



Global Energy Interconnection
Development and Cooperation Organization
全球能源互联网发展合作组织

Analysis Report on China's Economic, Energy and Electric Power Development, Focal Points and Hot Spots in the Third Quarter of 2018

**Global Energy Interconnection Development and Cooperation
Organization**

October, 2018

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I. General Information on the Development of China's Economy, Energy and Electric Power

In the third quarter, the international environment underwent significant changes, and China's economy achieved a stable but slower performance. The prices of international crude oil and imported LNG rose, and energy security faced certain risks. China's electricity consumption maintained rapid growth, and UHV construction was further accelerated.

i. Economy

1. Economic operation in the third quarter was generally stable

In the third quarter, China's economy grew by 6.5% year-on-year, a slight decline from the first and the second quarters, and a year-on-year increase of 6.7% in the first three quarters. **Employment continued to improve.** In the first three quarters, over 11 million new jobs were created in urban regions, and the annual target was completed one quarter ahead of schedule. **The prices rose moderately.** In September, the CPI rose by 2.5% year-on-year, an increase of 0.2 percentage points from the previous month, and the PPI rose by 3.6% year-on-year. **Foreign exchange reserves fell slightly.** The balance of foreign exchange reserves at the end of September was USD 3.09 trillion. As of October 24, the RMB exchange rate was USD 1 against

6.9357 yuan, and there was a certain depreciation compared with the second quarter.

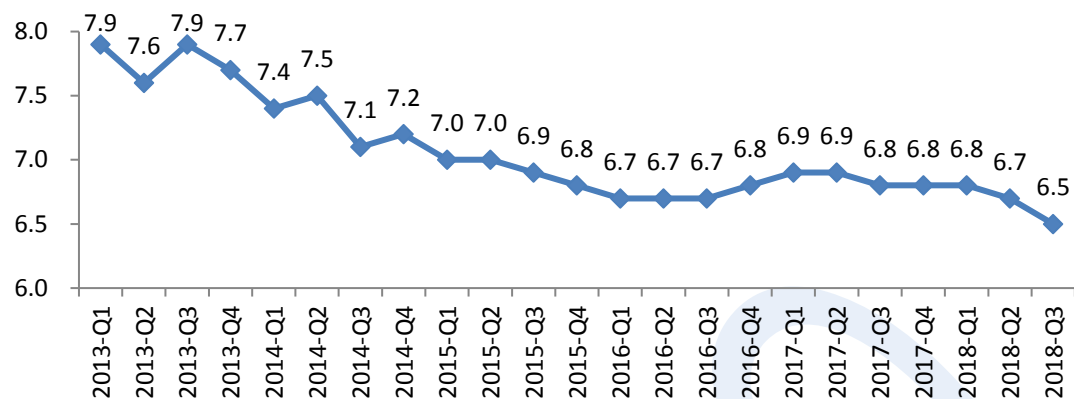


Fig.1-1 Quarterly Real GDP Growth Rates (%)

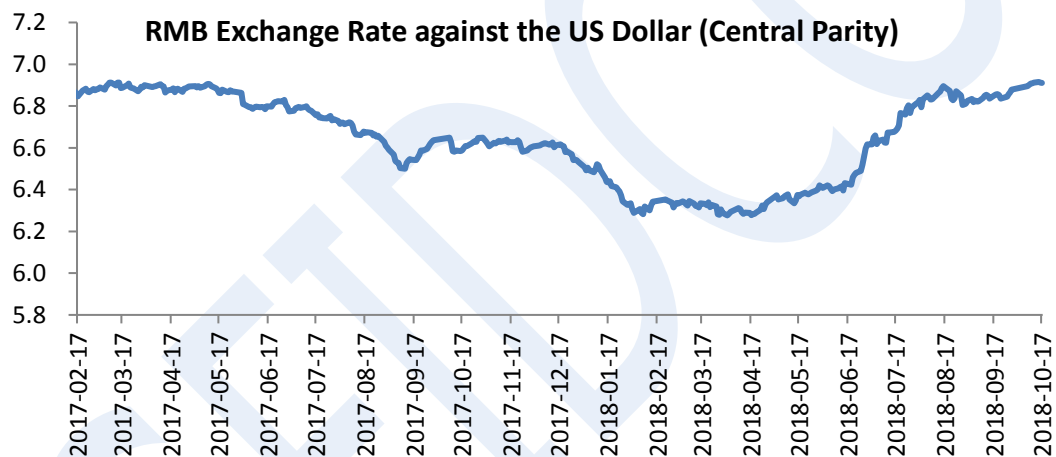


Fig.1-2 Trend of RMB Exchange Rate

2. The growth rates of industrial and services production fell slightly

The growth rate of industrial value added slowed down and the structure was continuously optimized. The Manufacturing PMI for September was 50.8%, down 0.5% from the previous month. In the third quarter, the value added of China's industrial enterprises above designated size increased by 6.0% year-on-year, the growth rate dropped by 0.3% year-on-year, and the industrial

capacity utilization rate was 76.5%, down 0.3% from the same period of the previous year. Industrial development continued to move towards the medium-high level. In the first three quarters, the value added of high-tech manufacturing, equipment manufacturing, and industrial strategic emerging industries grew by 11.8%, 8.6%, and 8.8% respectively, or 5.4%, 2.2%, and 2.4% higher than that of the industrial enterprises above designated size.

