

# China Refining Industry Outlook and Oil Demand Peak



# 2019

Report series of China energy and petrochemical industry

**Xiaoming KE**

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**01**

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

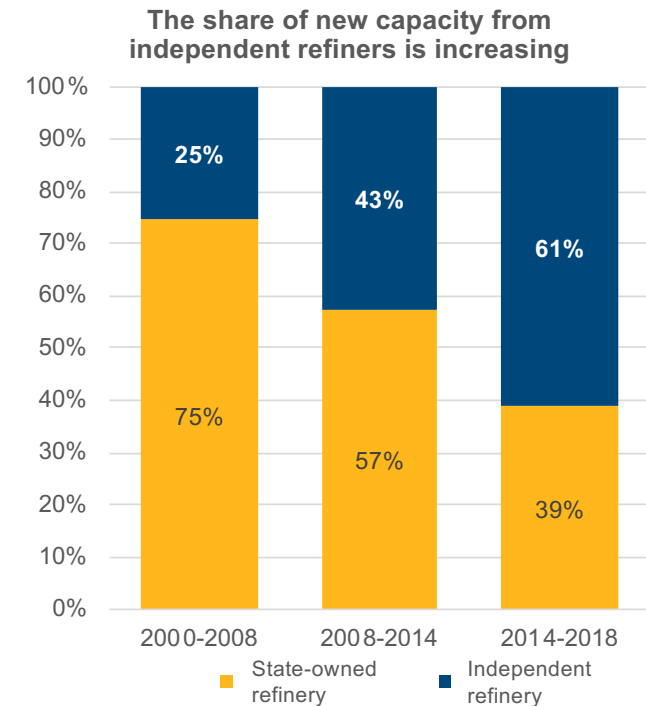
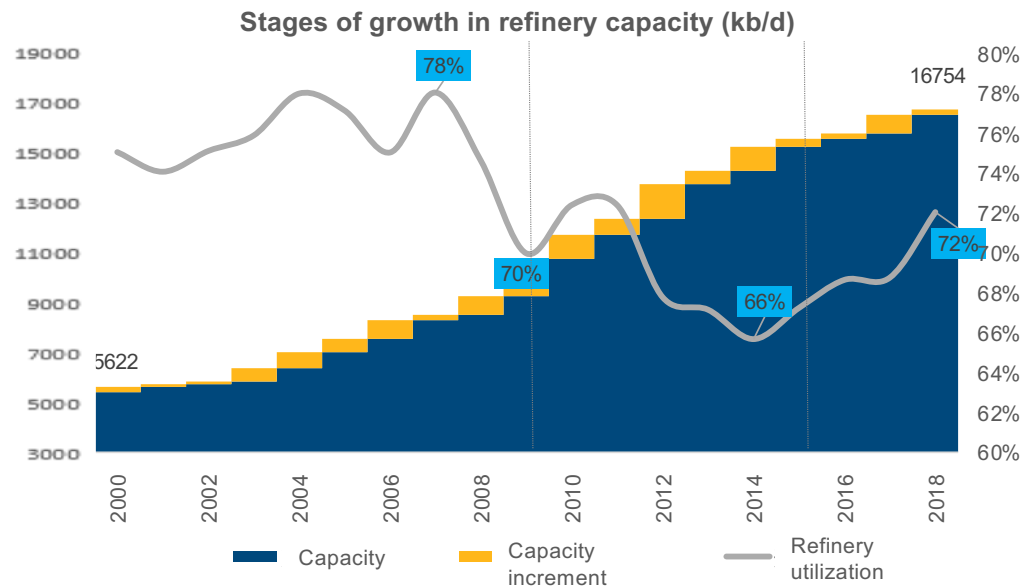
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# The refinery capacity in China ranks among the top in the world, and is still in expansion

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

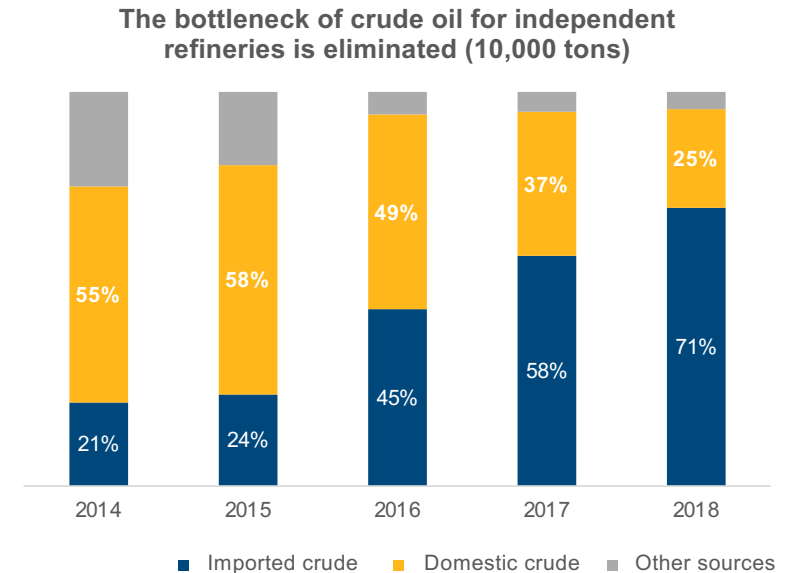
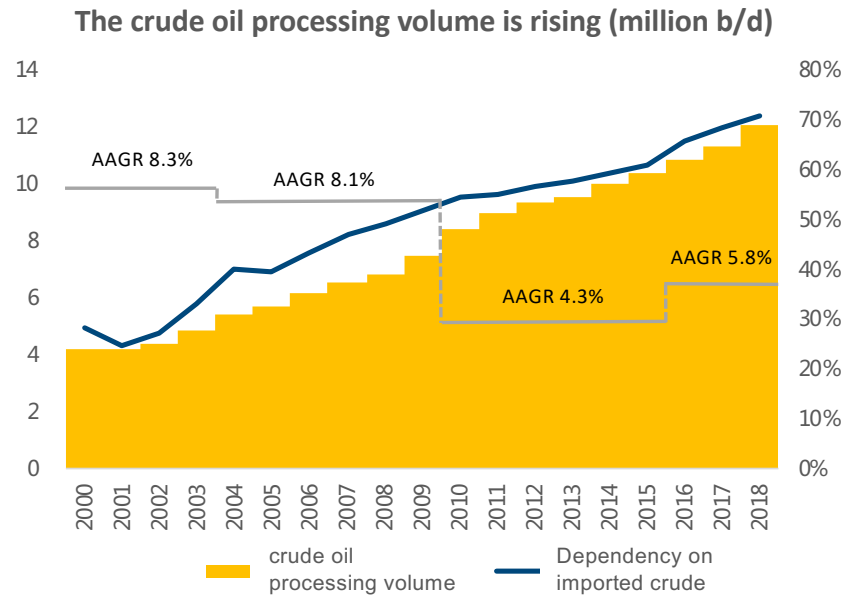
Independent refiners began to accelerate their expansion.

