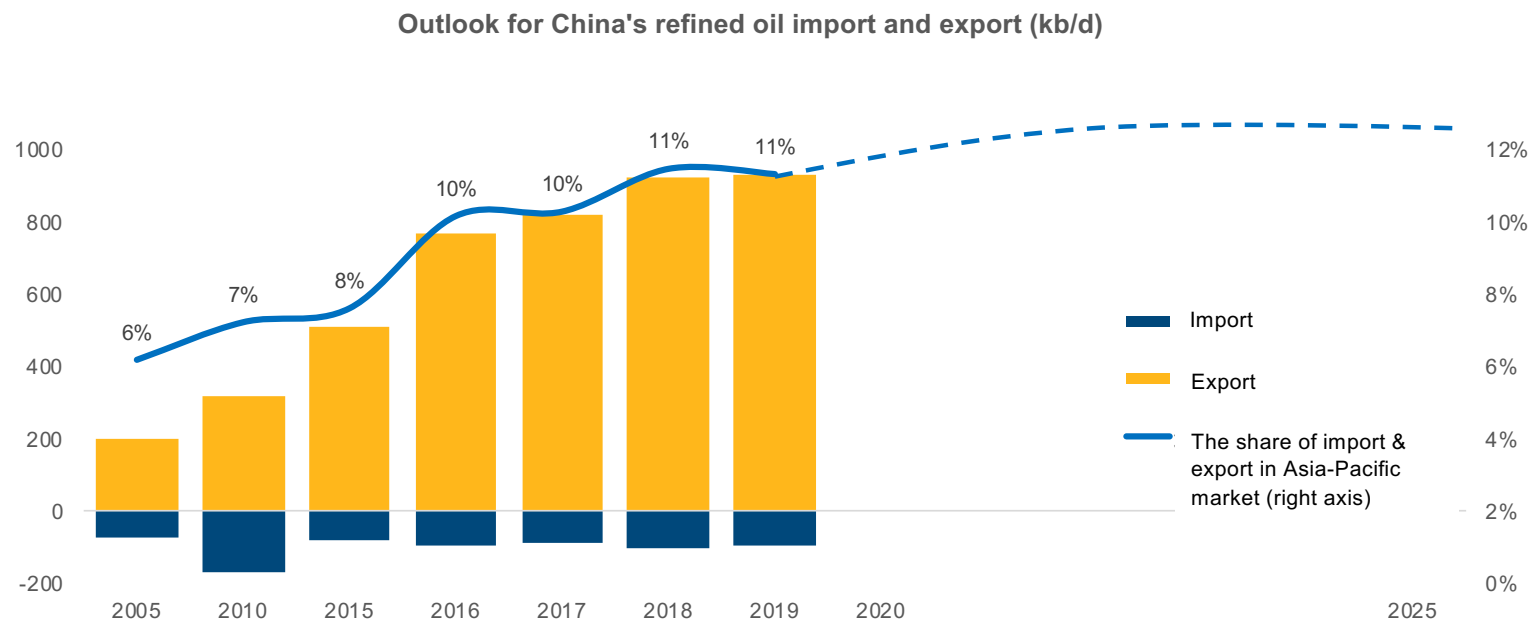
Environmentally friendly & Digital

Emission reduction from the source
 Process control enhancement
 End treatment

IOT in refineries
 Process optimization
 Monitoring of operation

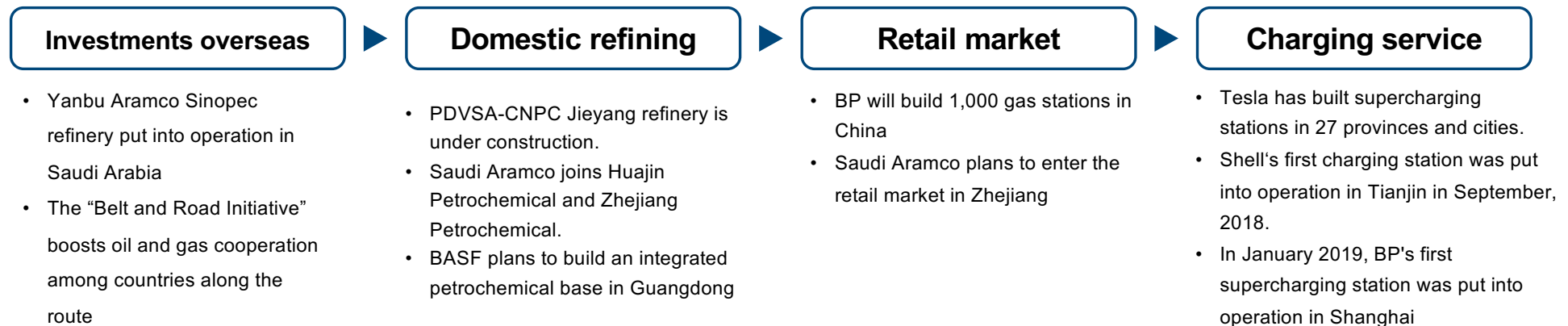


Increasing influence of China in the Asia-Pacific refined oil export market



- In 2018, China's refined oil exports increased by 1.9 times compared with 2010 and became the fourth largest exporter in the Asia-Pacific region. (Top 3: Korea, Japan and India)
- Due to the low yield of refined oil in new capacity, the net export of refined oil will not increase much by 2020-2025.
- In the future, large refineries in coastal areas will target both domestic and international markets.

A more opening-up refining market in China welcomes cooperation in various fields



Thank you



China's Energy Transition and Development Path



2019

Report series of China energy and petrochemical industry

Zuoxian Luo

March 20th 2019



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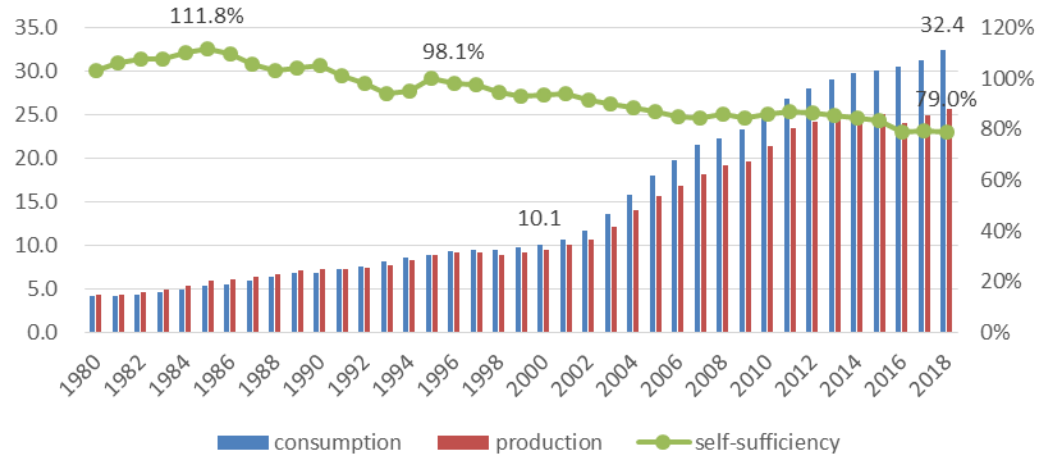
1. Evolution of China's Energy Supply and Demand Structure
2. Coal Demand and Development Trend
3. Oil Demand and Development Trend
4. Gas Demand and Development Trend
5. Non-fossil Energy Demand and Development Trend
6. Future Energy Demand and International Cooperation



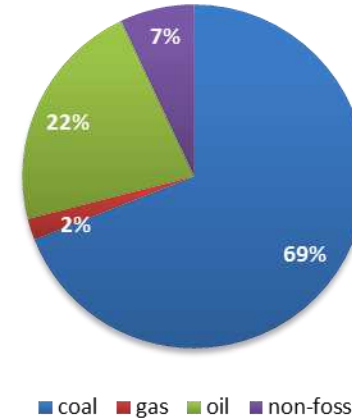
1 Evolution on China's Energy Supply and Demand

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

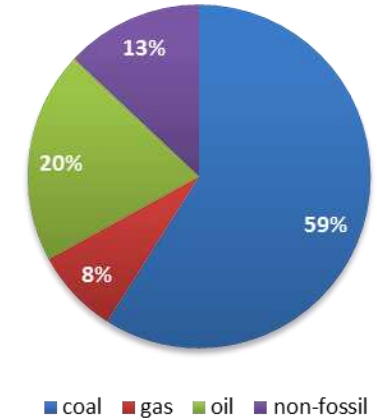
China's energy demand and supply(100 million tons of oil equivalent)



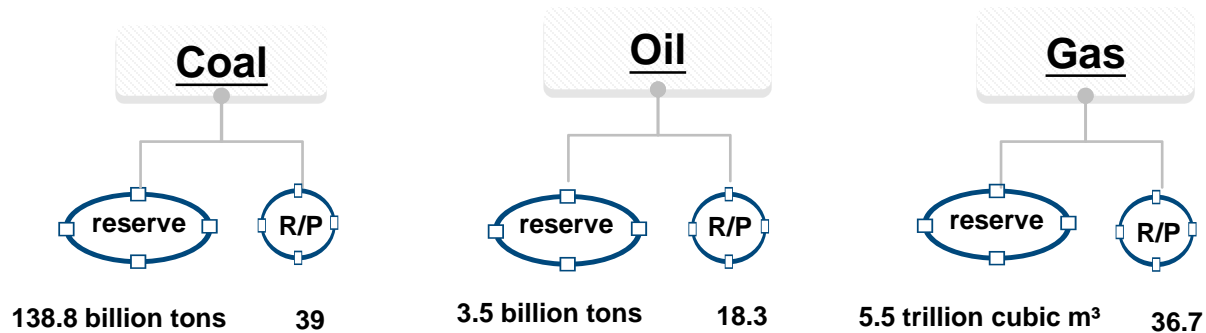
Primary energy proportion,2000



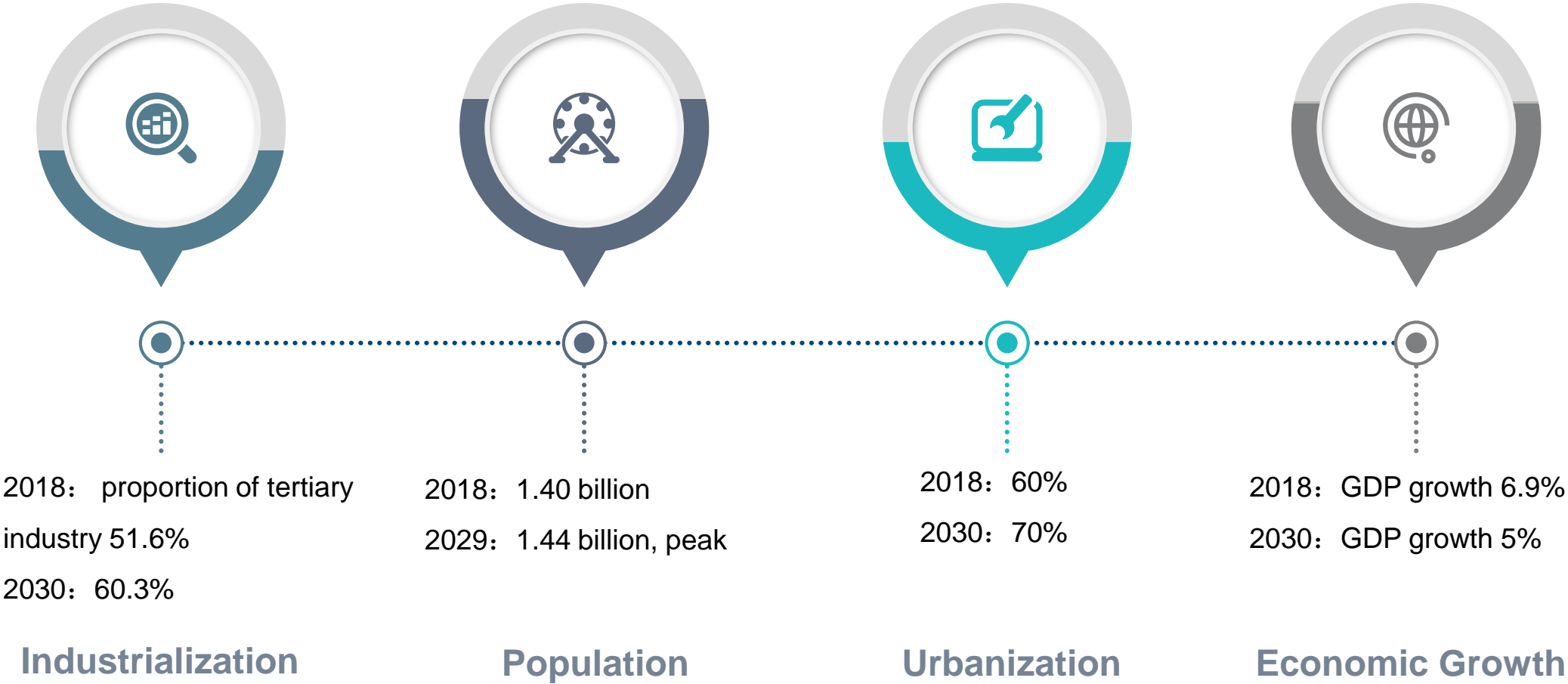
Primary energy proportion,2018



- 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

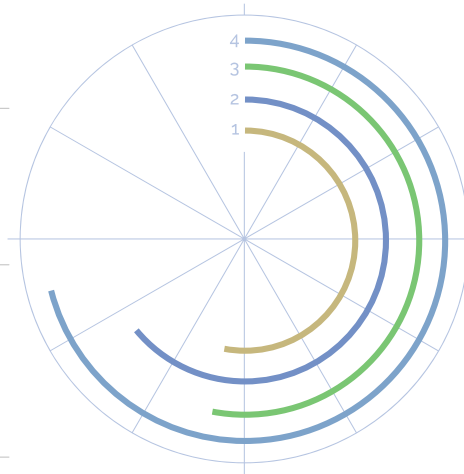
Overseas cooperation; one belt one road energy corridor