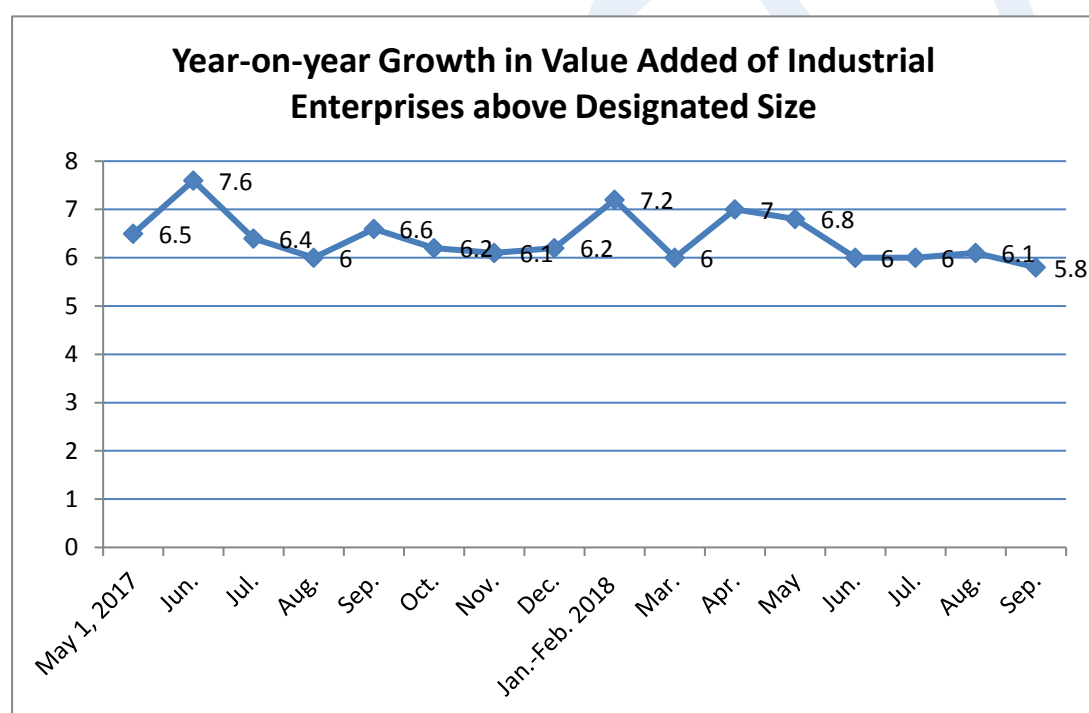


Fig.1-3 Year-on-year Growth in Value Added of Industrial Enterprises above Designated Size

The role of the services sector as a ballast continued to be consolidated. In the first three quarters, the value added of the services sector grew by 7.7%, maintaining relatively rapid growth. **Its contribution rate**

to economic growth reached 60.8%, an increase of 1.8% over the same period of the previous year. Tertiary industry accounted for 53.1% of the GDP, a growth of 0.3% over the same period of the previous year. The production index of China's services sector increased by 7.8% year-on-year, and the growth rate dropped by 0.2% from the first half of the year. Among it, information transmission, software and information technology sectors, and leasing and business services sectors grew by 37.5% and 10.8% respectively.

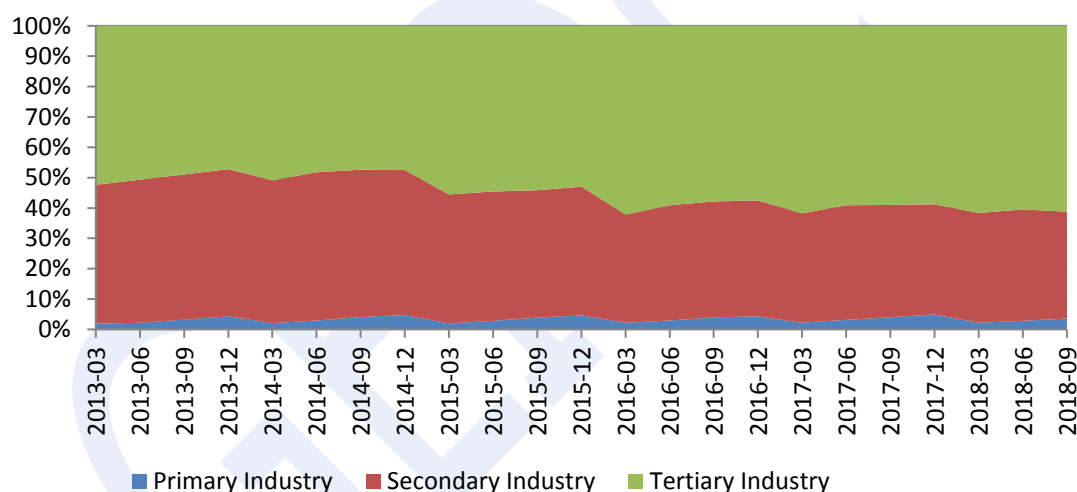


Fig.1-4 Contribution Rates of the Three Sectors to Economic Growth

3. Consumption is a key driver of economic growth

The growth of household consumption was stable, and services consumption grew rapidly. In the first three quarters, the per capita disposable income of Chinese residents was RMB 21,000 yuan, a year-on-year actual increase of 6.6%; the per capita consumption expenditure of

Chinese residents was RMB 14,000 yuan, a year-on-year increase of 6.3%, 0.4% higher than the same period of the previous year. The total retail sales of consumer goods reached RMB 27 trillion yuan, a year-on-year increase of 9.3%, and the growth rate dropped by 0.1% from the first half of the year. The proportion of services consumption in the first three quarters was 50.2%, an increase of 0.5% over the same period of the previous year. **The contribution rate of consumption to economic growth was 78%, an increase of 14% year-on-year.**

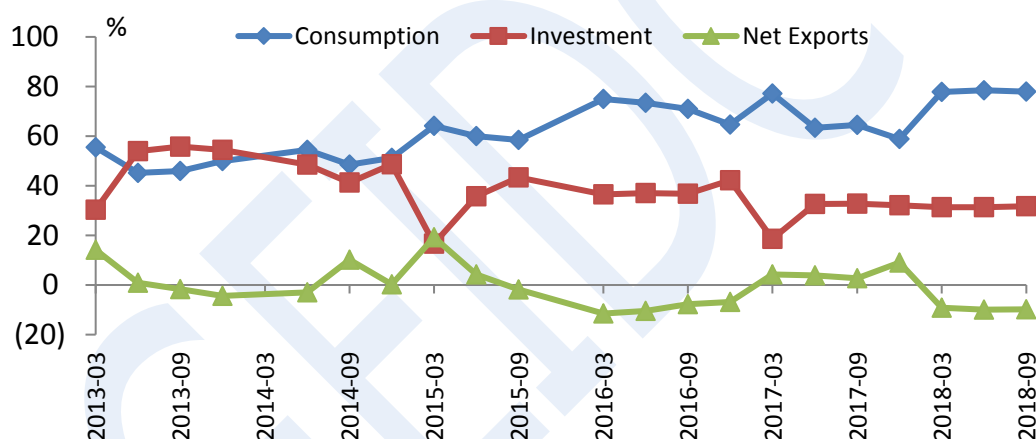


Fig.1-5 Contribution Rates of the Three Demands to Economic Growth

The growth rate of fixed asset investment continued to decline, while industrial investment rebounded. In the first three quarters, China's fixed asset investment (excluding rural households) rose by 5.4% year-on-year, and the growth rate dropped by 2.1 percentage points year-on-year. **The contribution rate of investment to economic growth was 31.8%, and the growth rate**

dropped by 1 percentage point year-on-year. Among it, private investment amounted to RMB 30 trillion yuan, an increase of 8.7% year-on-year. The growth rate was 0.3 percentage points higher than the first half of the year and 2.7 percentage points higher than the same period of the previous year. In terms of sectors, investment in primary industry rose by 11.7%; investment in secondary industry increased by 5.2%, of which manufacturing investment increased by 8.7%, 1.9 percentage points higher than the first half of the year, and the growth rate accelerated for six consecutive months; investment in tertiary industry increased by 5.3%, of which infrastructure investment increased by 3.3%.