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.

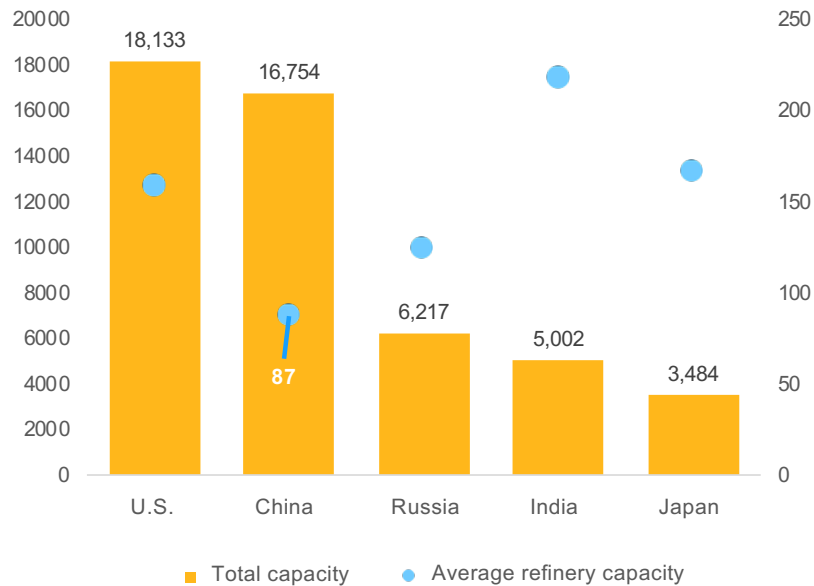
# The increasing crude oil processing meets domestic demand



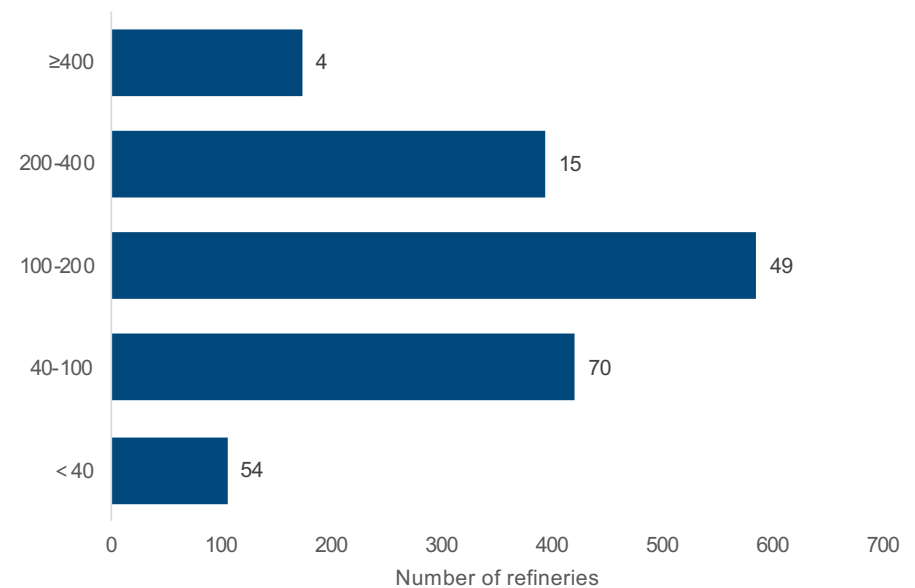
- By 2018, China's refining throughput was 12.1 Mb/d, and the dependency on imported crude oil came to 70.8%.
- Since the release of imported oil quotas in 2015, the growth rate of refining throughput has risen from 4.1% to 5.4%.
- The utilization rate of independent refineries increased from 30% in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



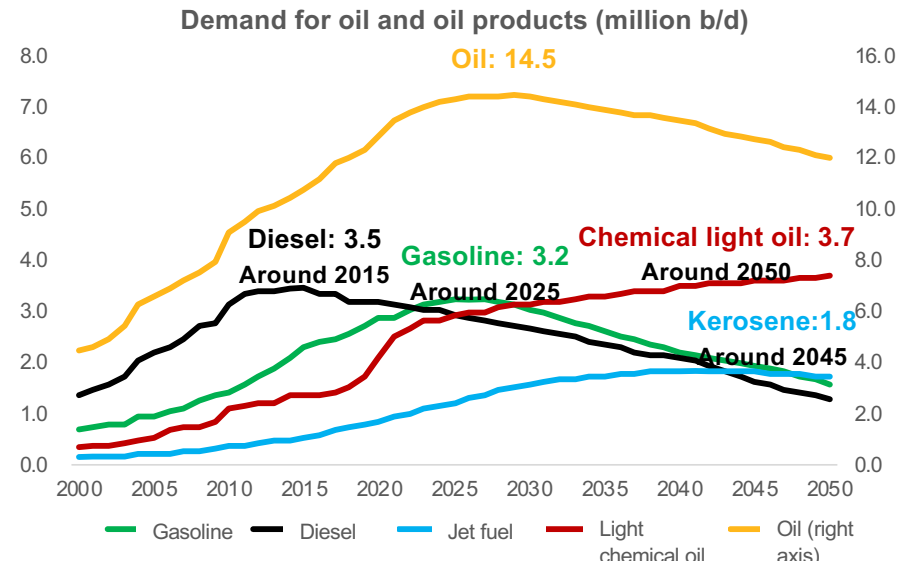
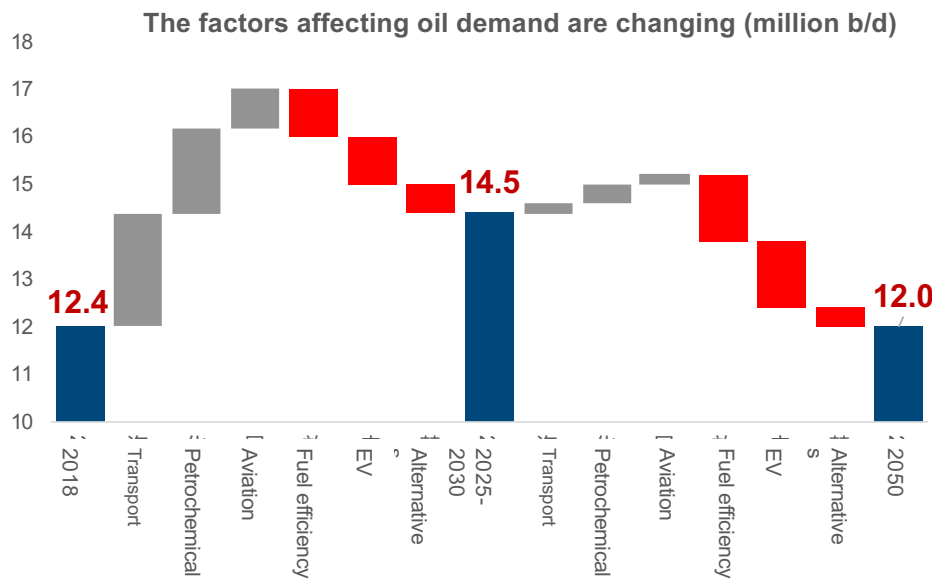
**In the future:  
Oil demand growth shifting from fuel-driven to  
petrochemical feedstock-driven**

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# 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.