○ 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**

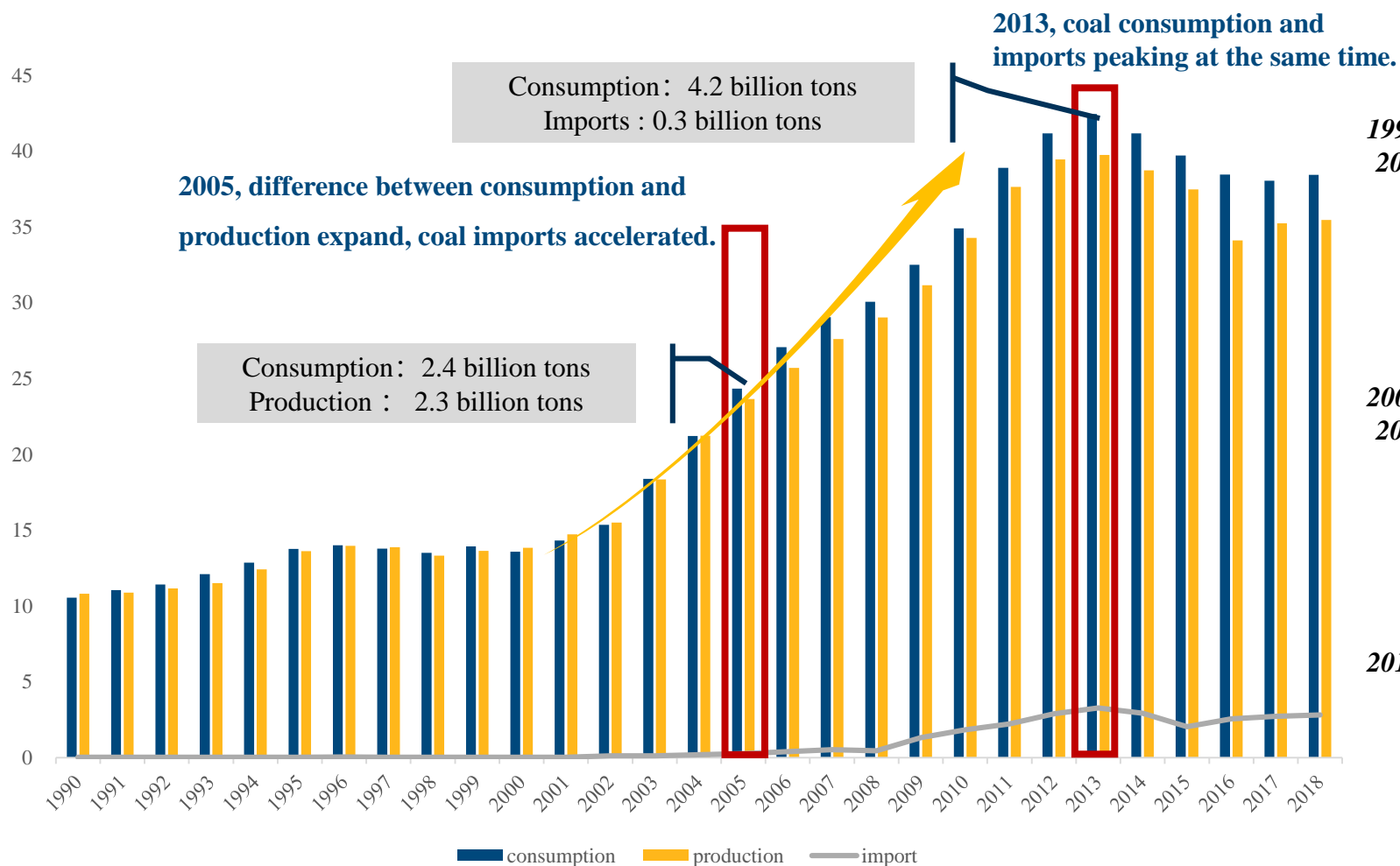
Non-fossil **24%**  **11% VS 2018**



2 Coal Demand and Development Trend

Coal consumption reached its peak on 2013

Coal consumption, production and imports (100 million tons)

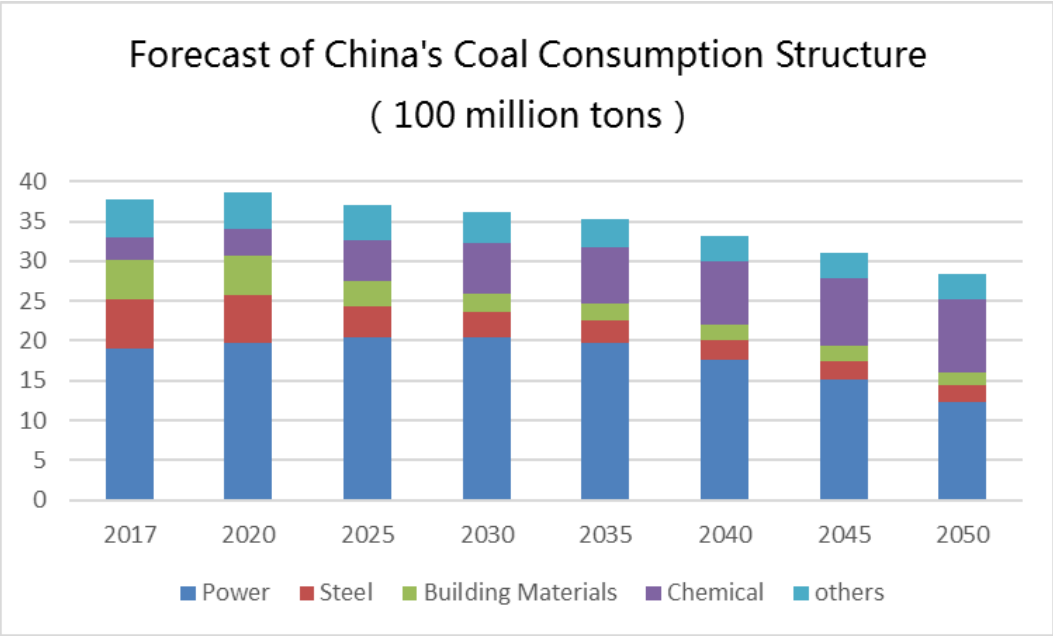


Three stages of China's coal consumption since 1990

- 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.

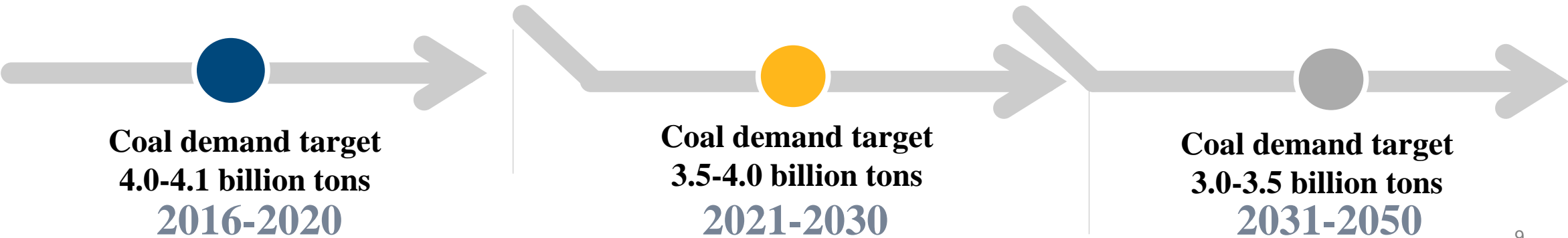
Building materials:

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



Chemicals

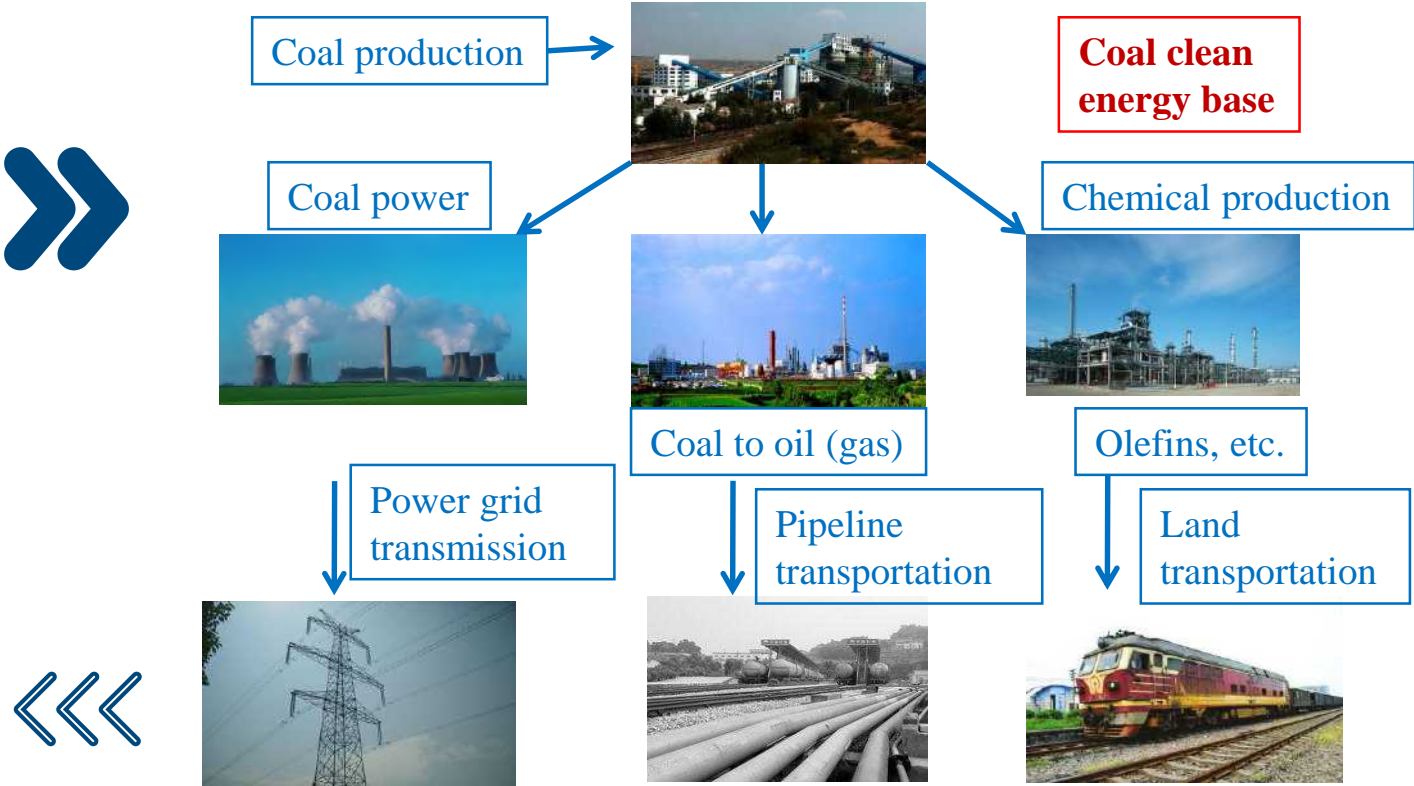
- ✓ Modern coal chemical industry develop
- ✓ Increase from **7%** in 2017 to **30%** in 2050.



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**



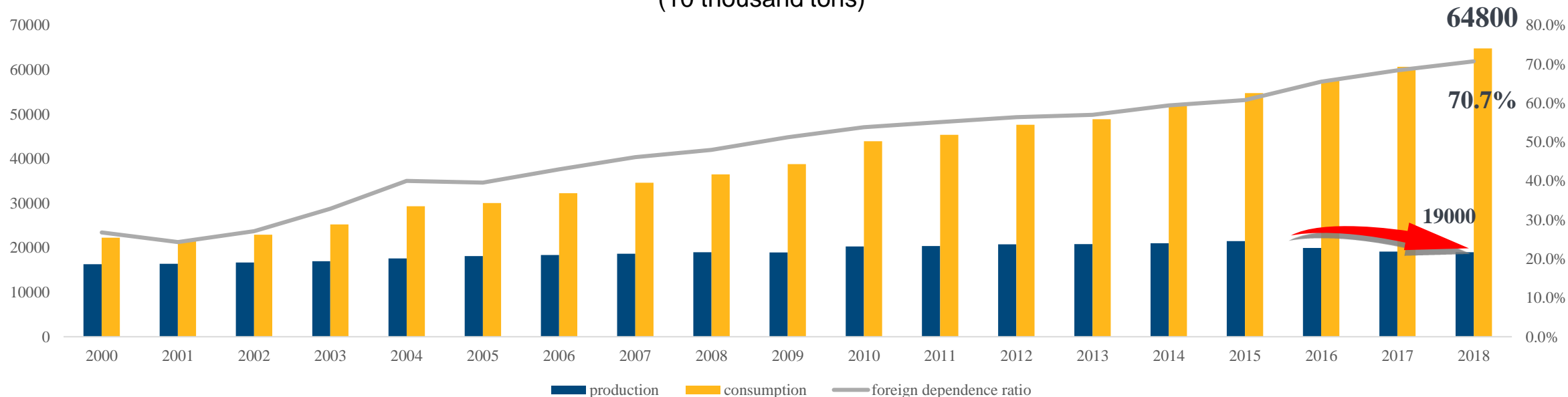
Around 2020, the output of **14 large coal bases** will be **3.7 billion** tons, accounting for more than **95%** of the total coal production.



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

199
million tons



2016

192
million tons



2017

190
million tons



2018

Refining
capacity
growth

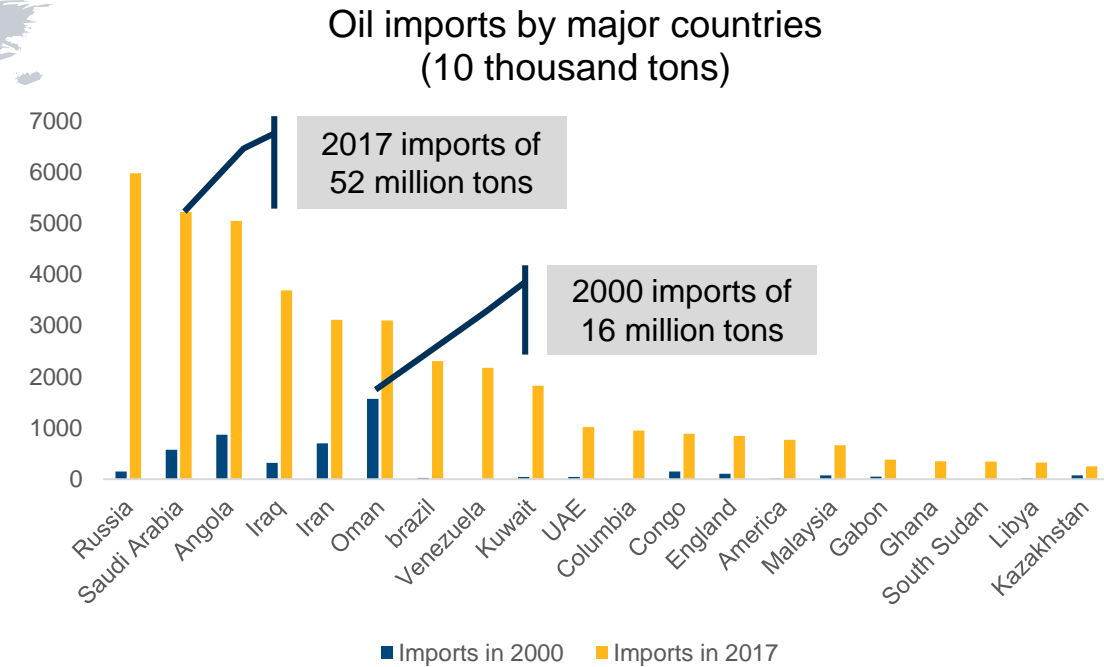
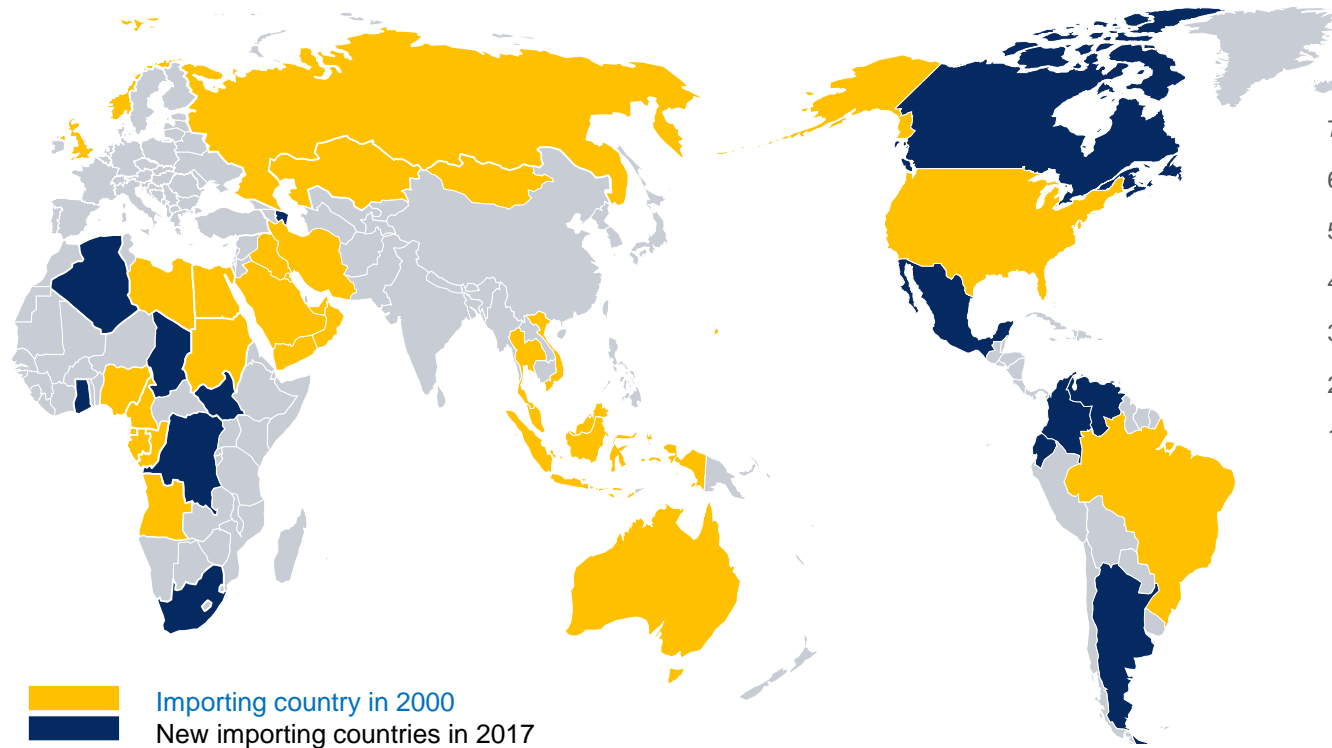
Net increase of **18 million**
tons
Refining capacity
reached **770 million** tons