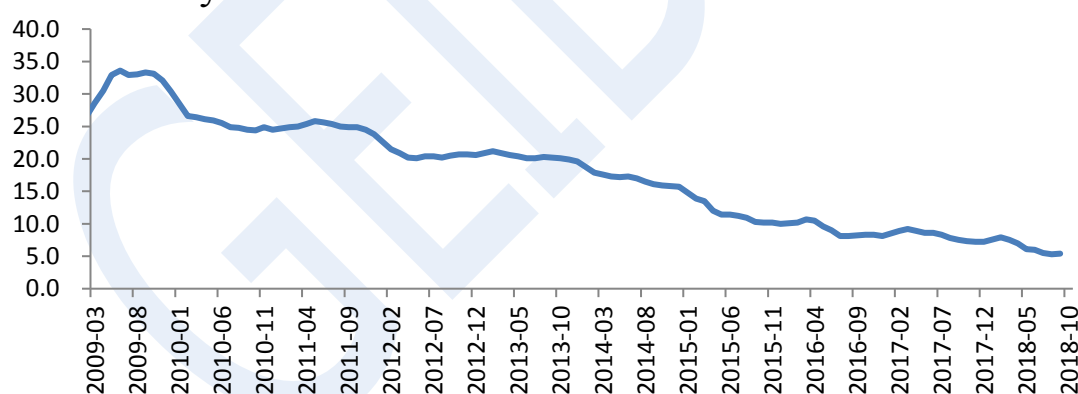


Fig.1-6 Cumulative Year-on-Year Growth Rate of China's Investment in Fixed Assets (%)

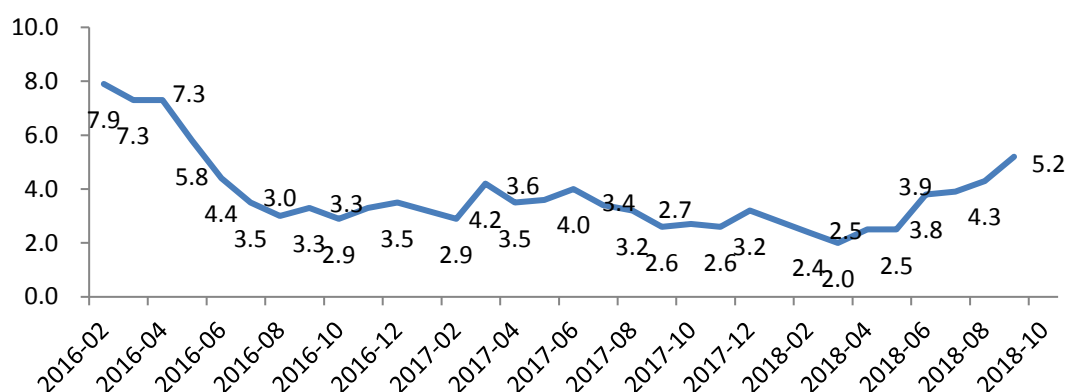


**Fig.1-7 Cumulative Year-on-Year Growth Rate of Investment in Fixed Assets
in Secondary Industry (%)**

The trade surplus continued to narrow, and the negative pull of net exports was obvious. In the third quarter, the total volume of imports and exports was USD 1.2 trillion, a year-on-year increase of 17.6%. Among it, exports amounted to USD 656.7 billion, up 12.3% year-on-year; imports were USD 571.3 billion, up 24.53% year-on-year. The trade surplus was USD 85.4 billion, which was 32.3% lower than the same period of last year. In the first three quarters, the contribution of net exports to economic growth was -9.8%, compared with 1.3% in the same period last year.

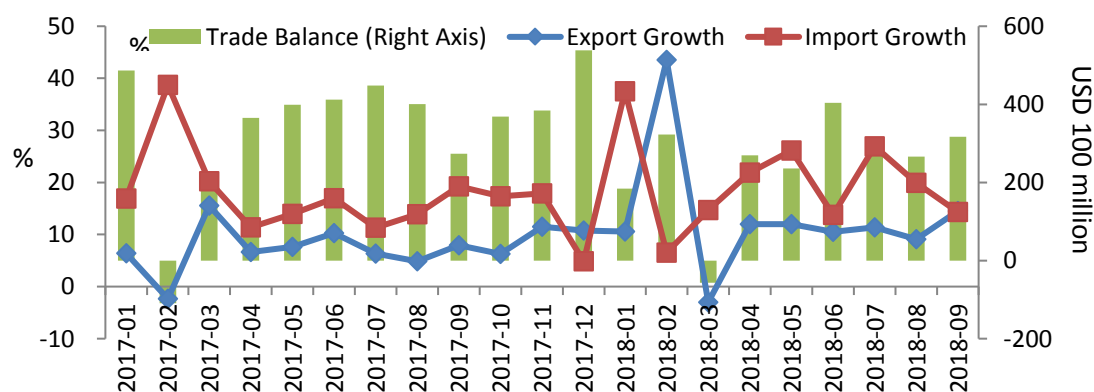


Fig.1-8 Foreign Trade Situation from 2017 to 2018 September

ii. Energy

In the third quarter, the production of industrial raw coal and natural gas was largely stable. Crude oil production fell year-on-year, and external dependence exceeded 70%. The external dependence of natural gas increased to 44%. There were prominent energy security risks.

1. The production of raw coal accelerated and the price of coal increased slightly. In September, raw coal production was 310 million tons, up 5.2% year-on-year. In the first three quarters, raw coal production was 2.59 billion tons, up 5.1% year-on-year, and imported coal amounted to 230 million tons, up 11.8% year-on-year. As of October 17, the comprehensive transaction price of Qinhuangdao 5500 kcal thermal coal was RMB 590 yuan/ton.