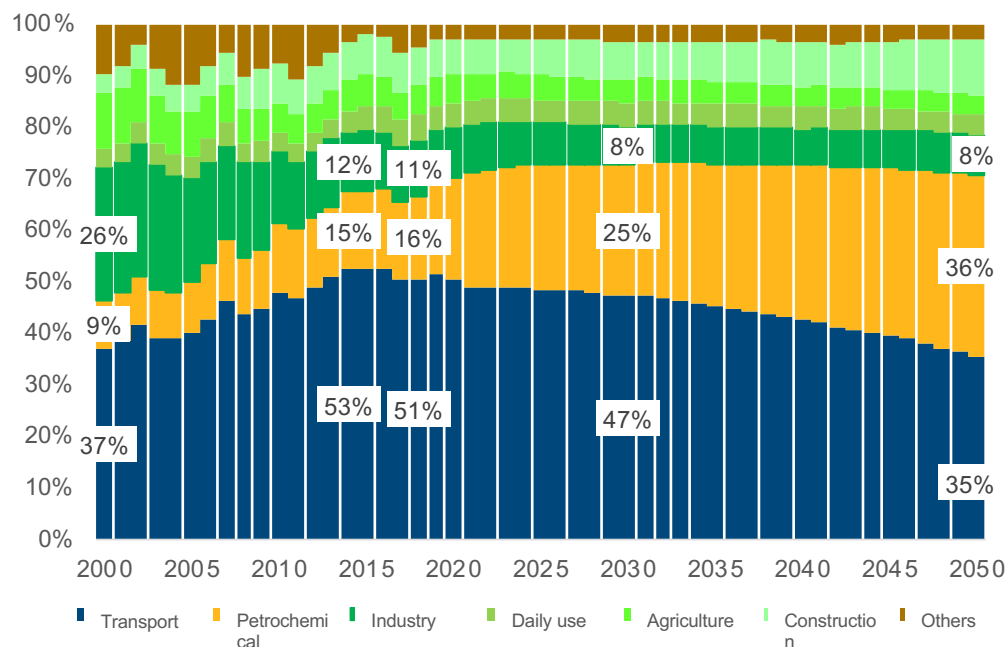




# Driver shifting--Fuel-oriented oil consumption in China is decreasing



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

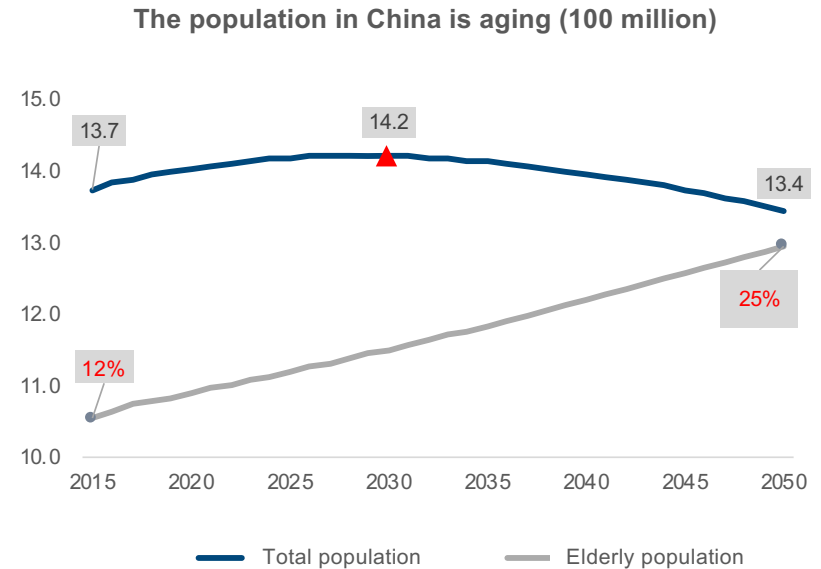
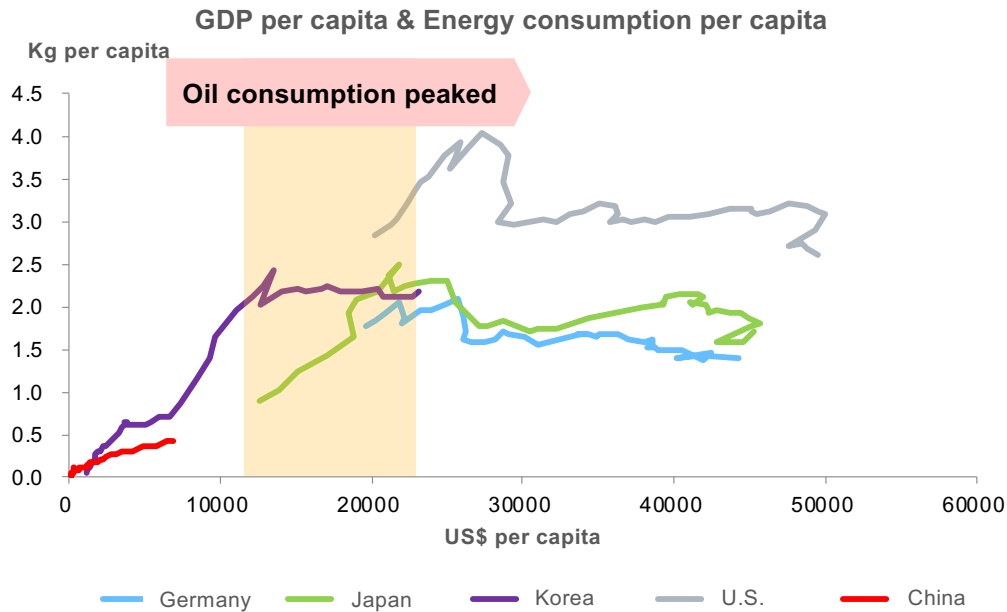
2000-2014: The growth in car ownership drove the growth of oil consumption.

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.