2017

Net increase of **22**
million tons
Refining capacity
reached **830 million** tons

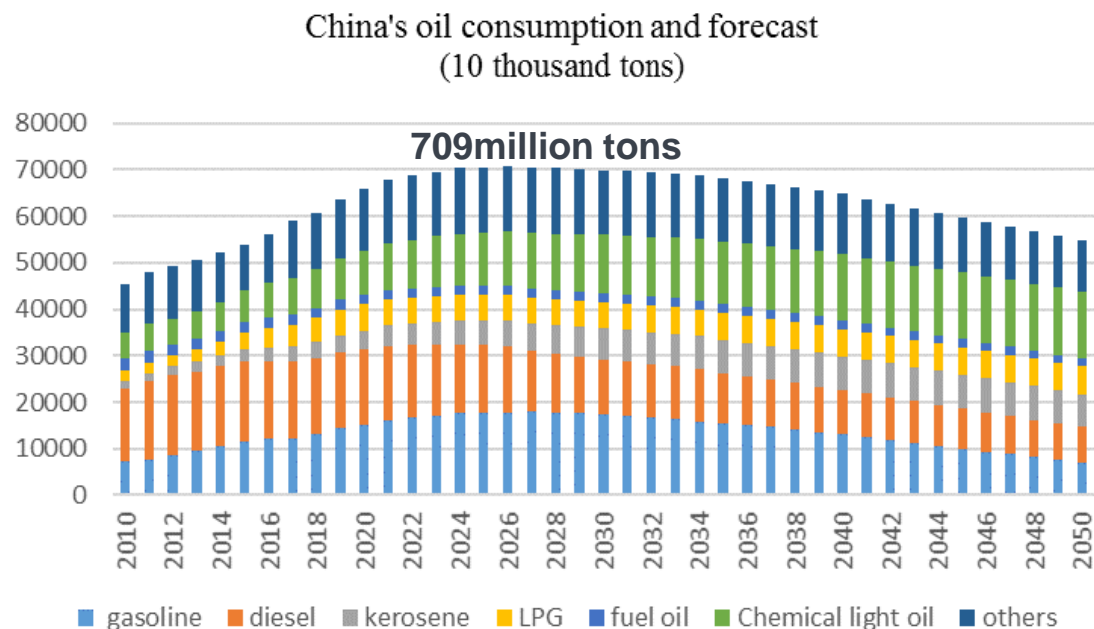
2018

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.



Data sources: EDRI

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.

- **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.

Domestic supply: widen E&P fields and EOR technologies

A large blue circle with a white center, containing the word "Resource".

Resource

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

A large gray circle with a white center, containing the text "Resource Conversion Rate".

Resource Conversion Rate

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

A large yellow circle with a white center, containing the text "Unconventionals".

Unconventionals

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

A large light gray circle with a white center, containing the word "Output".

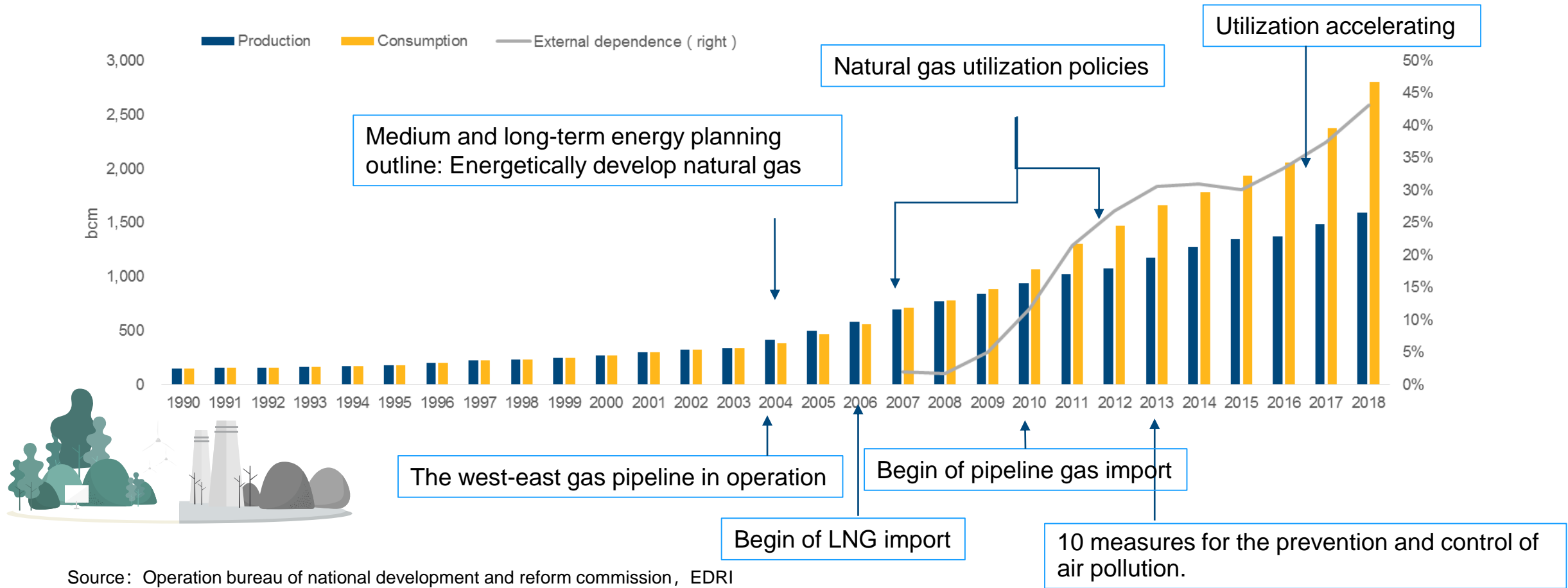
Output

- ✓ 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%



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

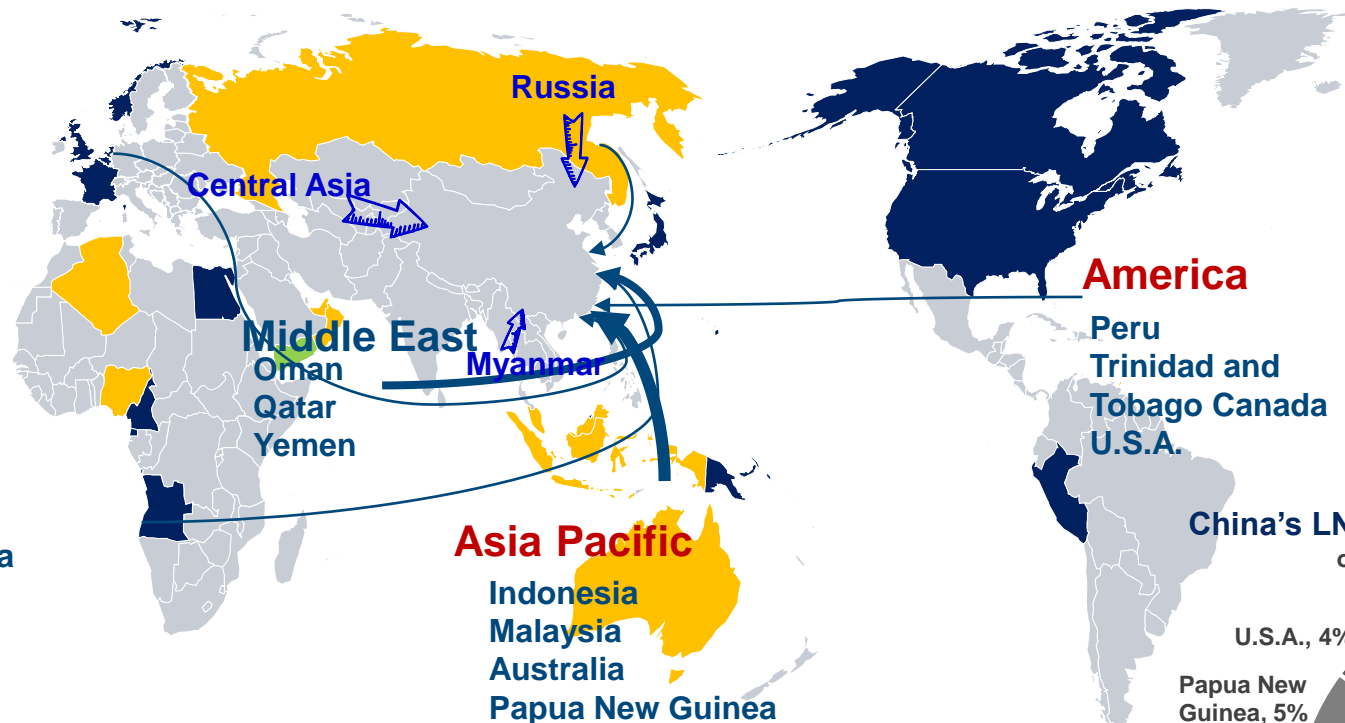
Map of LNG and pipeline gas import of China

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

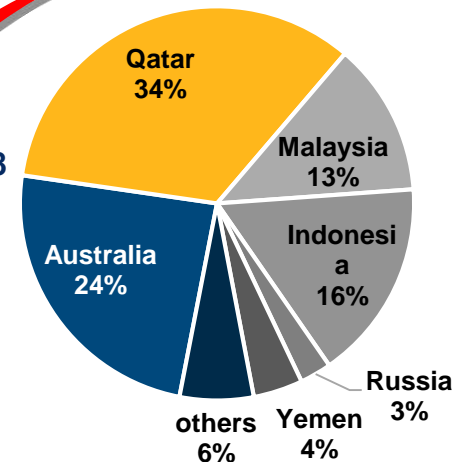
✓ China has imported LNG from more than **20 countries** in 2018.



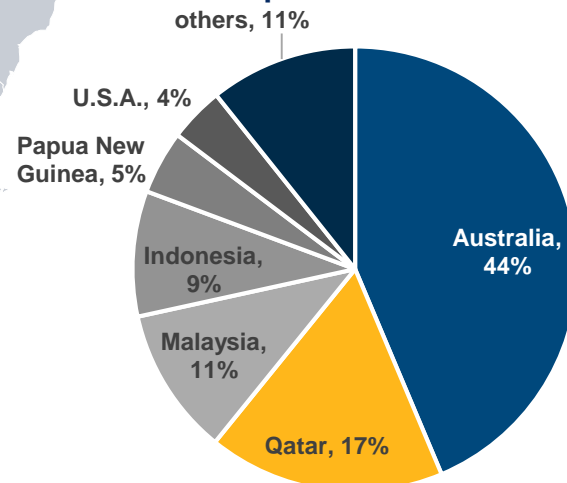
✓ **2006-2007**, 85% came from long-term contracts in Australia
✓ The rest from spot contracts in Oman, Algeria and Nigeria.

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

China's LNG import structure in 2012

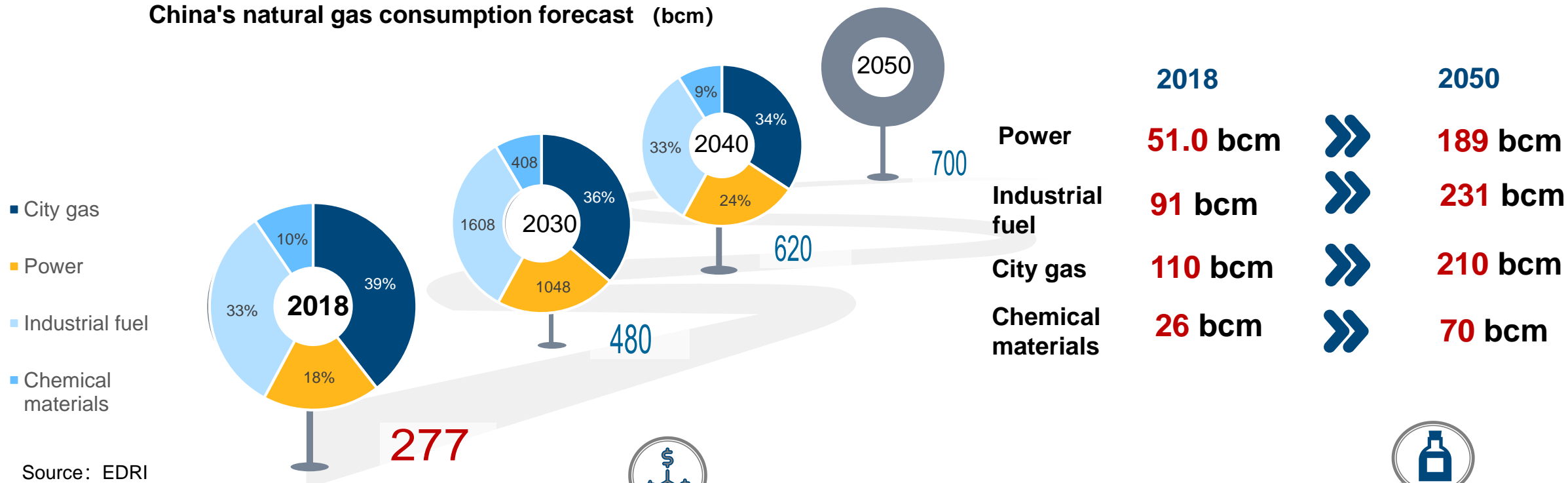


China's LNG import structure in 2018



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.