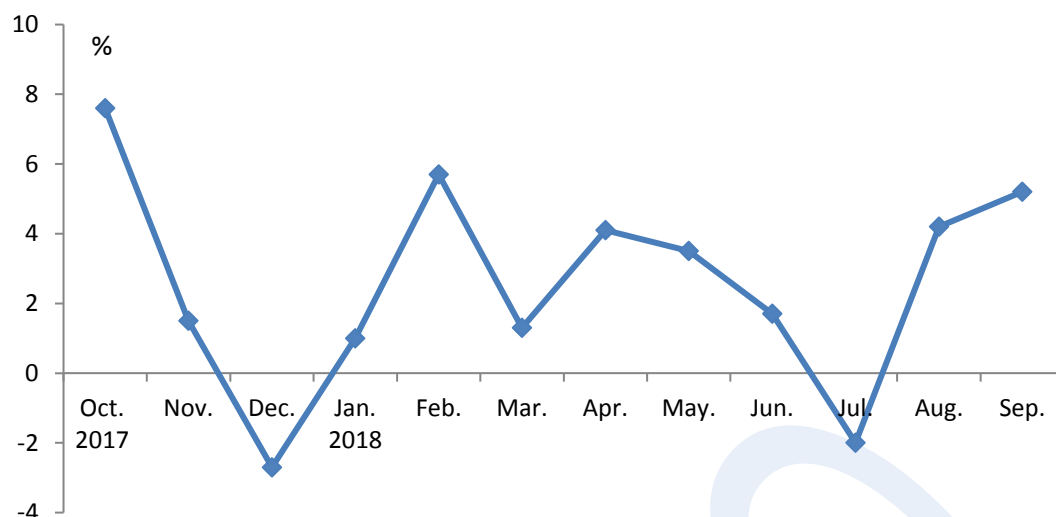


Fig.1-9 Monthly Growth Trend of Raw Coal Production of Industrial Enterprises above Designated Size

2. The price of international crude oil continued to rise and security risks in energy supply increased. In September, crude oil production amounted to 15.18 million tons, down 2.4% year-on-year. In the first three quarters, crude oil production was 141.13 million tons, down 1.9% year-on-year, and 336.41 million tons crude oil was imported, up 5.9% year-on-year. The external dependence of crude oil exceeded 70%. As of October 15, Brent crude oil price once exceeded USD 84/barrel. Affected by the rise in international crude oil prices, China's costs of crude oil importation rose 62.8%.

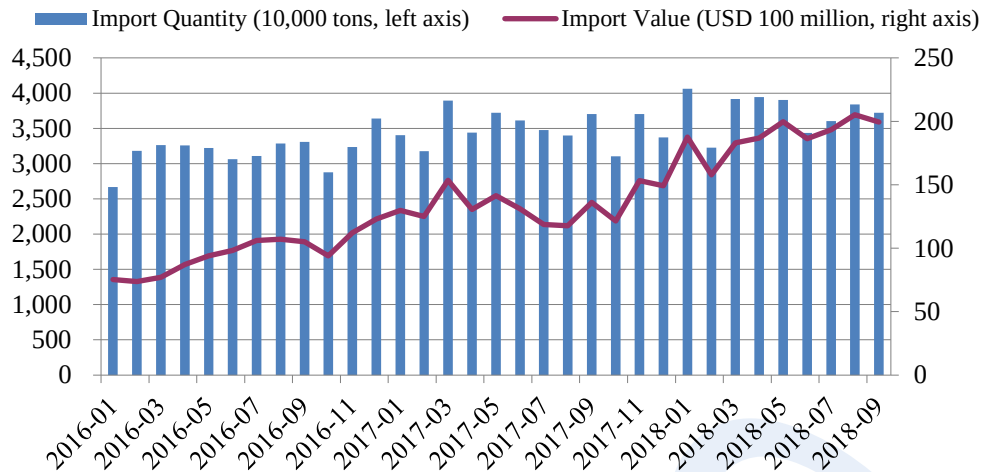
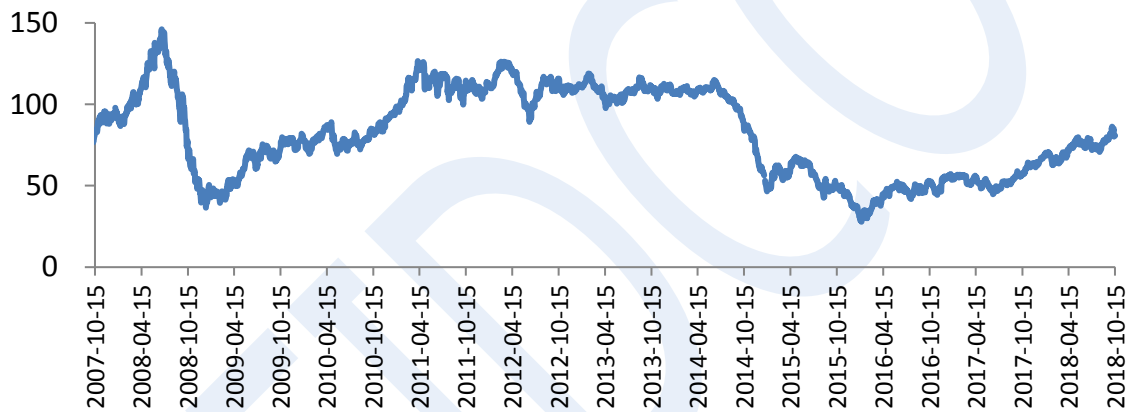


Fig1-10 Monthly Trend of China's Crude Oil Imports

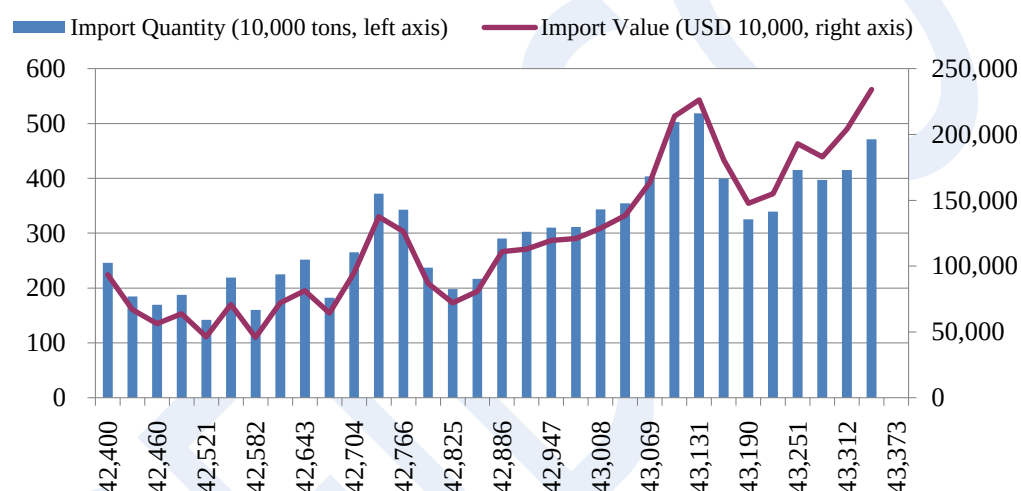


Source: ICE Brent Crude Futures

Fig.1-11 Settlement Price of Brent Crude Oil Futures (USD /barrel)

3. Both the volume and the price of imported natural gas rose, and the supply pressure in winter was obvious. In September, 12.2 billion cubic meters of natural gas was produced, an increase of 8.5% year-on-year. In the first three quarters, 116.2 billion cubic meters of natural gas was produced, up 6.2% year-on-year, and 90.8 billion cubic meters of natural gas was imported, up 34.0% year-on-year. The external dependence of natural gas

dependence was 44%. The price of imported LNG increased significantly, and the average price in August rose by 27.7% year-on-year. With the arrival of the heating period, LNG is under pressure from rising prices. **The rise in the prices of coal, oil and gas will be transmitted to downstream sectors, and both the PPI and the CPI were facing upward pressure.**



iii. Electric Power

The consumption and production of electric power in China maintained a relatively high growth rate, the generating capacities of new energies increased rapidly, and UHV construction was further accelerated.