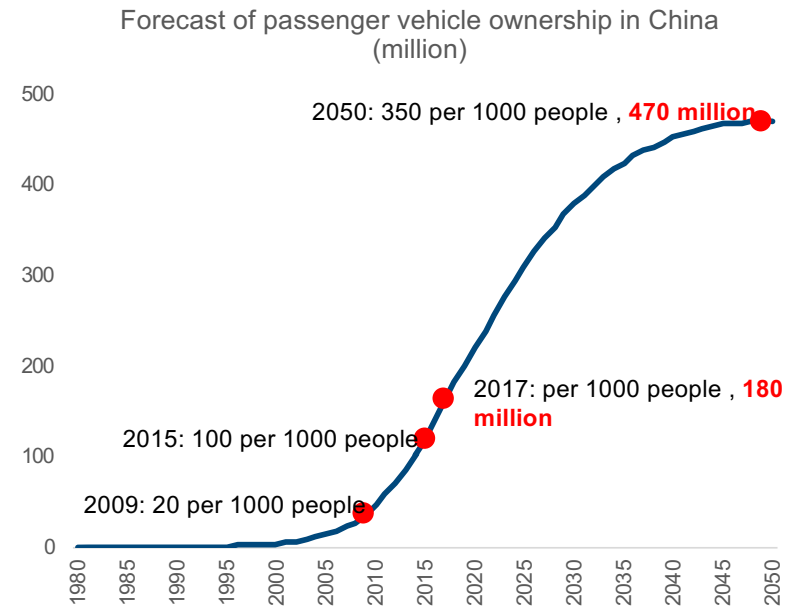
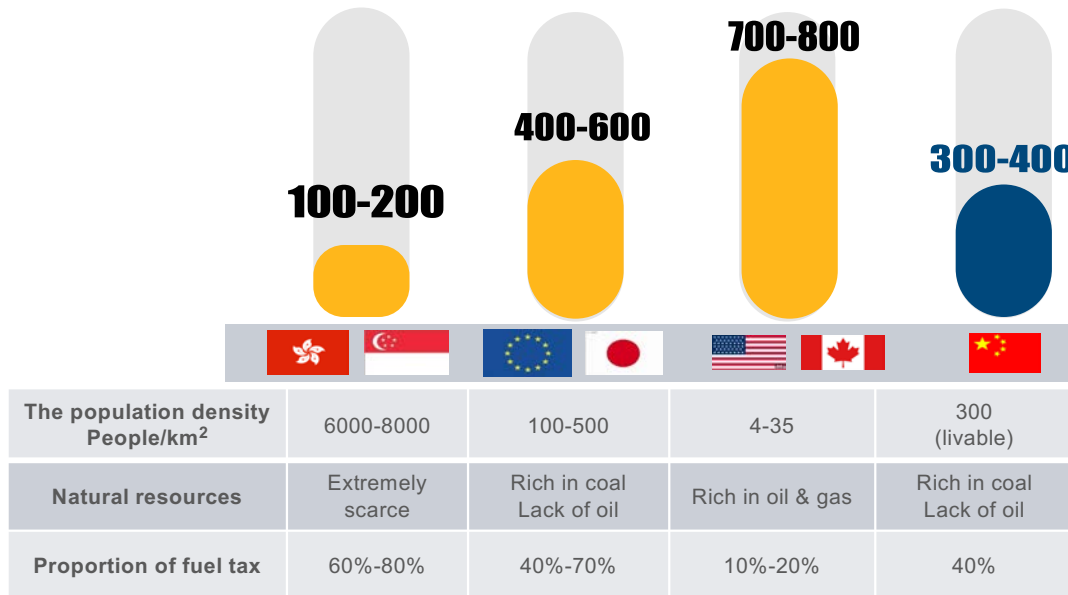
- China's oil demand reached 12.4 million b/d in 2018. What's more, the oil consumption structure has changed or is about to change.
- Instead of transportation fuel, petrochemical feedstock will become the major refining product by 2050.

# 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.

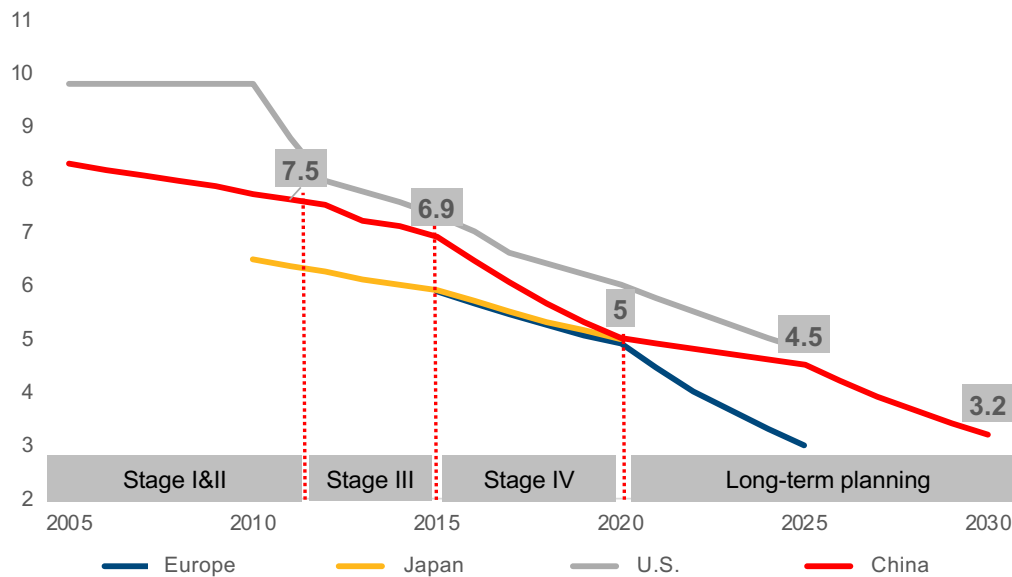
# Industrial driver-Broad prospects for China auto industry in the take-off period



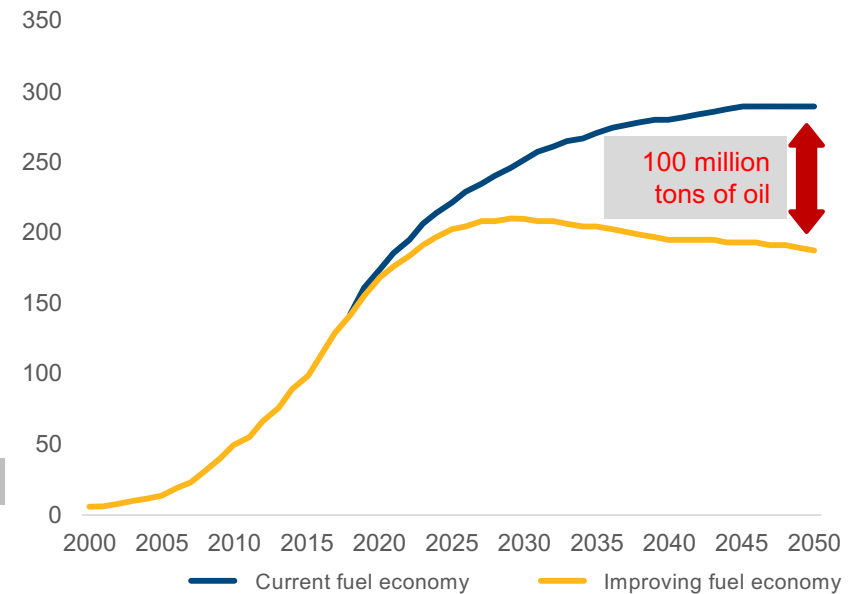
- Currently, the vehicle ownership in China was 130 vehicles per 1000 people, which is still in the take-off period of auto industry compared with developed countries.
- Considering the high density of population and the lack of oil and gas resources in China, the saturation level of vehicle ownership 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