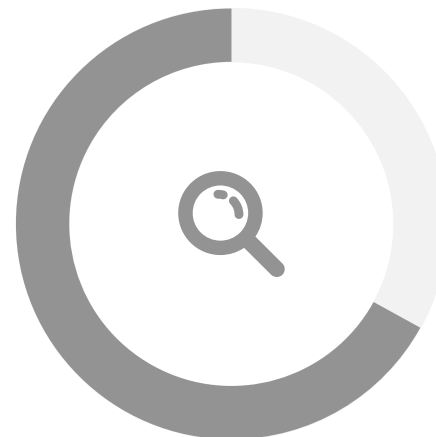
Pipeline network interconnection

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,.



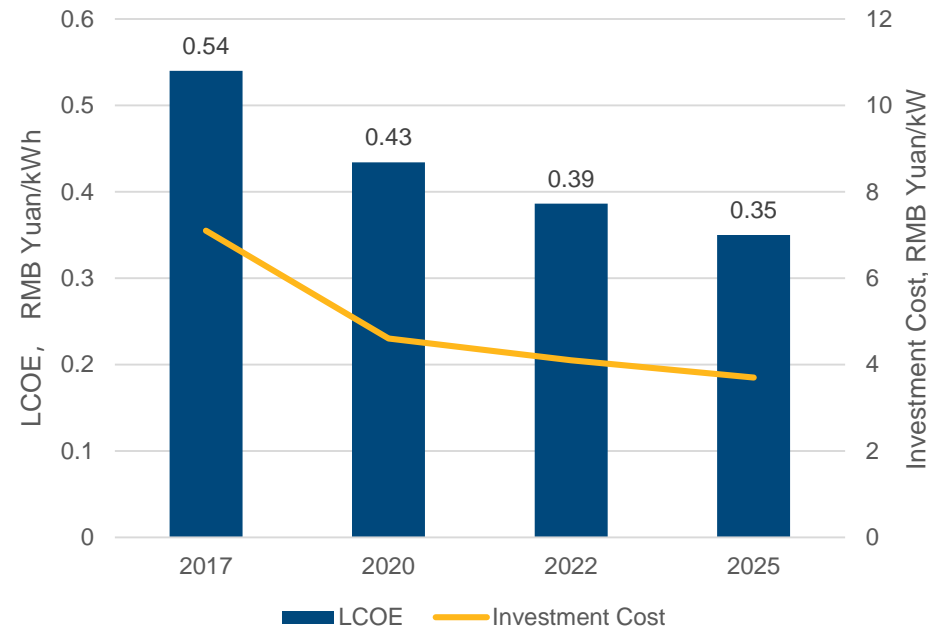
5

Non-fossil Energy Demand and Development Trend

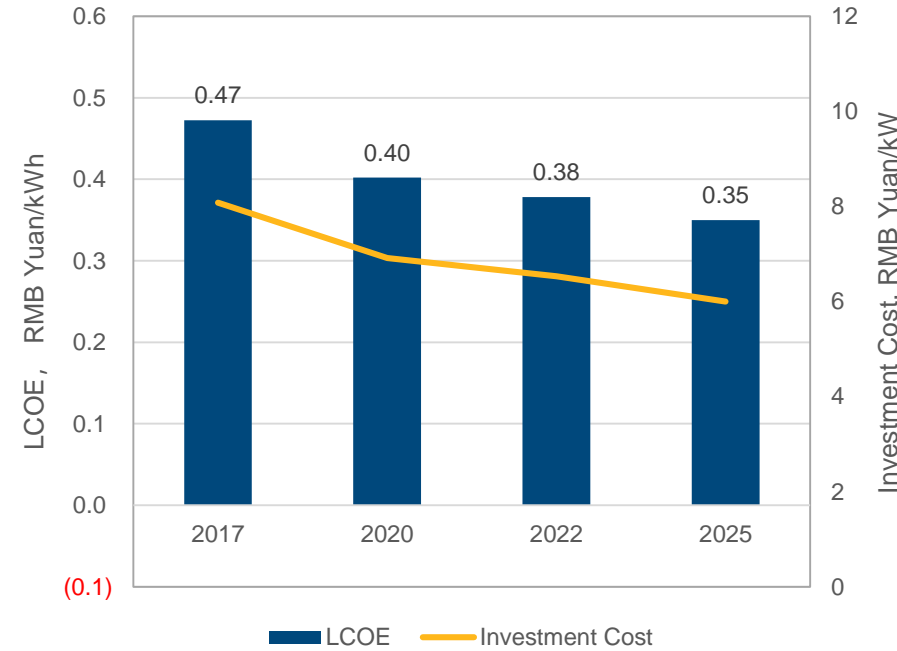
Technological advancements enhance Non-fossil energy’s competitiveness

- ✓ 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



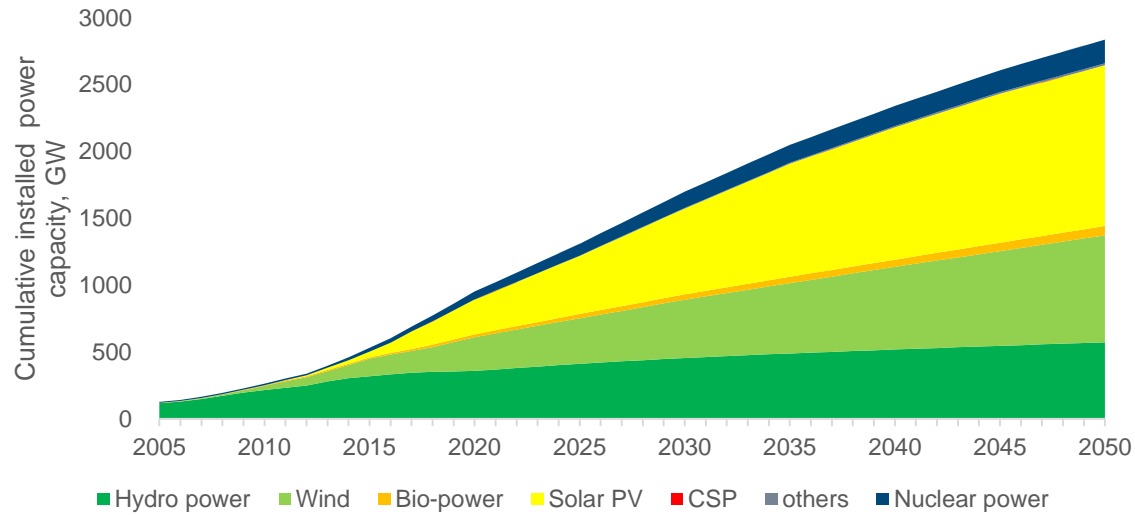
China’s onshore wind power station installed cost and LCOE



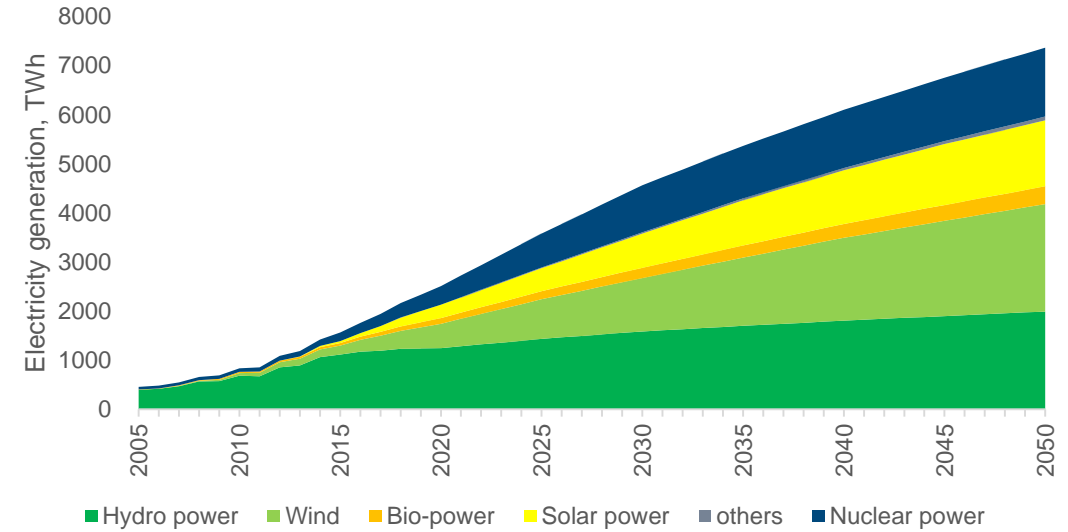
Note: National average, LCOE: Levelized Cost of Electricity. Data sources: Chinese State Grid Energy Research Institute, IRENA

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

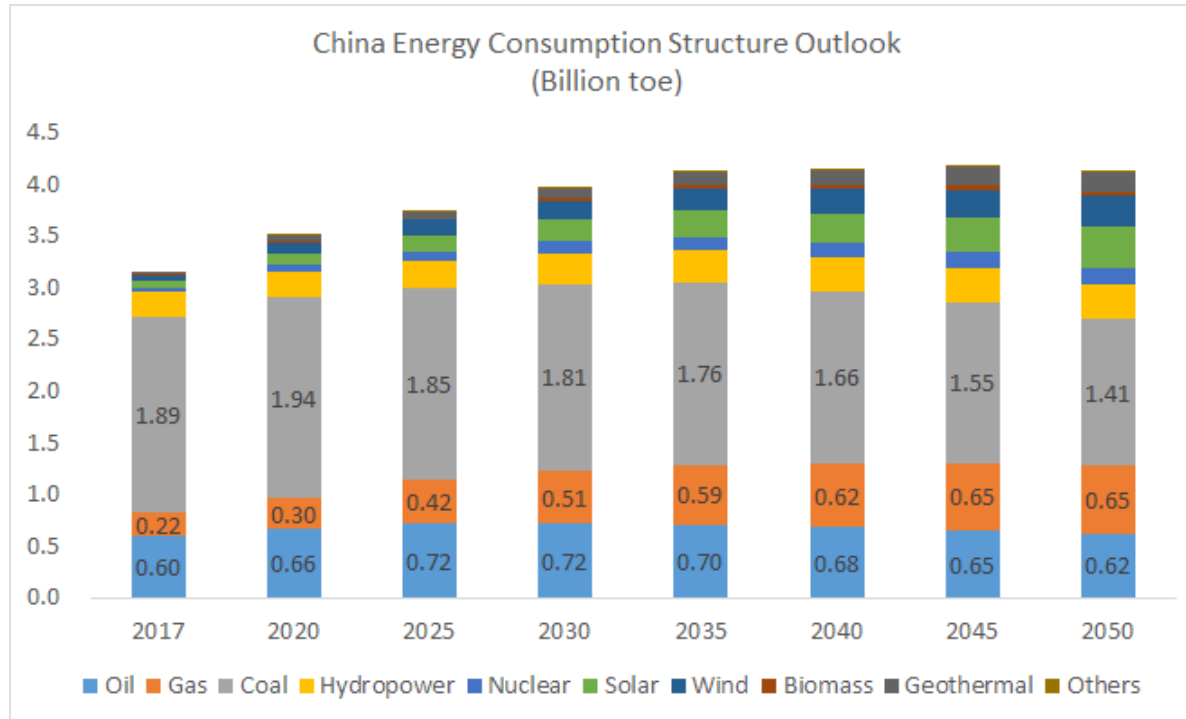


- 2018, China's non-Fossil energy cumulative installed power capacity is **780 GW**, **40%** of the total installed power capacity, generating **2200 TWh** of electricity, **30%** of total electricity generation.
- 2050, China's non-Fossil energy cumulative installed power capacity will be over **2800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



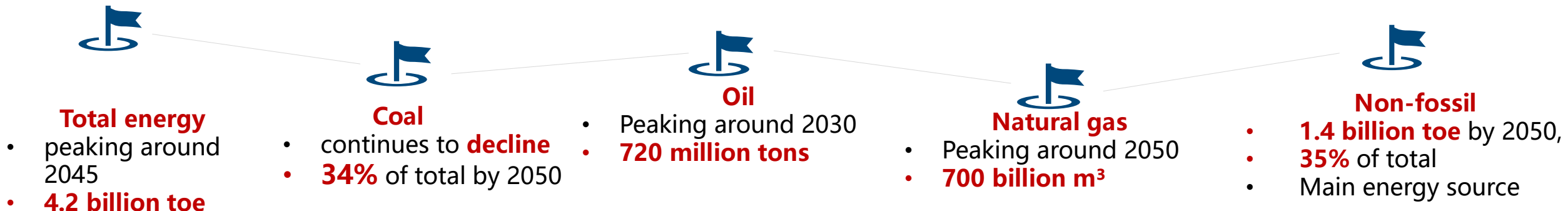
6 Energy Demand & International Cooperation Outlook

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



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

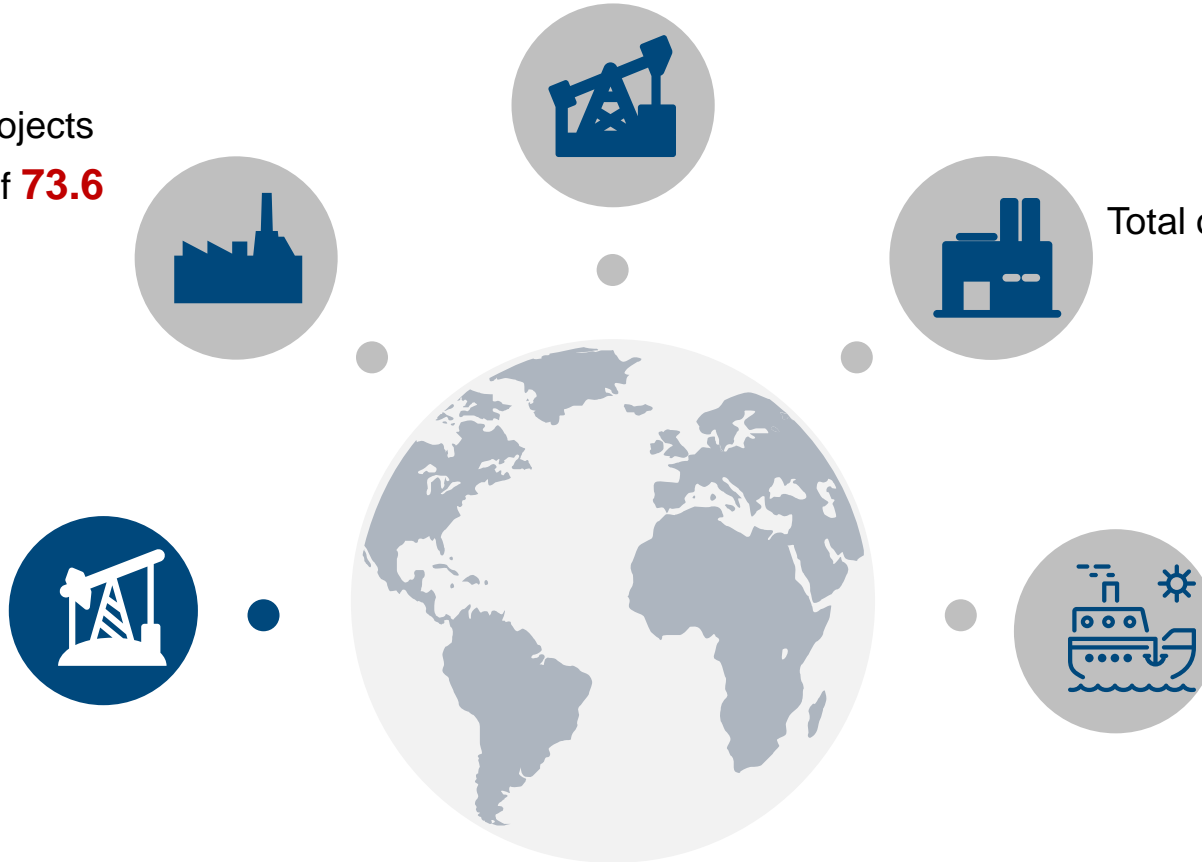
Total overseas investment : 200 billion yuan

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



Review and Prospect of China's Energy and Petrochemical Industry



2019

Report series of China energy and petrochemical industry

Jiao Yu

March 25th 2019



The release of 2019 Annual Report of China Energy and Petrochemical Industry



3 Modules

- Economy Forecast
- Market Analysis
- Insights on Hot Events

6 Industrial Chains

Refinery 、 C2 、 C3
C4 、 PX 、 C6

3 Parts

- Energy
- Refinery Industry
- Chemical Industry

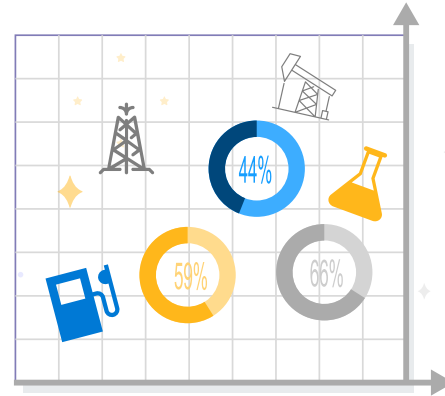
Over 40 Products

Crude oil, natural gas, refined oil,
ethylene, propylene, ethylene glycol,
butadiene rubber, acrylic



Main content of the 2019 report

Review **2018**



Prospect **2019**

How many ?