1. Electricity consumption in China maintained a rapid growth. In September, China's electricity consumption was 574.2 TWh, an increase of 8% year-on-year. In the first three quarters, China's electricity consumption was 5,100 TWh, an increase of 8.9% year-on-year, and the elasticity coefficient was 1.33. In terms of sectors, **the electricity consumption of tertiary industry and urban and rural residents maintained double-digit growth.** The electricity consumption of primary industry was 55.5 TWh, up 9.8% year-on-year; the electricity consumption of secondary industry was 3,472 TWh, up 7.3% year-on-year; the electricity consumption of tertiary industry was 825.9 TWh, up 13.5% year-on-year; and the electricity consumption of urban and rural residents was 753.4 TWh, a year-on-year increase of 11.5%.

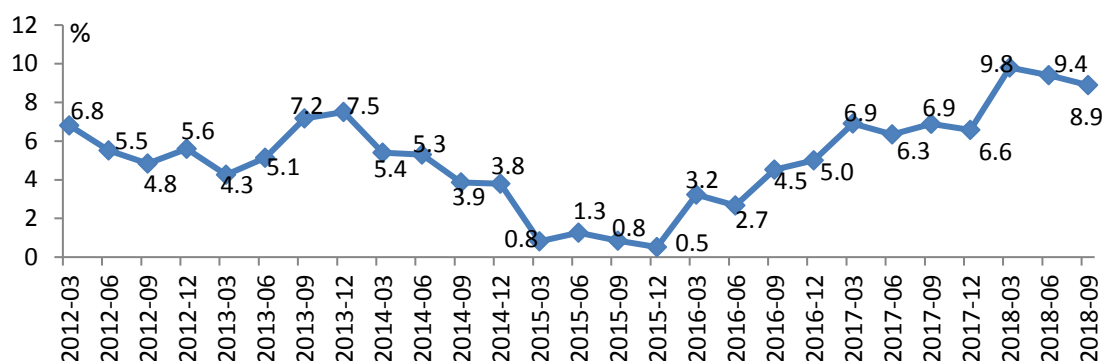


Fig.1-14 Cumulative Year-on-Year Growth Rate China's Electricity

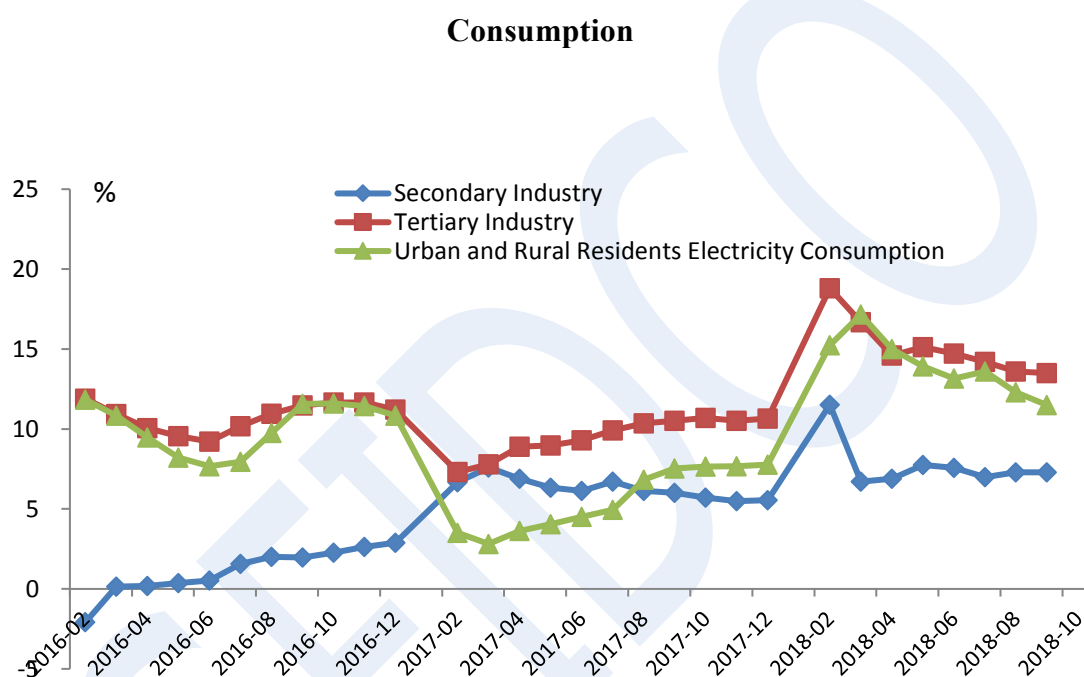
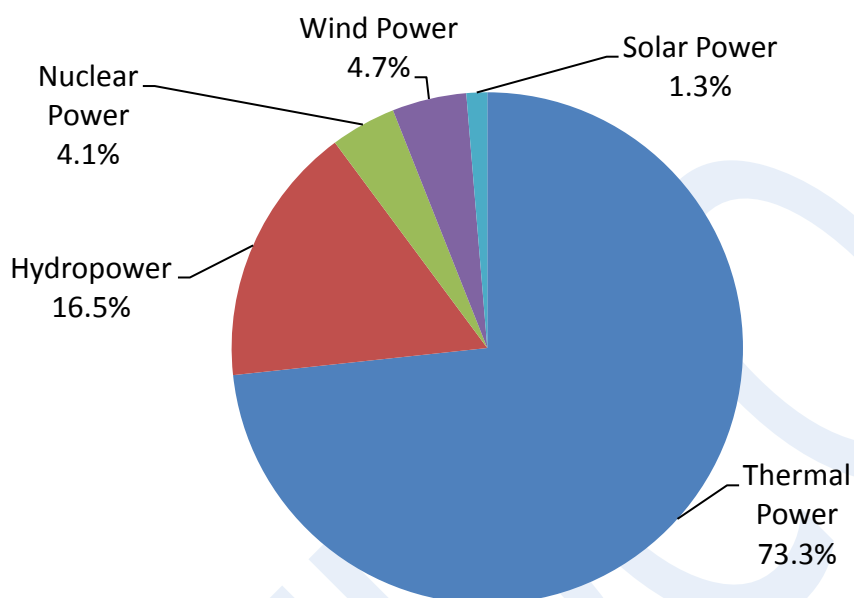


Fig. 1-15 Cumulative Year-on-Year Growth Rates of Electricity Consumption of Various Industries

2. Electricity generation from new energies grew rapidly. In the first three quarters, China's absolute electricity generation was 5,000 TWh, a year-on-year increase of 7.4%. Among it, thermal power was 3,690 TWh, an increase of 6.9%; wind power was 236.7 TWh, an increase of 20.1%; solar power was 66.1 TWh, an increase

of 17.9%; nuclear power was 208.9 TWh, an increase of 13.9%; and hydropower was 832.6 TWh, an increase of 4.4%.