Fuel consumption rate of new vehicles continues to decline ( L/100km )



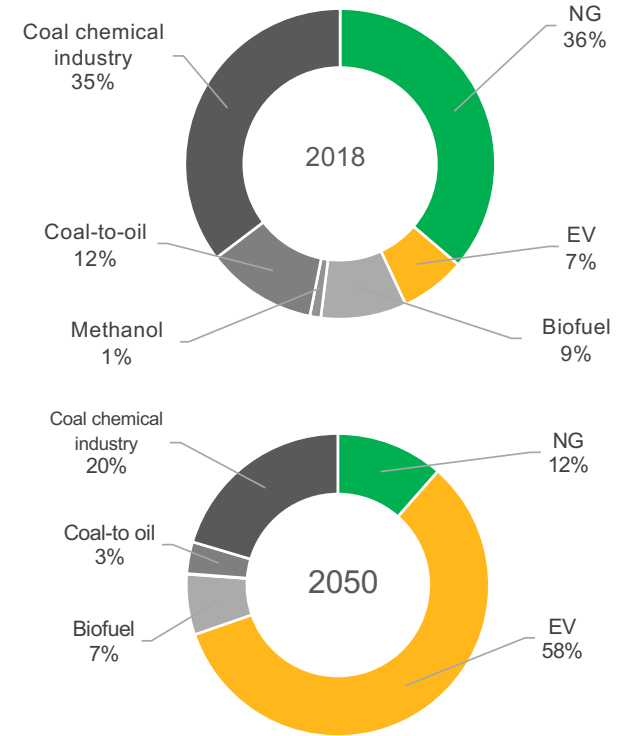
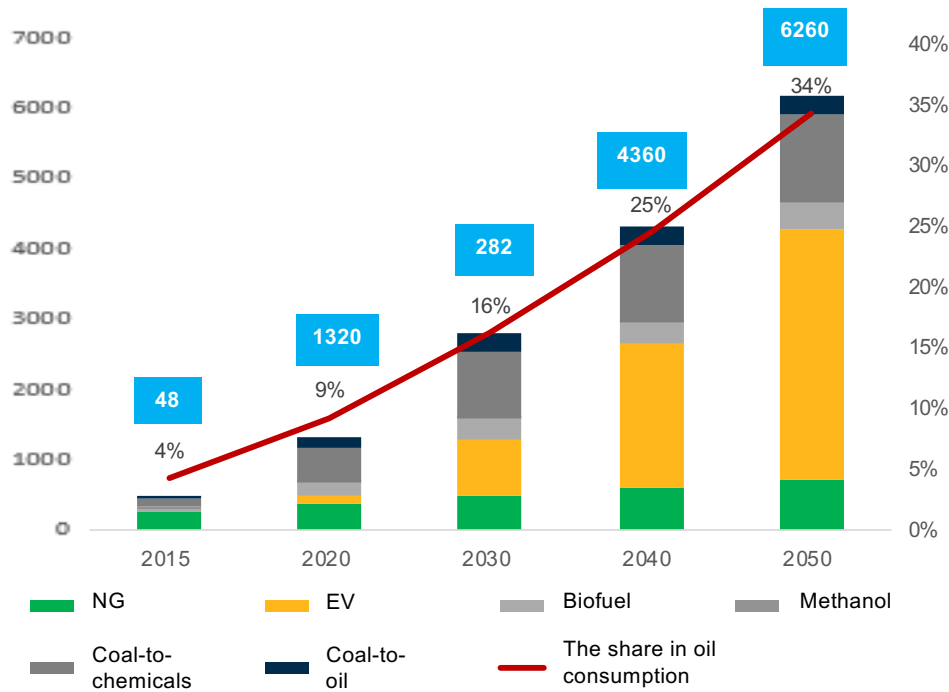
Significant oil savings from fuel economy improvements (million tons)



- 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

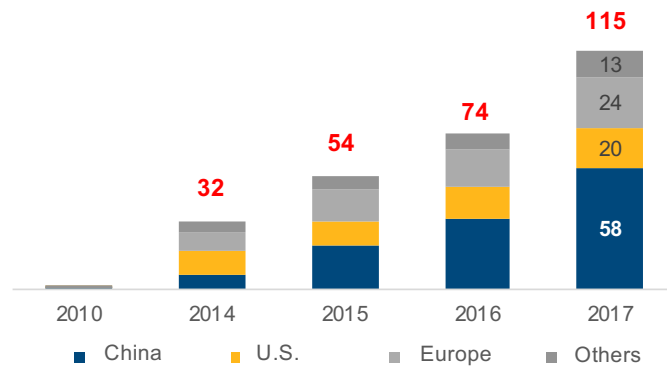
The consumption of oil alternatives is increasing ( kb/d )



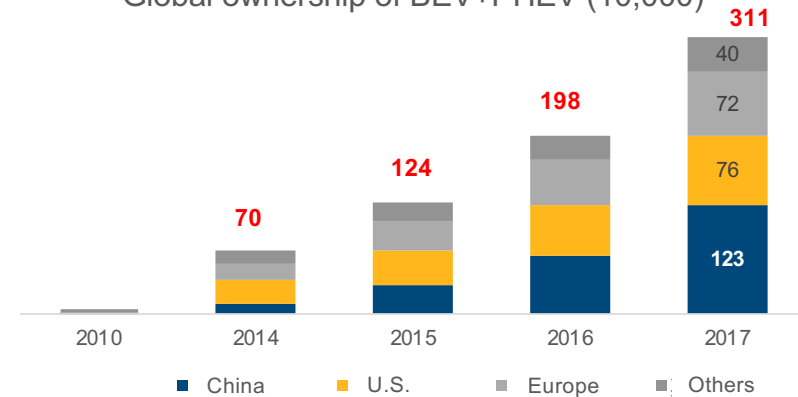
- Currently, natural gas and coal-to-liquid, coal-to-olefin are the main oil substitutes.
- After 2025, electric vehicles will replace natural gas as the first alternative.