How much ?

Demand & Supply & Price

How to change ?

Pattern of Supply and Demand
&
Trend of Price

How to impact ?

Impacts of Hot Events

CONTENTS

1

The Development of China Energy and Petrochemical Industry over the Past 40 Years

2

The New Pattern of Long-term Development of Energy and Petrochemical Industry in China

3

Market Prediction for 2019



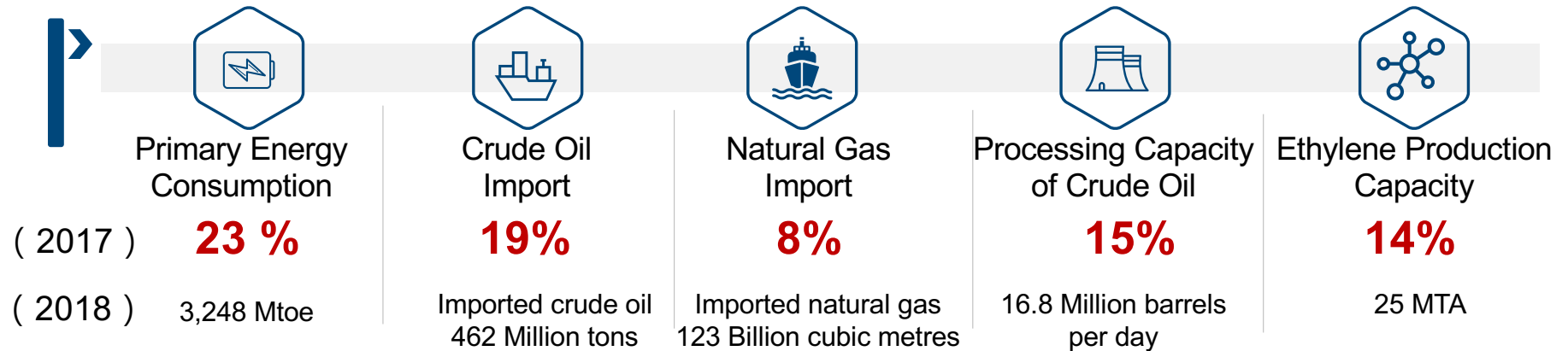


1

The Development of China Energy and Petrochemical Industry in the Past 40 Years

1. Has been the vital component of China's and even the world economy

An important role in global energy and petrochemical system



A vital position in the development of national economy

1978-2017年

11.6%

of national industrial assets

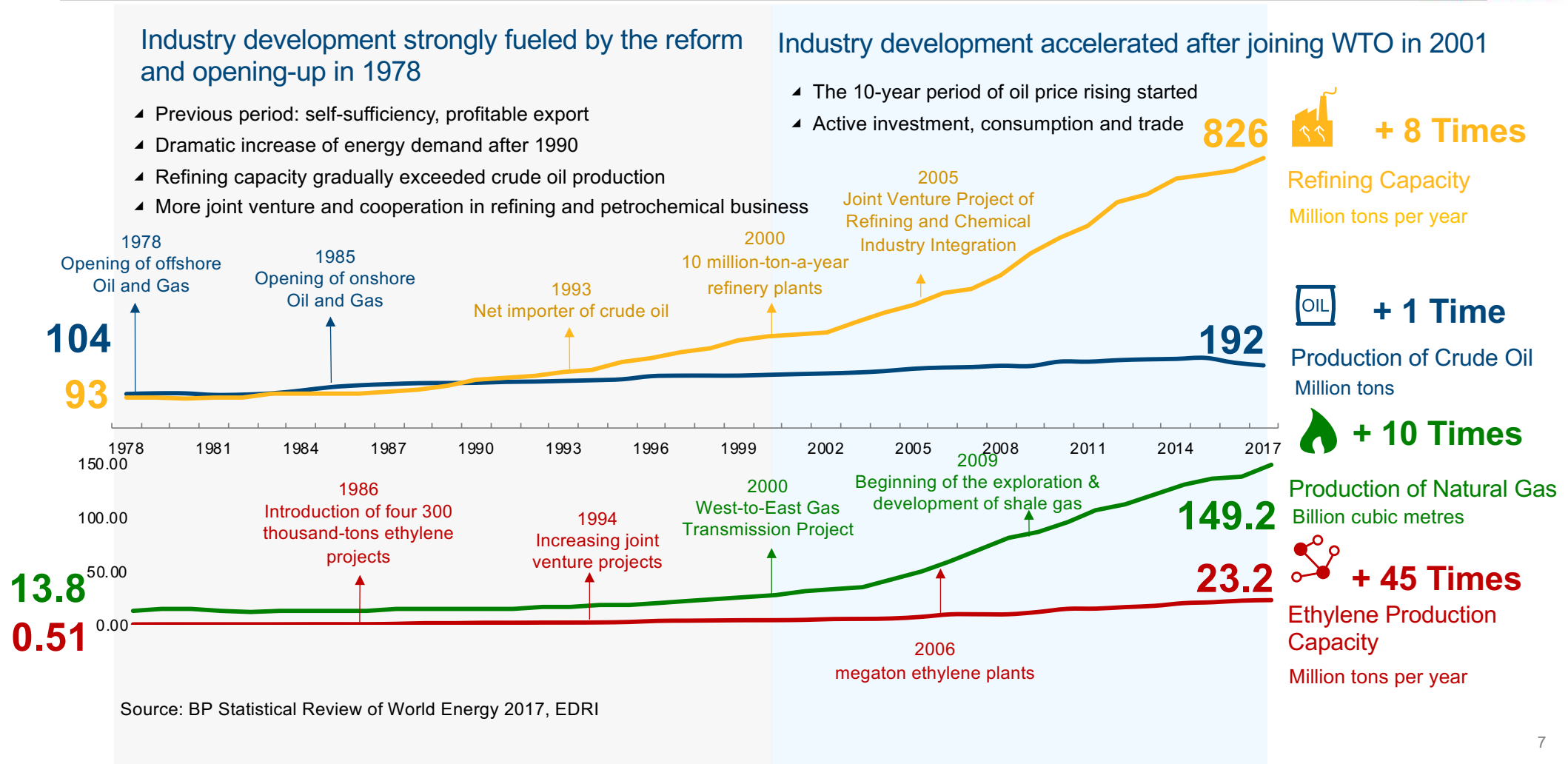


The main business income of the industry is **2.0** trillion US dollars · increased by **182** times.

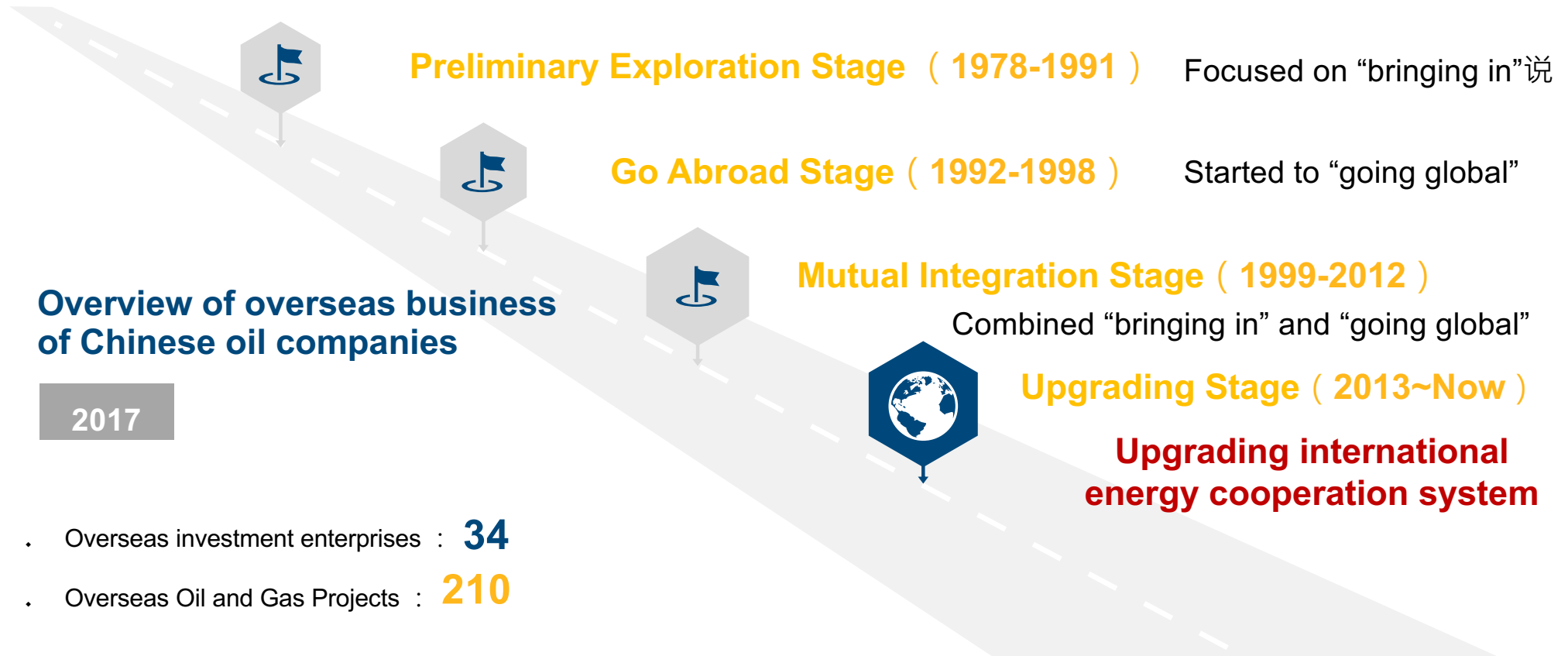
The number of large and medium-sized enterprises is **10** times more, and large ones is more than **30000**.

Source: BP Statistical Review of World Energy 2017, National Bureau of Statistics of China, EDRI

2. Has Achieved “Leapfrog Development”



3. Opening and cooperation helps be in line with the global industry system




4. A number of petroleum and petrochemical international enterprises have emerged



2018

2013

2003

4	3	87		5	8	28	33	9
5	4	93		1	6	10	11	3
69	70	>500		4	5	14	15	3

5. The level of some energy and petrochemical technologies has entered advanced ranks in the world



Oil & Gas exploration and development theory as well as technology highlights characteristics



Conventional → Unconventional



Marine Facies → Continental Facies



Onshore → Offshore



(Exploration of Shale Gas at Fuling)



(offshore drilling)

Refining Technology
Overall advanced, some leading



(Yanbu Aramco Sinopec Refining Company Ltd.)

Technology with independent intellectual property



Capacity to design and build ten-million-tons oil refinery



Complete technology series of clean petroleum products production

Petrochemical Technology
Reaches or approaches the world's advanced level



Complete technology series of megaton ethylene project



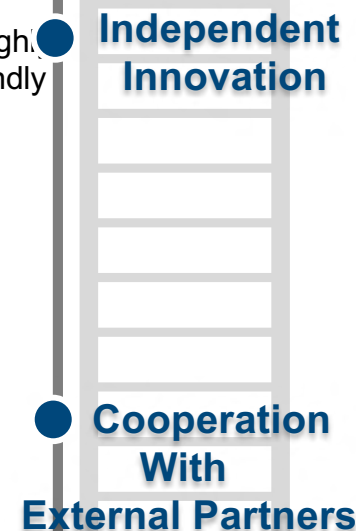
Complete technology series of highly efficient and environmentally friendly aromatic hydrocarbons



Complete technology series of modern coal chemical industry



(Sinopec technology series of highly efficient and environmentally friendly aromatic hydrocarbons)





2

The New Pattern of long-term Development of Energy and Petrochemical Industry in China

Past——Meet the Demand of Basic Necessities of Life

In the past 40 years, petroleum and petrochemical industry emphasized on satisfying

quantity and speed requirement



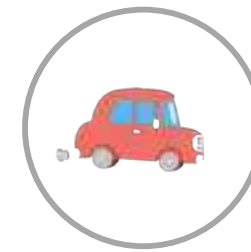
Clothing



Food



Housing



Transportation

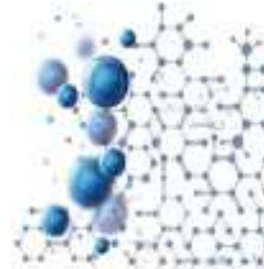
Future——Meet the Requirement of High-quality Development