Source: China Electricity Council

Fig.1-16 Composition of Absolute Electricity Generation in the First Three Quarters of 2018

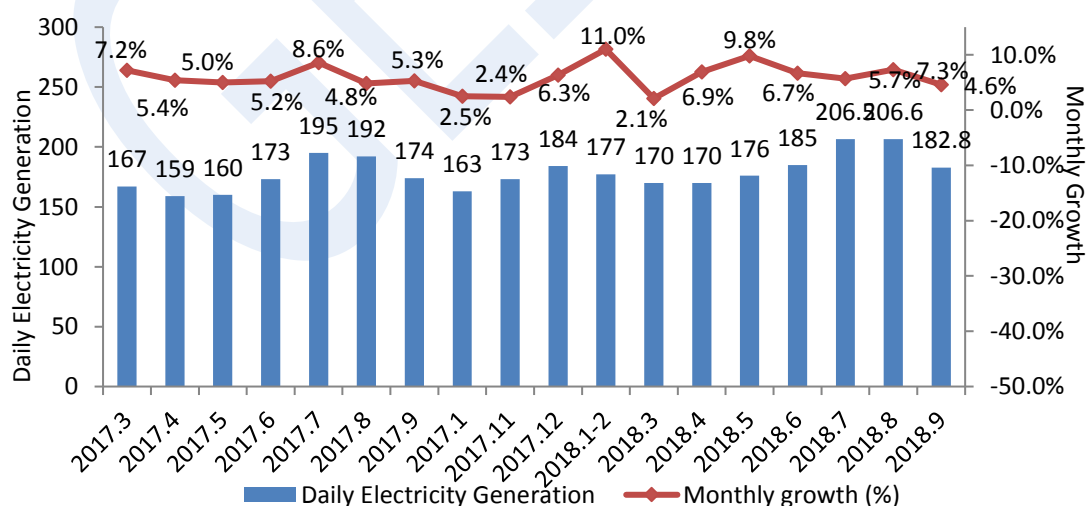


Fig.1-17 Electricity Generation by Industrial Enterprises Above Designated Scale 2017-September 2018

3. UHV construction was further accelerated. On September 10, the National Energy Administration of China issued the *Notice on Accelerating the Planning and Construction of a Group of Key Projects for Power Transmission and Transformation*. The 5 AC and 5 DC UHV projects have been included in China's national plan and will be approved this year or in the next year.

This round of UHV construction will bring win-win results. **First**, it is conducive to the absorption of the wind and photovoltaic resources in Qinghai, Zhangbei and other regions, and is conducive to the delivery of the hydropower of Yunnan, Sichuan and Guizhou to other regions. **Second**, it will alleviate the problem of power shortage in central and eastern regions. In the context of resolving the excess capacity of coal-fired power, the construction of thermal power plants in Jiangsu and other provinces with high electricity consumptions has slowed down, yet the growth of electrical load has been faster than expected, and power shortage in some provinces is quite obvious. The construction of key trans-provincial UHV power transmission and transformation projects will effectively ease the contradictions between supply and demand.

II. Analysis on Relevant Focal Points and Hot Spots

i. African Energy Interconnection will boost sustainable development in Africa

The Forum on African Energy Interconnection Development was an important part of 2018 Beijing Summit of the Forum on China-Africa Cooperation (FOCAC). Following the launch of the plan on the GEI Backbone Grid featuring nine horizontal and nine vertical grids for the first time in March this year, the first *African Energy Interconnection Planning Research Report* was been released at this forum. By putting forward the new strategy of “achieving coordinated development of electric power, mining and metallurgy industries by accelerating the development of clean energy, and promoting cross-border and inter-continental grid interconnection”, this report provides a package solution for the clean development of Africa with higher level of industrialization and electrification.

1. Ensuring the clean, efficient and safe supply of energy in Africa

Africa’s economic development enjoys a strong impetus, and the demand for energy and electricity will grow rapidly. The political situation in Africa is becoming

increasingly stable, the demographic dividend is continuously released, and the business environment continues to improve. Relying on abundant mineral resources and clean energy resources, Africa is welcoming new opportunities for sustainable development characterized by industrialization, urbanization and regional integration. By 2050, the economic aggregate of Africa will reach USD 20 trillion, which is 8.8 times of the current level. The per capita GDP will reach USD 8,000. Some countries will have entered the ranks of middle- and high-income countries and poverty will be basically eliminated. The rapid growth of population and the growth of economic aggregate, especially the development of industrialization and urbanization in Africa will place higher demands on the development of energy and electricity in Africa. In particular, the aluminum and steel industries in Guinea, Ghana, Nigeria and other West African countries have great potential for development. In the future, electricity consumption will be several times or even dozens of times that of the current power generation capacity. To address this power gap, it is urgent to accelerate the development of clean energy and the interconnection of power grids.

Developing African Energy Interconnection to

provide clean, sustainable and reliable energy and power supply for Africa's development. **First**, based on energy demands in Africa, accelerate the development of the large-scale hydropower bases in main river basins, the wind and solar power generation bases in the south, the north and the east and various distributed power sources to solve the problem of energy shortage from the source. **Second**, speed up the construction of the backbone grids in various countries, advance transnational, cross-regional and inter-continental interconnection, leverage the complementary advantages of water, wind and photovoltaic resources in Africa so as to promote the large-scale development, large-scale allocation and high-efficiency use of clean energies. **Third**, build and upgrade energy and electric power infrastructures, improve electrification and energy efficiency, and reduce energy and electricity costs. **In general**, by accelerating the comprehensive upgrading of energy and electric power production, allocation and consumption, build African Energy Interconnection characterized by close interconnection within the continent, efficient interconnection between continents and mutual complementation and supply of various energies, build an important carrier for the clean development in Africa, and provide strong guarantee for the implementation of

sustainable development in Africa.