# 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)

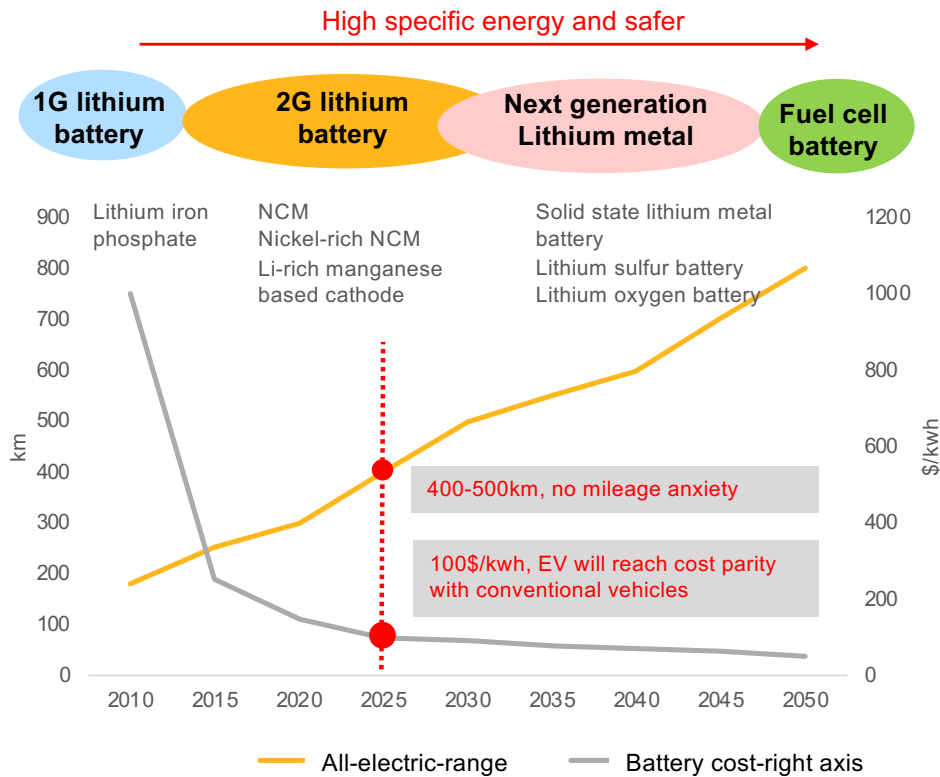


Targets for EV development in major countries

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

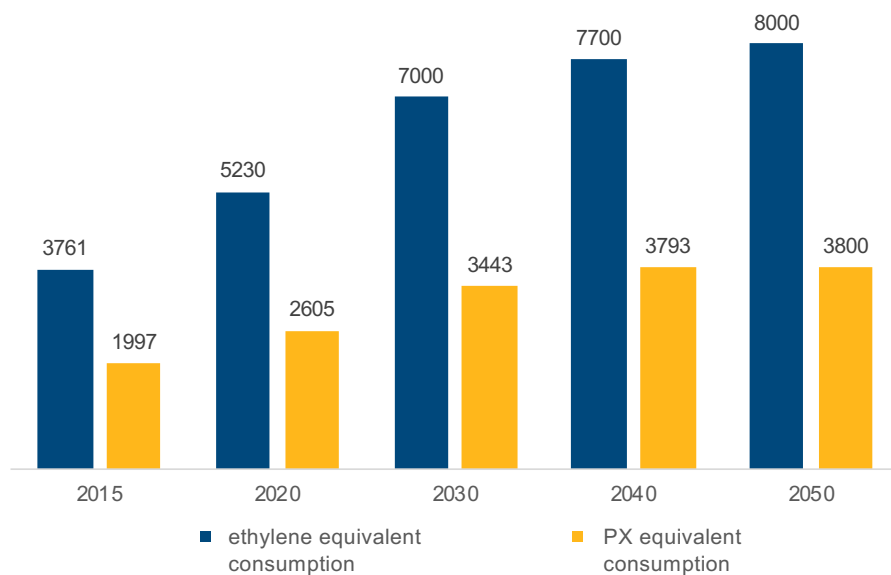
<b>Battery material</b> <ul style="list-style-type: none"> <li>Scarcity of lithium and cobalt resources</li> <li>Technology progress</li> </ul>	<b>Tax reform issues</b> <ul style="list-style-type: none"> <li>fuel tax</li> <li>Purchase tax reduction for EV</li> </ul>
<b>Technologies for car sharing</b>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

- 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.

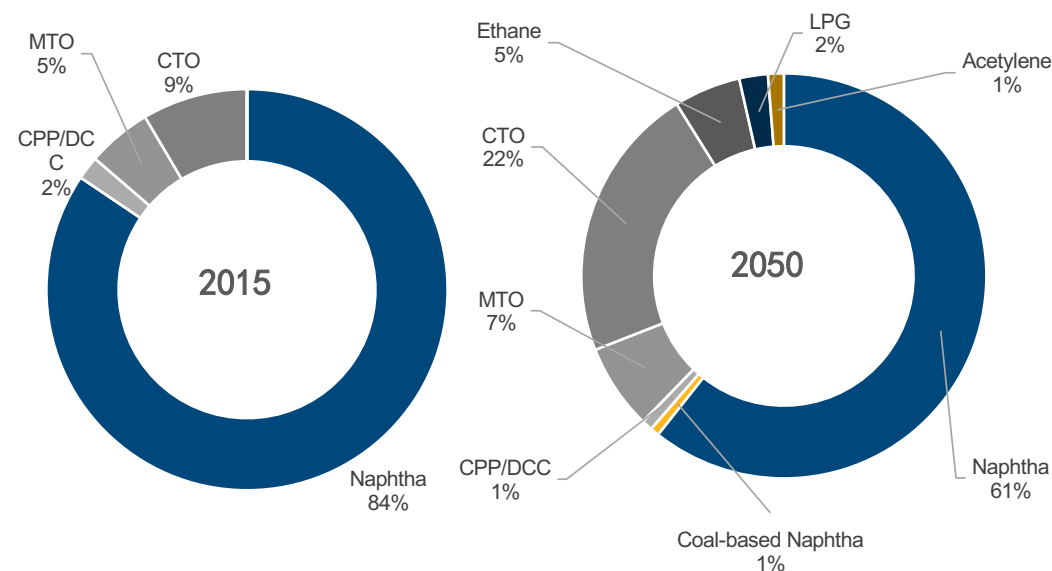
# Industrial driver-Significant growth of oil demand in petrochemical industry



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.