In the future, petroleum and petrochemical industry emphasized on satisfying

quality and efficiency requirement



Cleaner



Higher-end



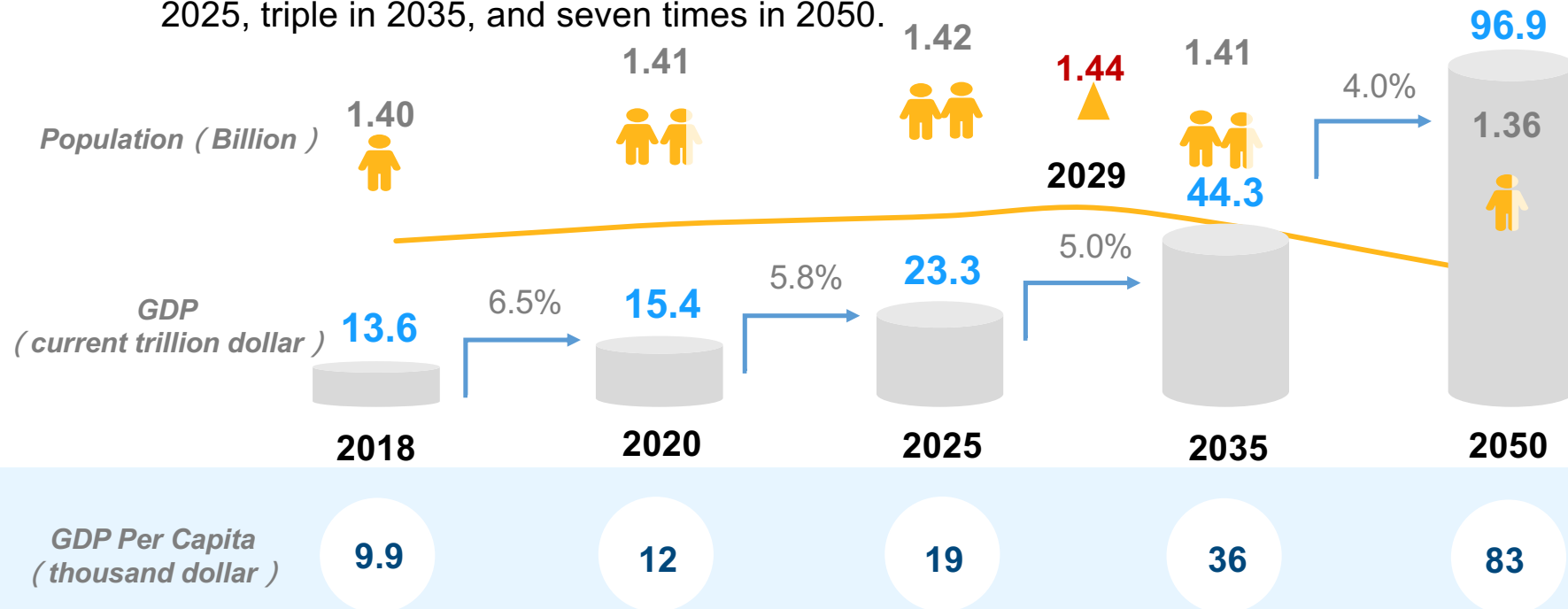
More Intelligent



More Sustainable

1. Steadily growing economy in China will constantly provide a sustained impetus for industrial growth

- China will be able to maintain GDP growth rate at 6-6.5% by 2025. Also, the population will continue to grow and is expected to reach peak at 1.44 billion in 2029.
- China's Per Capita GDP will increase significantly. Compared to 2018, it will double in 2025, triple in 2035, and seven times in 2050.

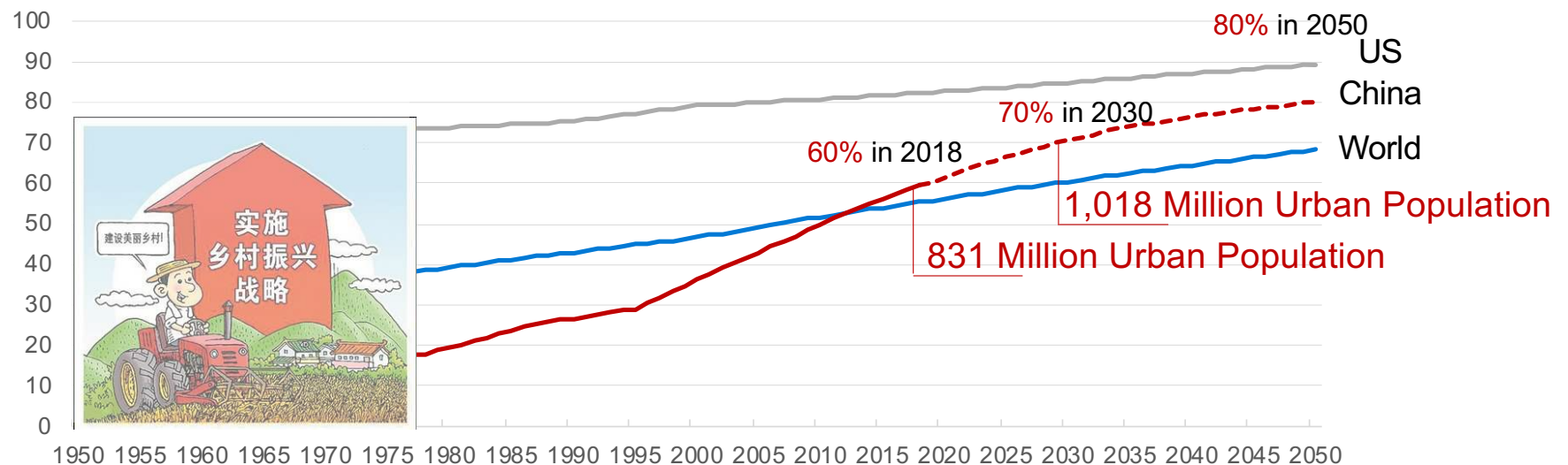


Source : The State Information Center · Development Research Center of the State Council · EDRI

The 1st New Driver: New urbanization and the rural vitalization strategy will inspire the potential of China's economic and industrial development



- The rural vitalization strategy will break the urban-rural dual structure and drive economic growth strongly.
- By the free flow of factors , the integration of urban and rural industries could be promoted, level of urbanization could be raised, the synergy of urban development and rural revitalization could be achieved.



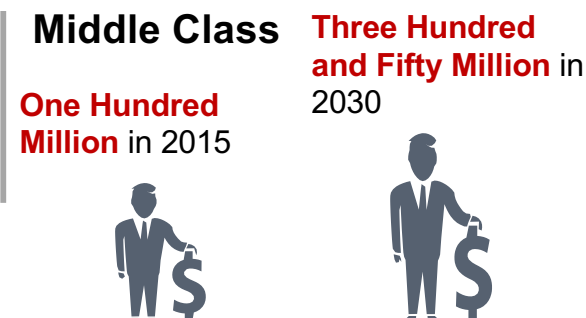
The gap between China's urbanization rate and that of developed countries has narrowed rapidly (%)

Source : UN, National Bureau of Statistics of China, EDRI

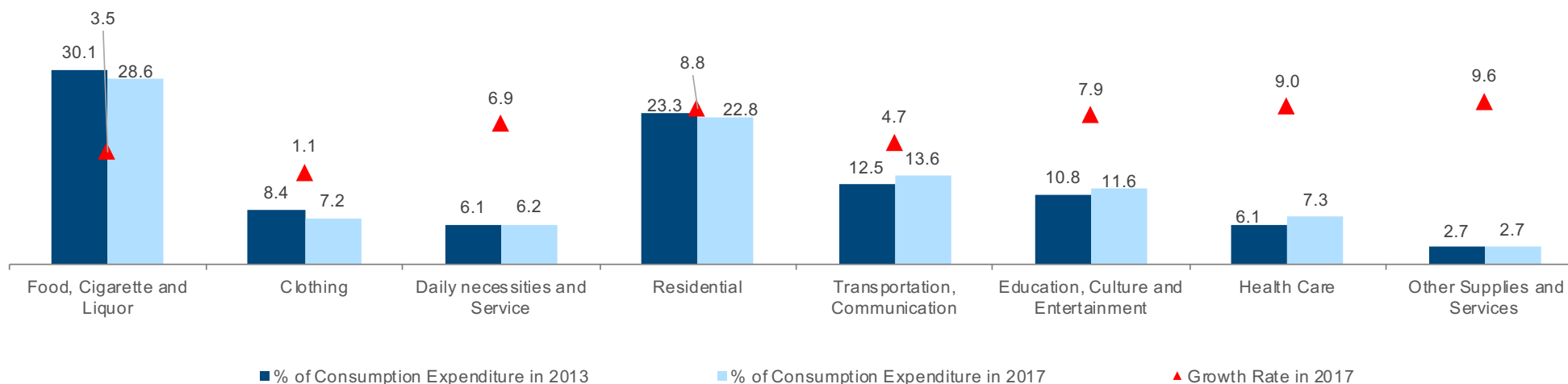
The 2nd New Driver: The rising middle class has become a strong driver of consumption growth and industrial upgrading



- Urban residents' consumption is upgrading along the path from necessary consumption to **improved consumption** to high-end consumption.



Consumption Expenditure Structure of Urban Residents (%)



Consumption Upgrade

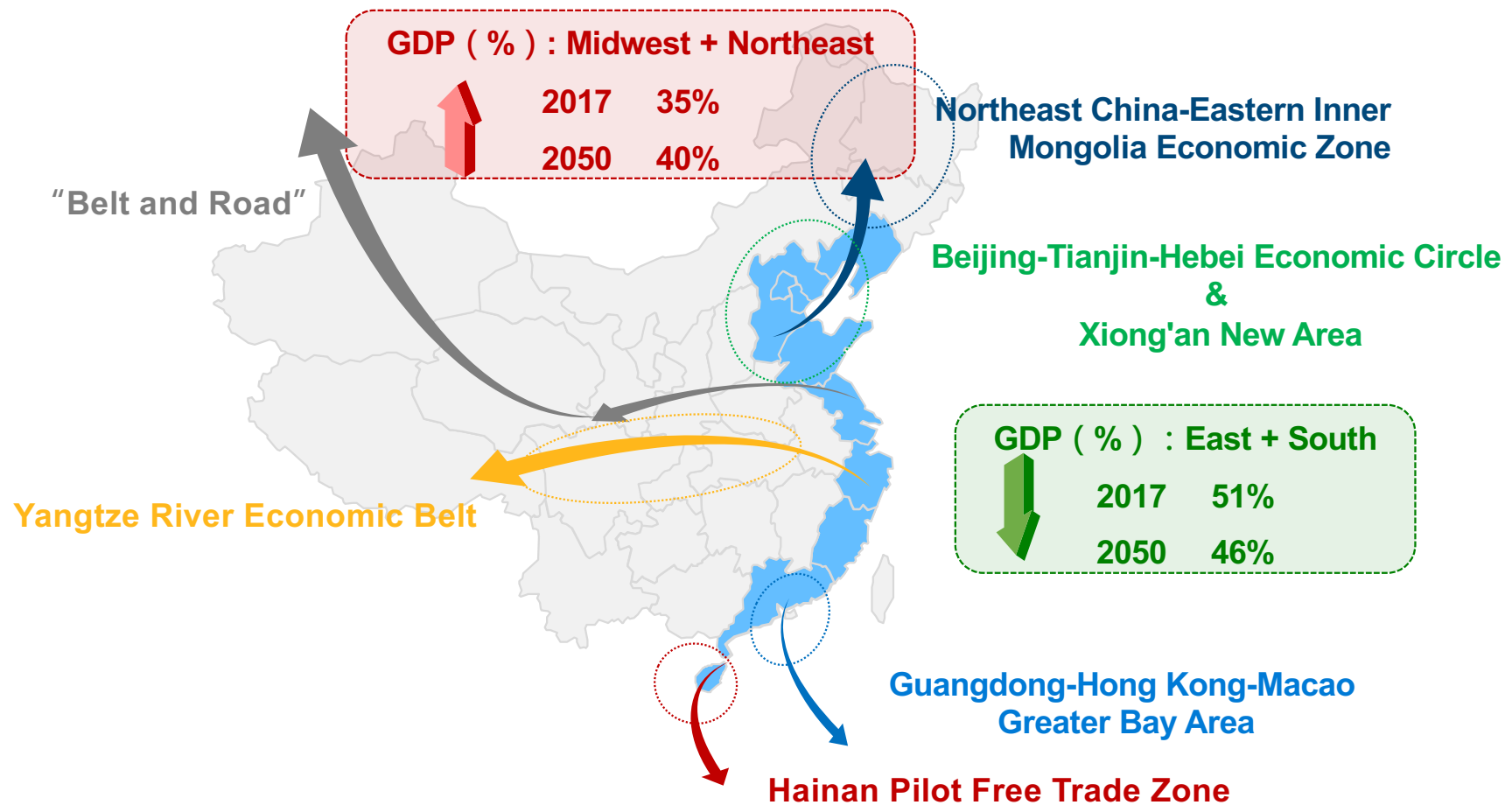
Necessary Consumption

Improved Consumption

High-end Consumption

Source : National Bureau of Statistics of China

The 3rd New Driver: The coordinated regional development strategy will provide a broader space for industrial further expansion



The 4th New Driver: Technological revolution will foster new growth and promote the upgrading of traditional petroleum and petrochemical industries



Emerging Industry Developing and Growing



Boosted GDP by
more than **\$7.5**
trillion

Traditional Industry Transforming and Upgrading



New Business Model

"Internet Plus" , Block chain , Sharing Economy, Modern Supply Chain, etc.



A New Generation of Information and Technology Industry

Big Data, Cloud Computing, High-end Software, etc



New Energy, New Materials

Clean Energy, Advanced Polymer Materials, High Performance Materials, etc



New Energy Vehicle

Electric Vehicles, Fuel Cell Vehicle, etc



Traditional Manufacturing

Promoting the In-depth Integration of the Internet, Big Data, Artificial Intelligence with the Real Economy



Energy Industry

Building a clean, low-carbon, safe and efficient modern energy system



Chemical Industry

Product Upgrading, Resource Conservation and Clean Production

The 5th New Driver: More comprehensive opening-up in China will create a more favorable industrial investment environment

- China will substantially ease market access, strengthen intellectual property rights protection, and take the initiative to expand imports.

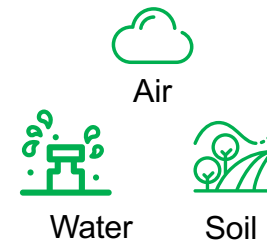
China will never close but open its door even wider.



The 6th New Driver: The requirement of green development will lead traditional industries to explore new development paths



Environmental Protection Policy



Long-term Mechanism



Environmental Protection Tax



Pollutant Discharge Permits

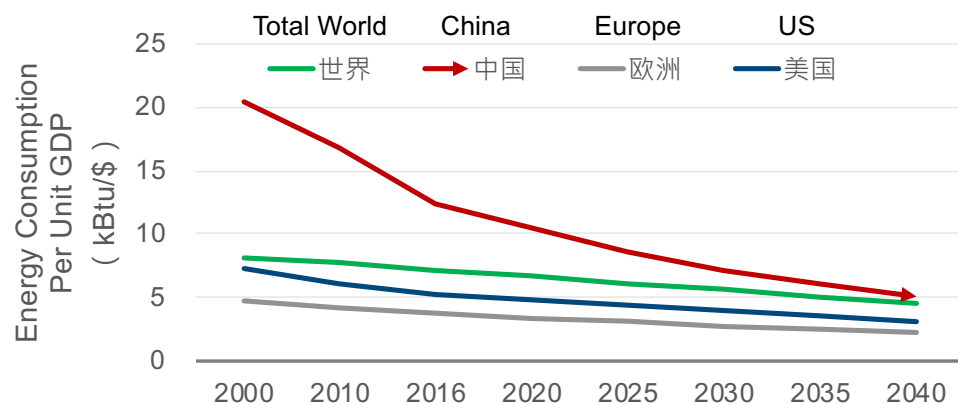


Environmental protection costs have accelerated the industry reshuffle, further enhanced the industry concentration.