2. Cracking development problems through co-development of electric power, mining and metallurgy industries

The industrialization of Africa must rely on its own resource advantages. Industrialization is the only way for Africa to achieve modernization. Africa has abundant natural resources, but it has long been mainly exporting primary raw materials with low economic value added. Meanwhile, it has all along been difficult to implement major energy, mining and other infrastructure projects in Africa, and this has seriously restricted the economic and social development in Africa. West Africa, South Africa and other regions enjoy huge high-quality mineral reserves. However, due to lack of electricity, they can only rely on the export of primary products such as raw ores which has limited contribution to economic development. The lower reaches of the Congo River are rich in hydropower resources, and the total installed capacity can exceed 120 GW. However, due to the constraints in technology, market and capital, the resources have not been exploited yet.

The co-development of electric power, mining and metallurgy industries may solve the dilemmas of major hydropower development in lower reaches of the Congo

River and major mining projects in West Africa. With clean and sufficient electric power supply, this model will ensure mineral development and metallurgical production, realize the coordinated development of the “electricity-mineral-metallurgy” industrial chain, promote the transformation of African resource advantages into economic advantages, and fundamentally change the energy development modes and economic development model in Africa. In the development of hydropower of the Congo River, for example, upon meeting Congo (DRC)’s domestic electricity demand, the hydropower of the Congo River can be sent to mineral-rich areas such as western and southern Africa through UHV technology to support the upgrading of aluminum and steel industries in Guinea and other countries and turn export of raw ores into local processing. The economic value will be increased by more than 6 times, and the products will be highly competitive. According to preliminary estimates, by 2050, Congo (DRC) and Guinea may enjoy mining and processing industries with annual output values of USD 50 billion and USD 80 billion respectively. Congo (DRC) can also obtain USD 16 billion from electricity exports per year.

This model will effectively solve the funding problems of large-scale projects in Africa: power plants, transmission

companies and industrial consumers sign long-term agreements based on the profit expectations of power and mining projects and the credit of large enterprises to reduce project risks and ensure the profits of the parties; banks and consortiums can then provide loans according to the capital invested by relevant parties and the long-term legally binding agreements among these parties. In this way, the dilemma faced by large-scale projects in their implementation due to the government's inability to guarantee and the lack of funds will be solved.

3. Building new mechanisms and platforms for China-Africa energy cooperation

We came up with the proposal to establish African Energy Interconnection Sustainable Development Alliance. GEIDCO and the government of Guinea jointly initiated this Alliance to promote the development of multilateral cooperation mechanisms and build cooperation platforms that follow the principles of achieving shared growth and win-win results through discussion and collaboration that coordinate actions of African countries and motivate businesses and banks to join the efforts in promoting the clean and integrated development of Africa with higher level of industrialization and electrification.

African Energy Interconnection will become a new platform for China-Africa cooperation. Infrastructure is a key area of China-Africa cooperation which covers both domestic transport and energy infrastructures in African countries, and the construction of transnational and cross-regional infrastructures. According to the plan, by 2050, a total of some USD 2.9 trillion will be invested in African Energy Interconnection, including USD 1.58 trillion of power generation investment and USD 1.32 trillion of grid investment, driving Africa's economic growth by 0.4 percentage points per year. Large-scale development of clean energy and interconnection of power grids can promote cooperation between China and Africa in related industries and technologies, and effectively promote the construction of major infrastructure and livelihood projects in Africa.

ii. IPCC's Special Report on Global Warming of 1.5 °C rings the alarm for climate change

On October 8, the Intergovernmental Panel on Climate Change (IPCC) released a special report that urges governments to take urgent measures to reduce carbon emissions.

1. Global climate change is faster than previously expected

The special report pointed out that global warming is likely to reach 1.5 °C above pre-industrial levels between 2030 and 2052 if it continues to increase at the current rate. Meanwhile, serious qualitative changes are projected to take place in impacts on ecosystems at 2 °C of global warming compared to 1.5 °C, including the acceleration of sea level rise, the doubling in the number of global water-deficient populations and the number of wildlife that have lost their habitats, and the significant rise in the incidence rate of forest fires. The governments should take stronger measures to keep global warming at 1.5 °C.

2. Accelerating energy green and low carbon transformation is imminent

In 2014, carbon dioxide emissions associated with fossil energy accounted for 85% of total carbon dioxide emissions from human activities and were decisive for global warming. At present, more than 80% of the energy consumed globally is fossil energy. If the existing energy development pattern remains unchanged and the clean and low-carbon transformation on a global scale is not sped up, it is expected that global energy sectors alone will produce more than 4.8 trillion tons of carbon dioxide emissions by the end of this century, which is likely to cause global warming to exceed 4 °C. Controlling the global cumulative

carbon dioxide emissions from 2011 to 2100 to be within 1 trillion tons is an important precondition for global warming to be controlled within 2 °C by the end of this century. Compared with existing policy scenarios, this requires the cumulative emissions from global energy departments to be dramatically reduced by over 80%.

3. Global emissions reduction pathway proposed by GEIDCO

Based on the basic law of the “decarbonization” of energy, Global Energy Interconnection comprehensively promotes the clean and low-carbon transformation of global energy through the implementation of “clean replacement” on the supply side, “electricity replacement” on the consumption side, and “grid interconnection” on the allocation side. **Global Energy Interconnection can effectively ensure the realization of the 2 °C target, enjoys the advantages of advanced technology, lower cost, being practical and feasible, and being easy to popularize, may promote the decoupling of economic growth and carbon emissions, win development space for all countries, especially developing countries, and cooperate to facilitate the achievement of the goals of global sustainable development.** Based on existing planning programs, the possibilities for the construction processes of

the “Two Replacements” and Global Energy Interconnection may be greatly enhanced. The international community’s active advocacy and promotion of the 1.5 °C target will more vigorously promote the research, application and international cooperation of low-carbon technologies, and this, objectively, will help accelerate the technological innovation and project implementation of Global Energy Interconnection.

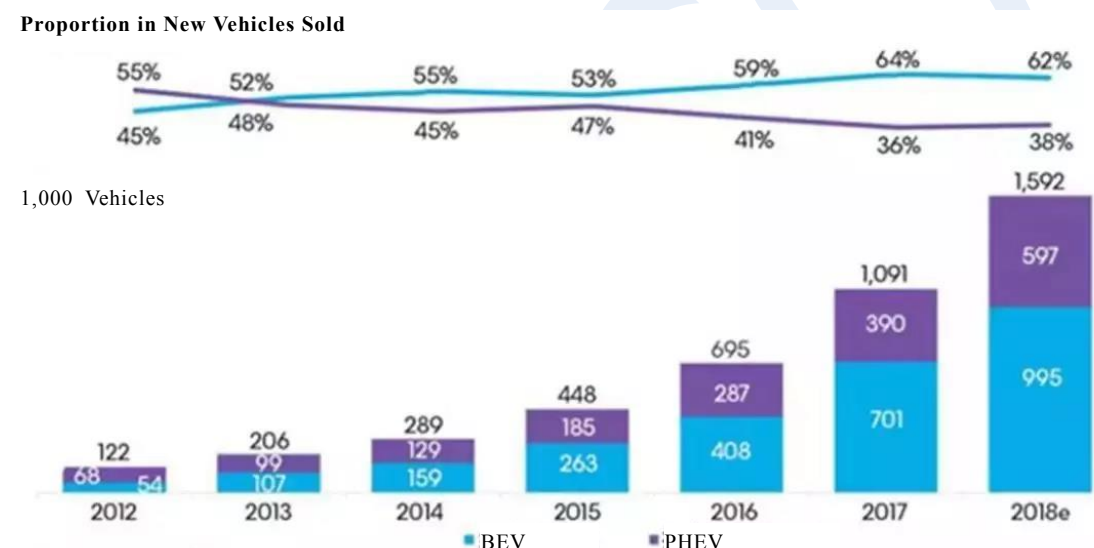
iii. New energy vehicles enjoy booming development globally