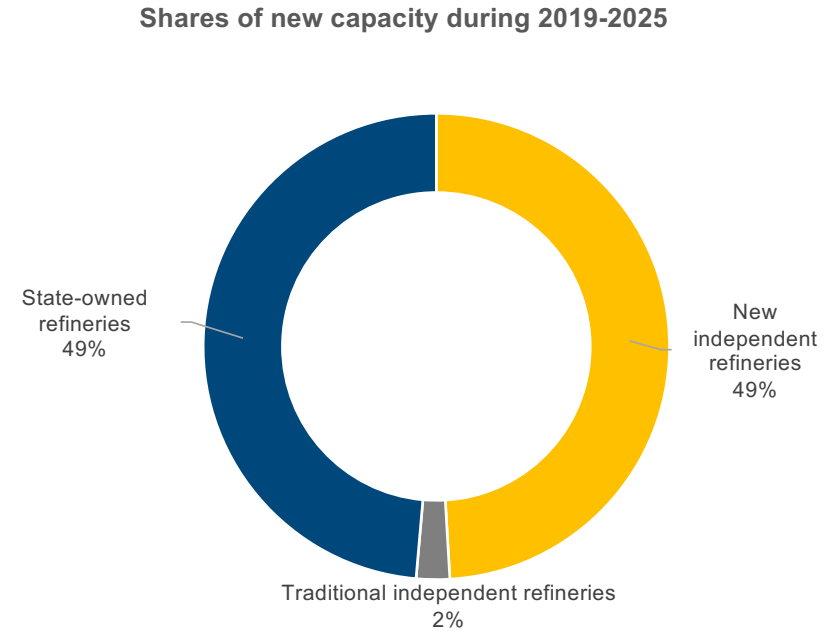
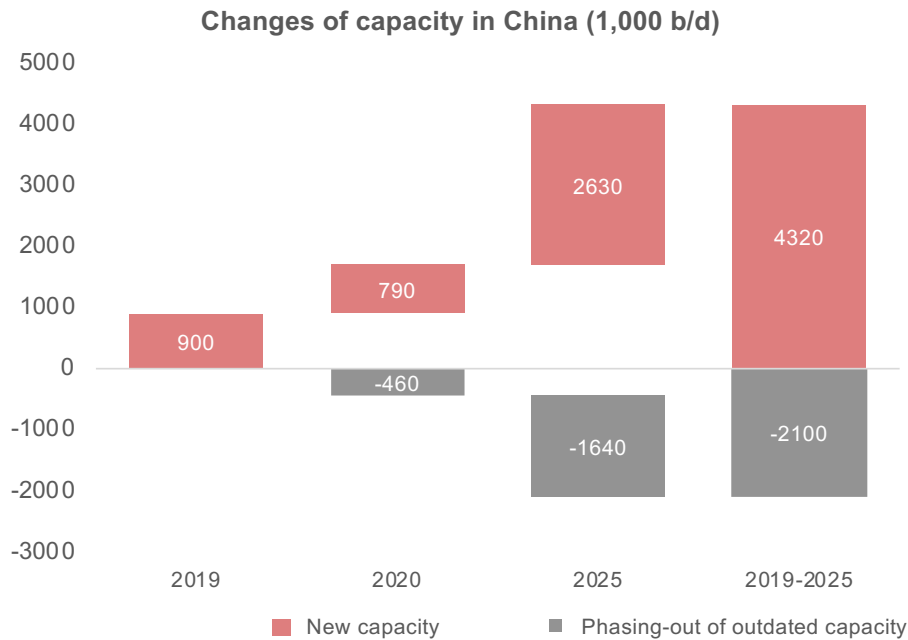


**03**

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

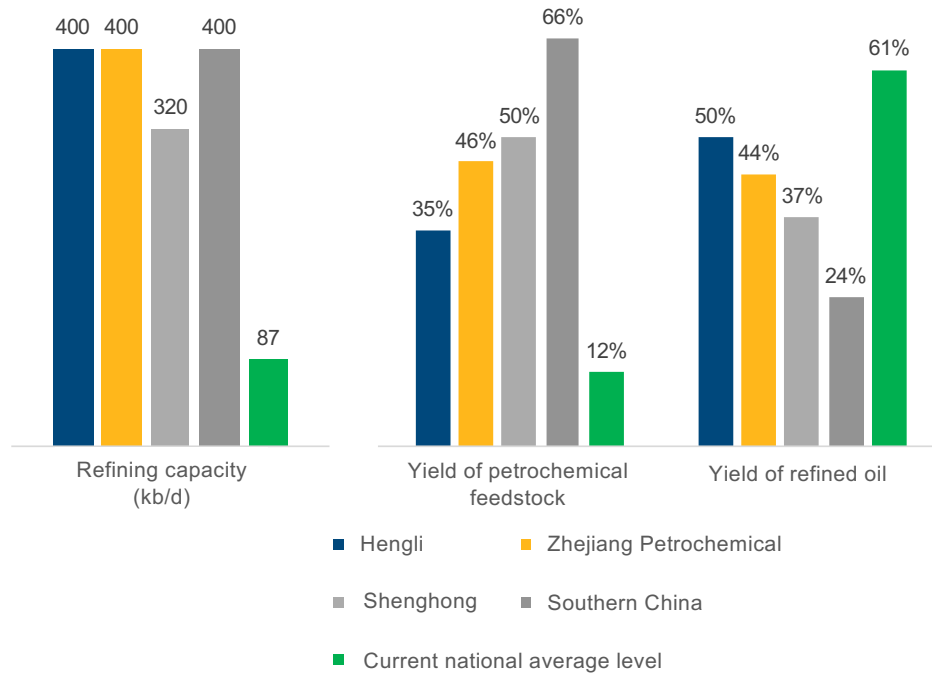
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# Advanced capacity will replace outdated capacity in the future