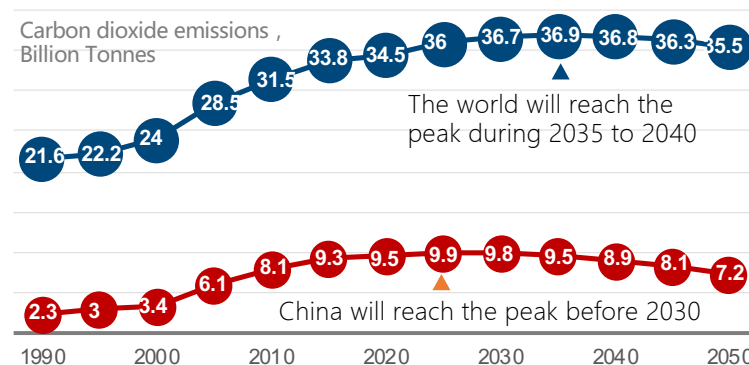
- ↳ Outdated production capacity will be largely eliminated to make room for the development of advanced clean production capacity and green production.
- ↳ Environmental costs of companies will be increased significantly.
- ↳ The development space of urban enterprises will be limited.

2. China's energy transition will move faster than the world, and energy efficiency will be greatly improved

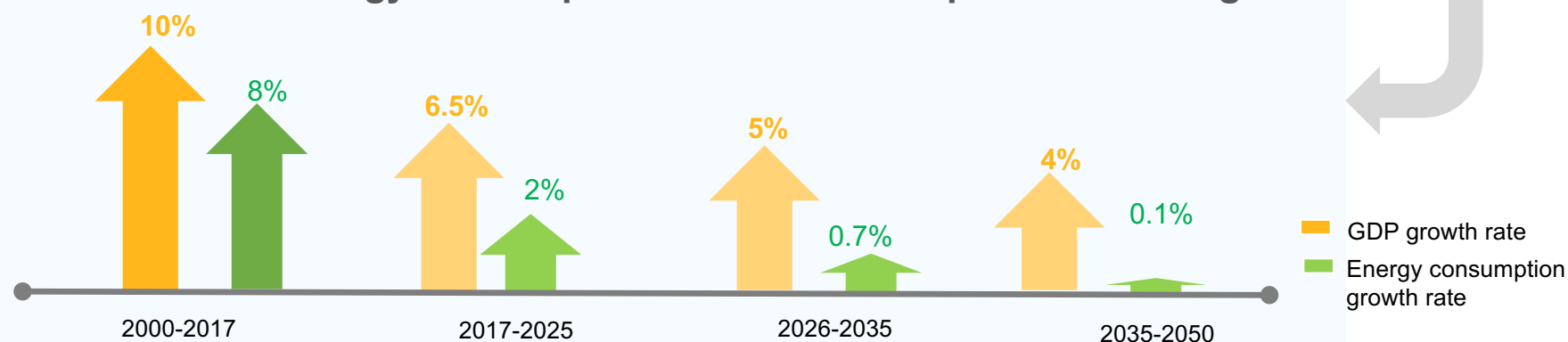
China's energy intensity descends most quickly



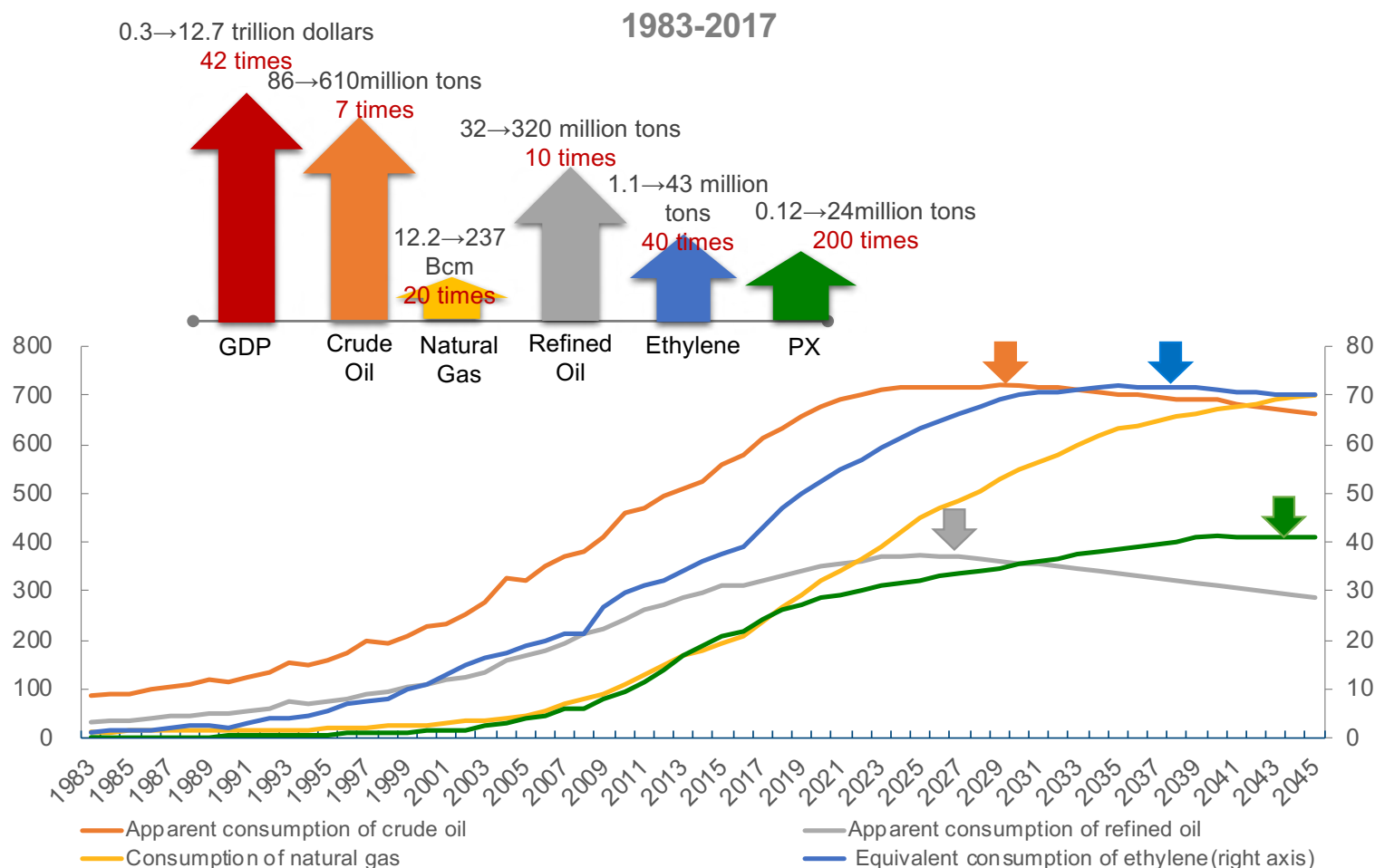
Will reach the peak of carbon emissions before the world does



China's energy consumption has been decoupled from GDP growth



3. The market for petroleum and petrochemicals remains huge, especially in natural gas, chemicals and new materials



Crude Oil

Peak Time≈ around 2030
Peak Value≈**720 million tons**



Natural Gas

Peak Time : before 2050↑
Demand in 2050 : about **700 Bcm**



Refined Oil

Peak Time≈2027
Peak Value≈**370 million tons**



Ethylene

Peak Time≈2035-2040年
Peak Value≈**72 million tons**



PX

Peak Time≈2040-2045
Peak Value≈ **41 million tons**

4. China's market will be more competitive, with the gradual formation of a pluralistic supply system



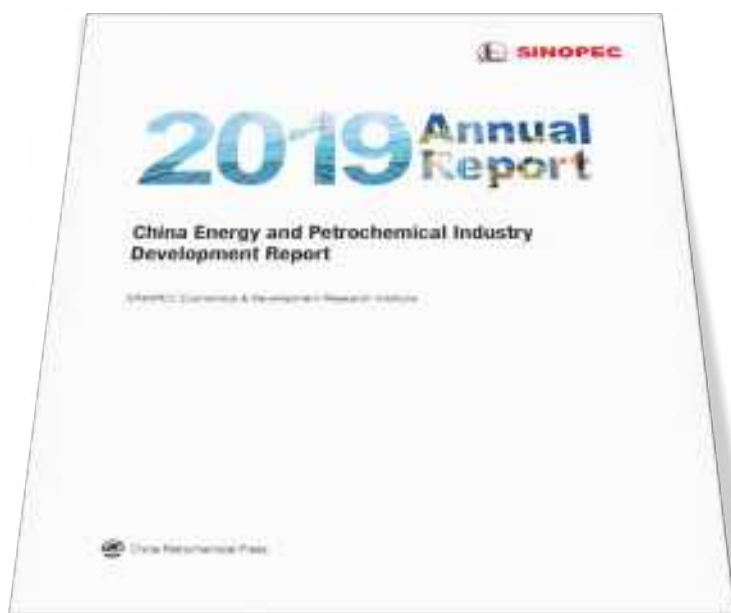


3

Market Prediction for 2019

2019 Annual Report of China Energy and Petrochemical Industry

Focuses on **6** Questions



- 1 What Are the Roads Ahead for World and China Economy ?
- 2 How Do We Evaluate Forces that Influence the Sustainable Development of Energy?
- 3 Will Gas Supply be very tight in 2019?
- 4 How Will the New Expansion of Refinery and Petrochemical Capacity Influence the Market ?
- 5 How Will the Market Demand Be in 2019 ?
- 6 Will Business Cycle of Refining and Petrochemical Industry Continue in 2019?

1. What Are the Roads Ahead of World and China's Economy ?

Higher Risks

2018 : 3.2%
2019 : 3.1%

I. Shrinking Trade

Trade friction
Unilateral sanctions

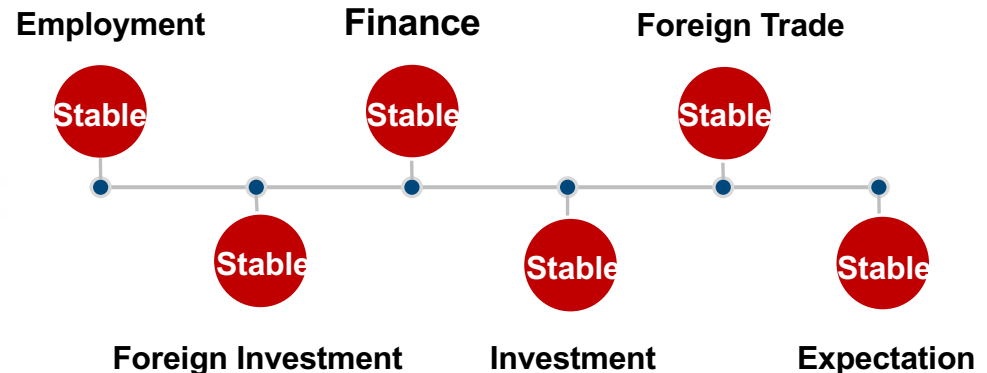
II. Contracting Real Economy

The manufacturing PMI has decreased by 3.8% since the beginning of 2018



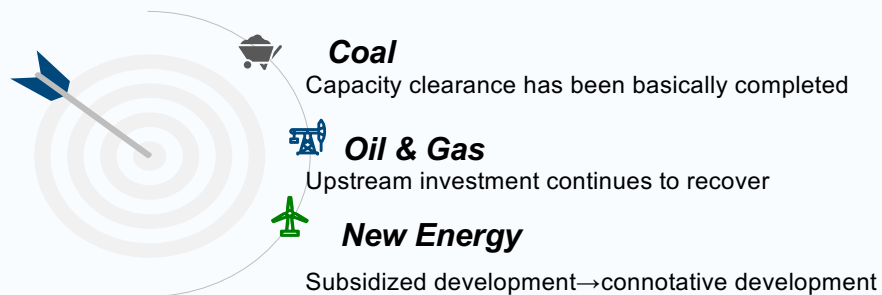
Stability First

2018 : 6.6%
2019 : 6.0-6.5%

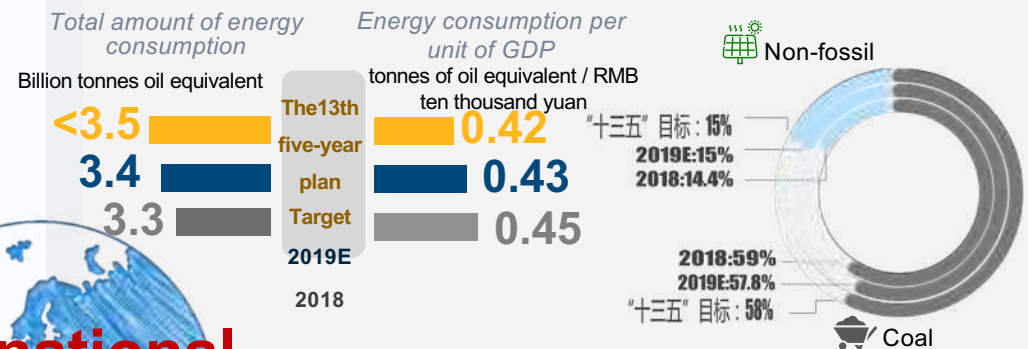


2. Whether the Energy Industry Can Achieve Sustainable Development?

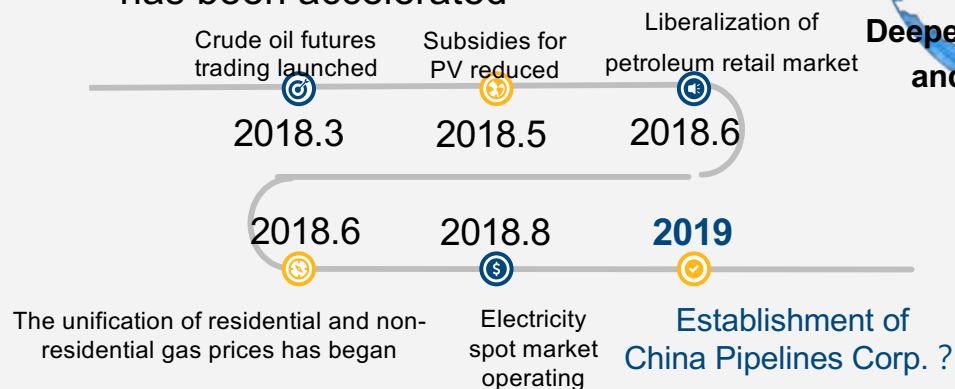
Production: A clean, efficient and diversified energy supply system is forming



Consumption: The goal of optimizing energy structure was achieved ahead of schedule

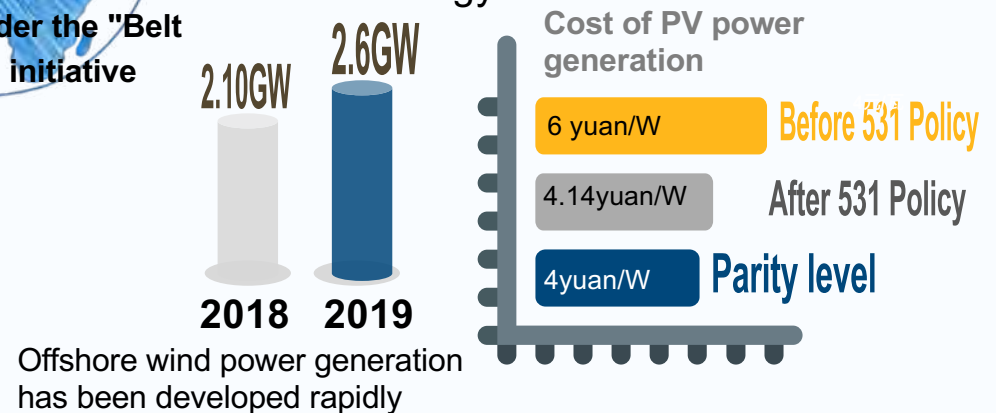


Reform: The process of marketization has been accelerated



International Cooperation
Deepened under the "Belt and Road" initiative

Technology Development: The cost of non-fossil energy continues to fall

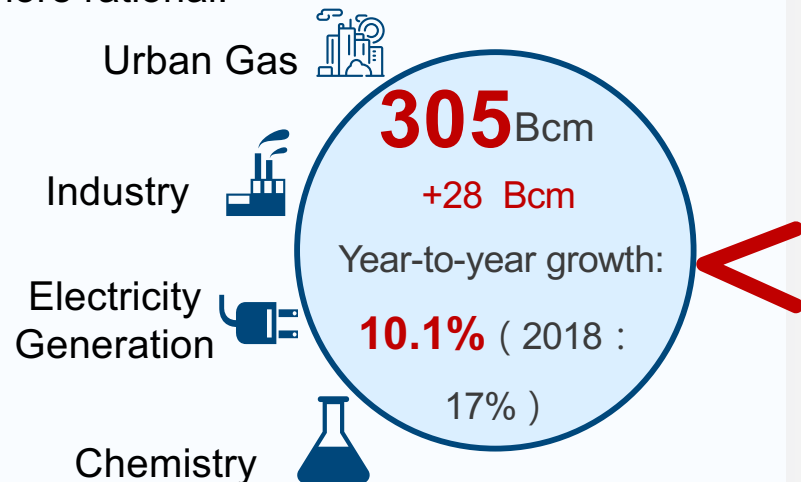


3. Will Gas Supply be very tight in 2019?



More rational demand

Fuel conversion from coal-to-gas will be more rational.



More sufficient supply

The establishment of production, distribution, storage and sales systems has been stepped up.



313 Bcm
 +33 Bcm
 Year-to-year growth: **11.7%**
 (2018 : 15.9%)





Production: Domestic gas production will be increased by over **7%**

Supply:
 Global LNG production **+76%**
 LNG terminal: **+6.40Mt/Y**

Storage : Gas storage **+3 Bcm**

Sales :

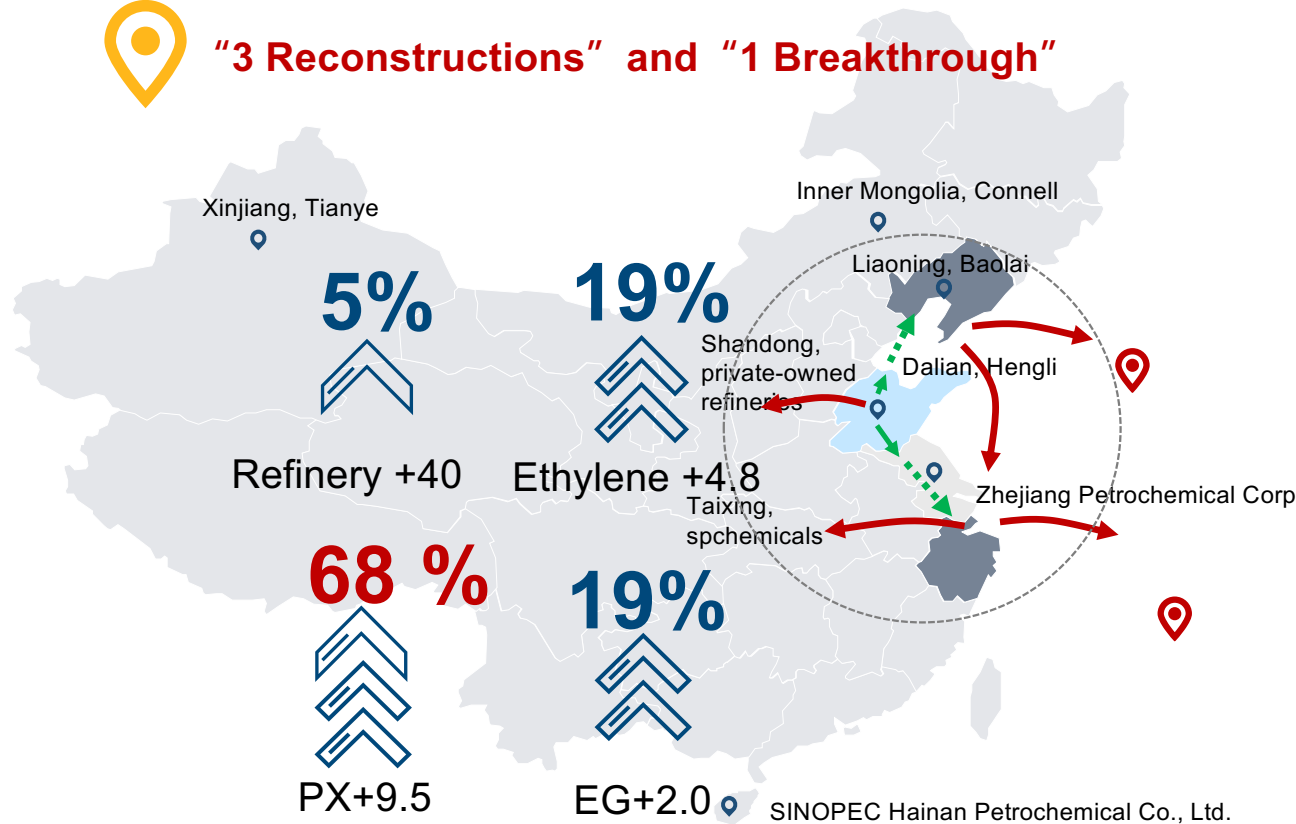
Pipeline network interconnection has been accelerated

- “Gas supply from South to North”: **30 Mcm/d**
- Supply increase in Beijing-Tianjin-Hebei surrounding areas: **60 Mcm/d**

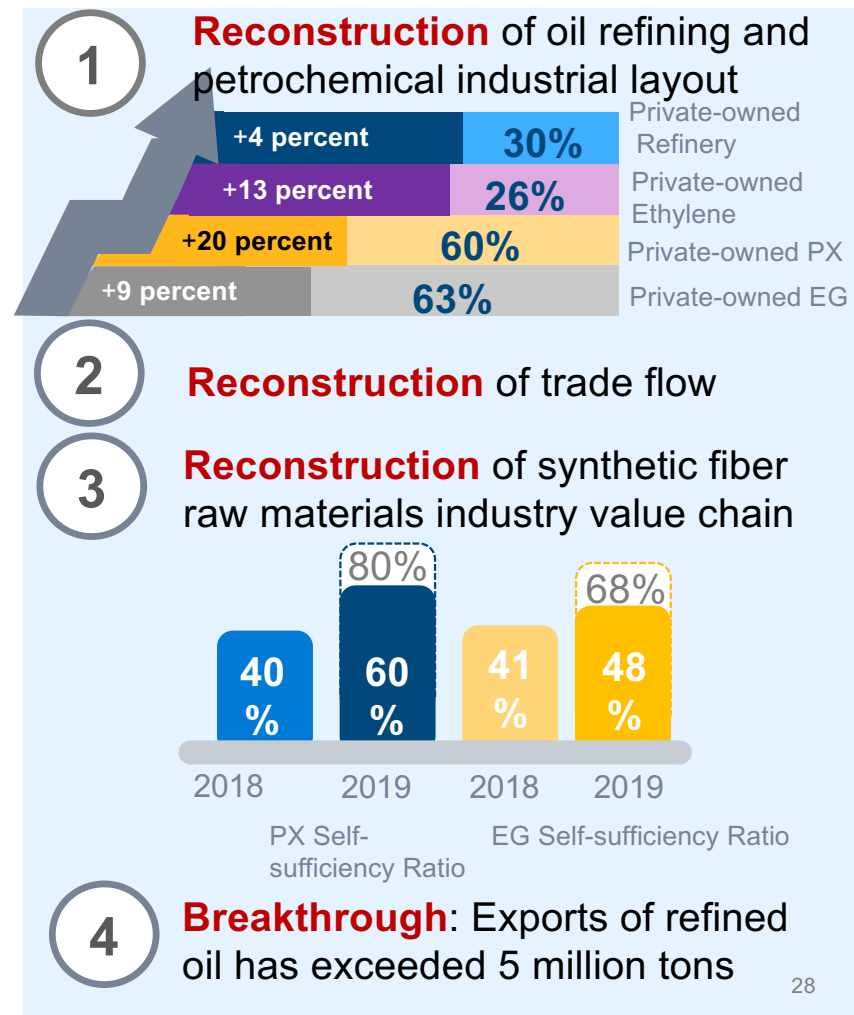
4. How Will the Operation of Private-owned Refinery and Petrochemical Capacity Influence the Market ?



"3 Reconstructions" and "1 Breakthrough"

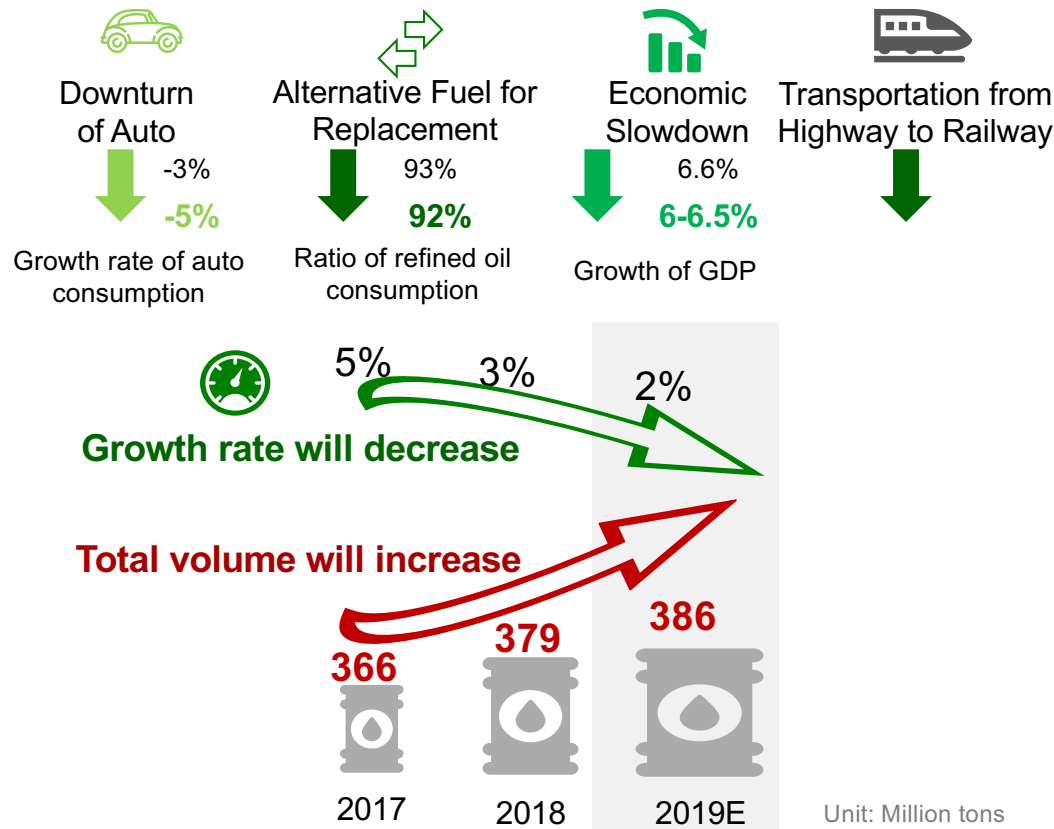


Production capacity increase of ethylene and PX are equivalent to the amount of new capacity added **in the past 4-7 years** combined



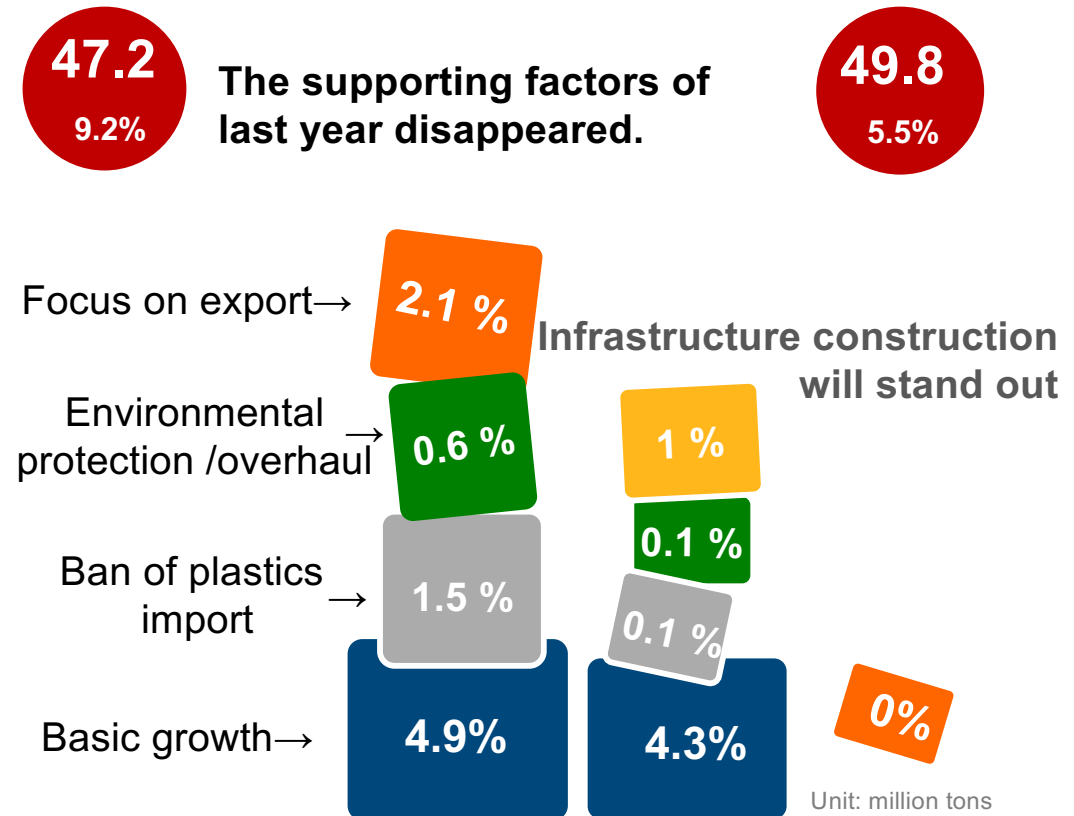
5. How Will the Market Demand Be in 2019 ?

Demand of refined oil will **weaken**



* end-use consumption

Demand of petrochemicals will **slow down**



6. Will Business Cycle of Refining and Petrochemical Industry Continue to Sustain in 2019?



Refining

The low-sulfur requirement of bunker fuel will extend the refinery margin , but China's margin will be lower than world average level for the reason of significant new capacity.



Petrochemical

Under strongly increasing supply but decreasing demand, China's Petrochemical profit ability will decline from high level.