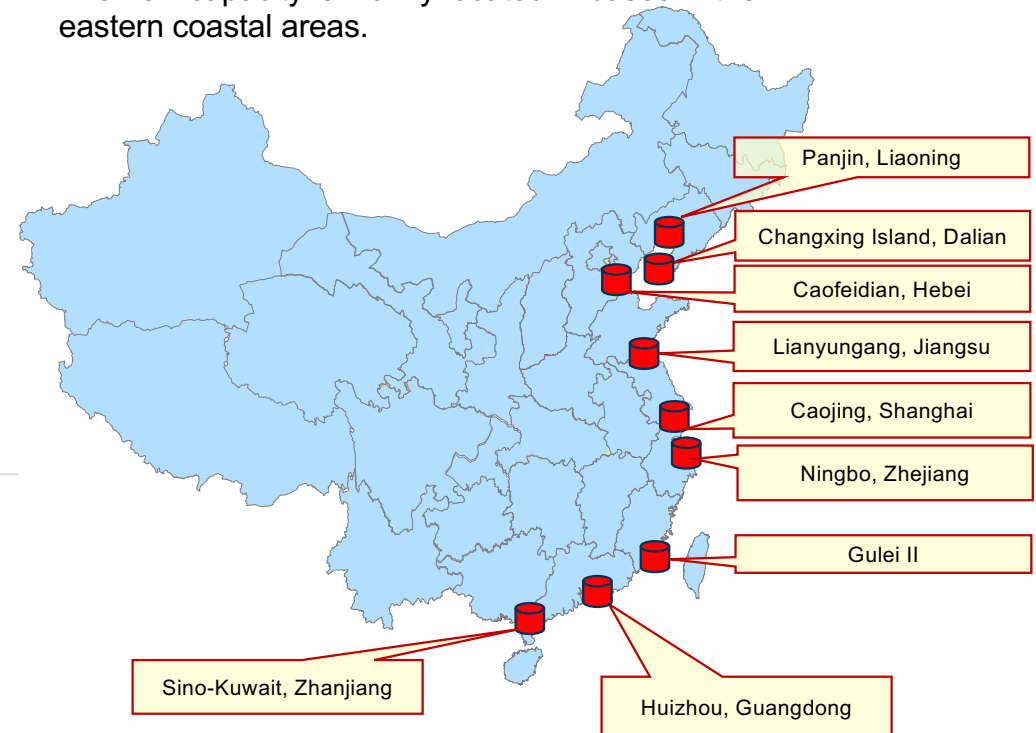


- China will have 4.32 million b/d new capacity and phase out 2.1 million b/d backward capacity before 2025.
- The total capacity will reach 18.8 million b/d by 2025.

# 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

**State-owned existing enterprise**

Expansion: 15 Mtons/year refining capacity and 1.2 Mtons/year Ethylene capacity  
 ... ..  
 Overall optimization to produce petrochemical feedstock

**Integrated independent enterprise**

Expansion: 20 Mtons/year refining capacity, 1.4 Mtons/year Ethylene capacity and 5.2 Mtons/year PX capacity  
 ... ..  
 The adoption of Diesel HC process

**State-owned new enterprise**

Expansion: 16 Mtons/year refining capacity, 2Mtons/year Ethylene capacity and 1.6 Mtons/year PX capacity  
 ... ..  
 The adoption of H-oil process and cancel FCC units

**Local independent refineries**

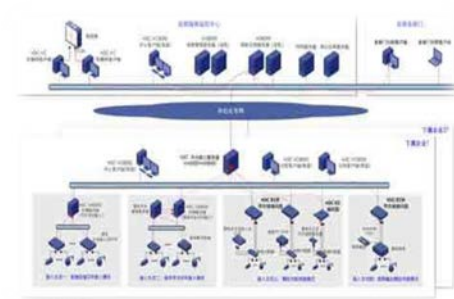
Phasing-out: outdated capacity less than 2 Mtons/year  
 ... ..  
 Expansion: 30 Mtons/year integrated units



## Environmentally friendly & Digital

- Emission reduction from the source
- Process control enhancement
- End treatment

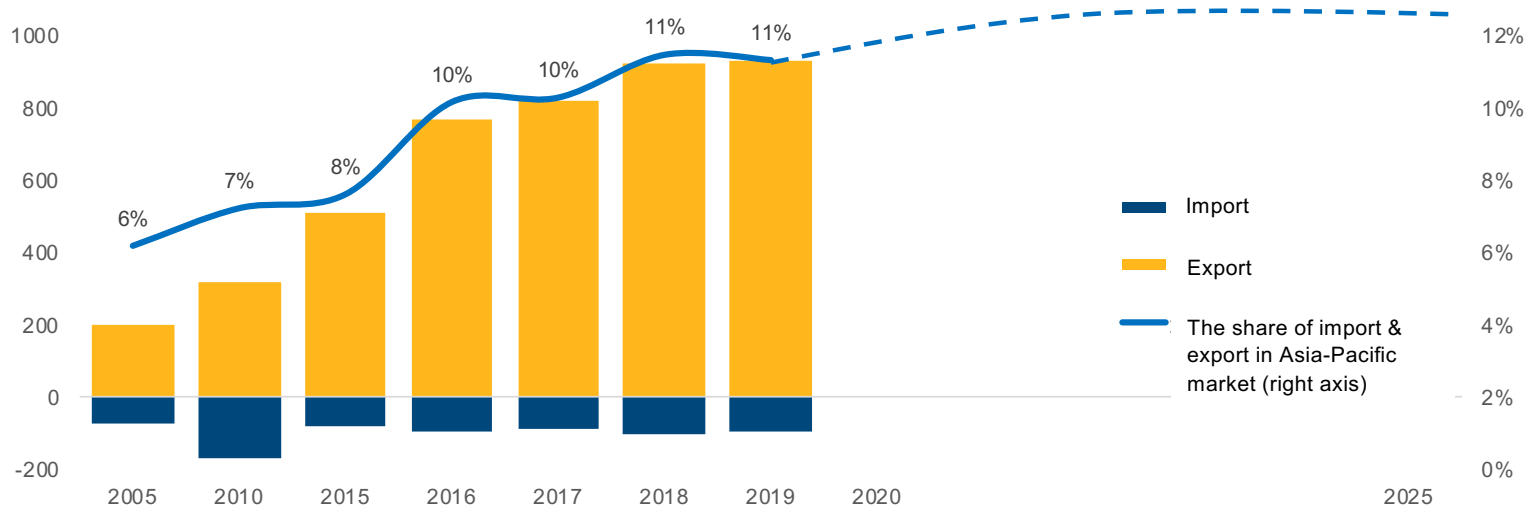
- IOT in refineries
- Process optimization
- Monitoring of operation



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

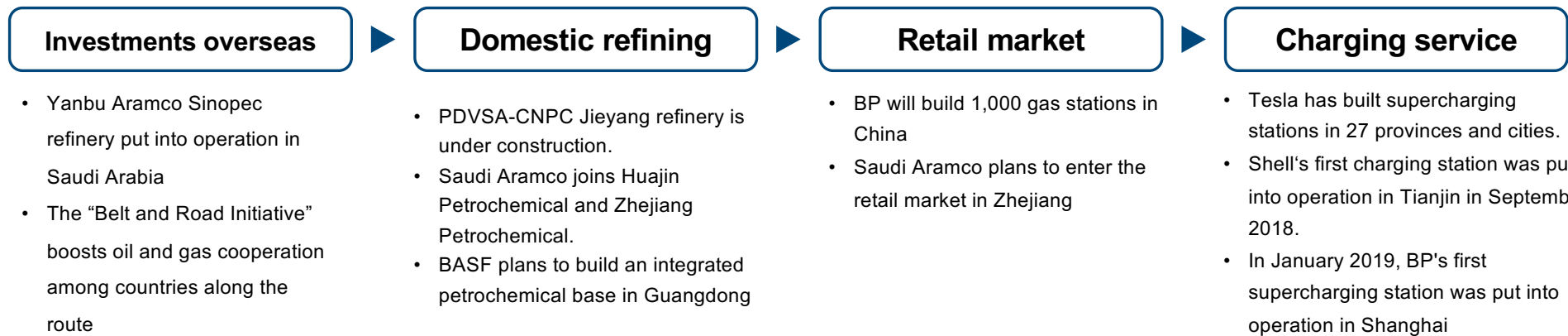


Outlook for China's refined oil import and export (kb/d)



- 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