1. The production and sales of new energy vehicles are growing rapidly

From January to September 2018, the production and sales of new energy vehicles in China were 735,000 and 721,000 respectively, an increase of 73% and 81.1% respectively over the same period of the previous year. Among them, the production and sales of battery electric vehicles (BEV) were 555,000 and 541,000 respectively, up 58.9% and 66.2% respectively over the same period of last year; the production and sales of plug-in hybrid electric vehicles (PHEV) were 180,000 and 181,000 respectively, up 138% and 146.9% over the same period of last year.

In 2017, the global sales of new energy passenger vehicles reached 1,206,800, a year-on-year increase of

66.2%, setting a new record. In the first five months of 2018, the cumulative sales volume was 598,000, a year-on-year increase of 71%, and the market share rose to a record high of 1.5%. With the large-scale production of electric vehicles, the cost will continue to decline. According to Bloomberg News, the global sales of electric vehicles will rise from the global record of 1.1 million in 2017 to 11 million in 2025, and then to 30 million in 2030.



Source: BNEF

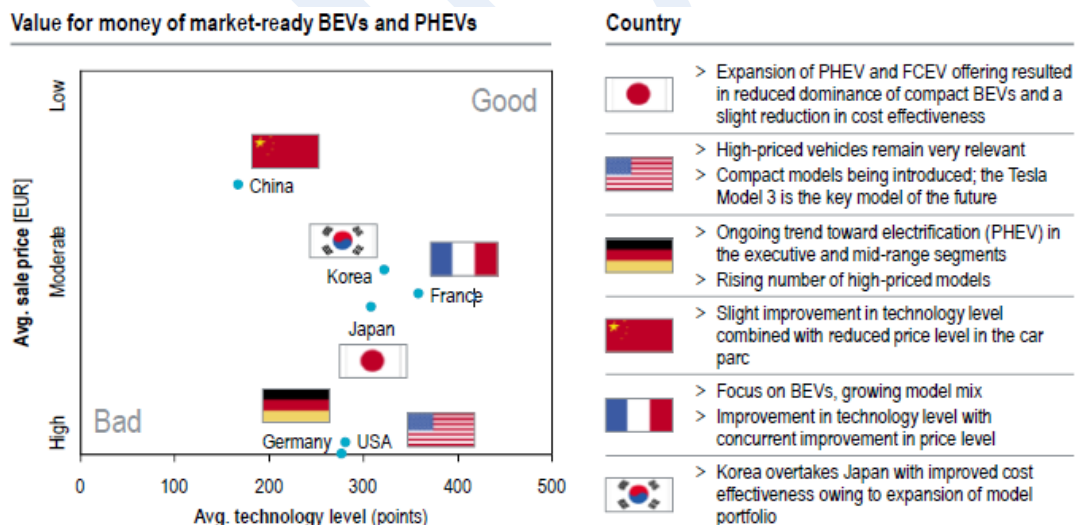
Fig.2-1 Sales and Forecasts of Various Types of Electric Vehicles

Worldwide 2012-2018

2. The technical level of electric vehicles still needs to be improved at a faster pace

According to the E-mobility Index 2018 released by China Association of Automobile Manufacturers, compared with the United States, Japan, Korea, Italy and

Germany, China's electric vehicle development is ranked the last in terms of technology, while France and Germany are ranked the first and the second. Battery technology is currently the biggest constraint to electric vehicle development in China, and there are problems such as high cost and long charging time. Meanwhile, there is also room for improvement and progress in electric motor and electronic control technologies and traditional whole vehicle technologies represented by NVH technology. It is necessary to speed up the pace and catch up with the international advanced level.



Source: Forschungsgesellschaft KraftfahrwesenmbH Aachen; Roland Berger

Fig.2-2 Cost Performance of Electric Vehicles of Major Countries

3. The electrification of transport will replace a large number of demands for crude oil

16 countries and regions have established exit schedules of fuel vehicles. As the environmental pollution caused by fuel vehicles has seriously affected environmental targets, countries around the world have successively formulated plans for the exit of fuel vehicles. As the largest oil consumer, the transport sector accounts for about 50% of China's total oil consumption. Exhaust emissions from fuel vehicles have become a major source of air pollution in some cities. In Beijing, for example, 45% of locally emitted PM_{2.5} is from mobile emissions. Therefore, accelerating the development of electric vehicles to replace traditional fuel vehicles and optimize transport modes is an important way to ensure national energy security and environmental safety.

Table 2-1 Suggested Exit Timetables of Fuel Vehicles of Various

Countries

Area	Time	Form	Deadline	Scope
Netherland	2016	Bill	2030	Pure gasoline/diesel passenger vehicles
Norway	2016	National plan	2025	Pure gasoline/diesel vehicles
Germany	2016	Bill	2030	Diesel locomotives
France	2017	Official oral statement	2040	Gasoline/diesel vehicles
UK	2018	Government document of Road to Zero released in 2018	2040	Gasoline/diesel vehicles
UK (Scotland)	2017		2032	Gasoline/diesel vehicles
India	2017	Official oral statement	2030	Gasoline/diesel

				vehicles
China (Taiwan)	2017	Government action plan	2040	Gasoline/diesel vehicles
Ireland	2018	Official oral statement	2030	Gasoline/diesel vehicles
Israel	2018	Official oral statement	2030	Imported gasoline/diesel passenger vehicles
Italy (Roma)	2018	Official oral statement	2024	Diesel vehicles
China (Hainan)	2018	Government document	2030	Gasoline/diesel vehicles

A great deal of demands for crude oil will be replaced by transportation electrification. It is estimated that, by 2040, more than 50% of the world's newly sold vehicles will be electric vehicles, and the corresponding demand for crude oil will be reduced by 7.3 million barrels per day. Among it, the demand for oil replaced in China will be about 2.5 million barrels per day, and those in the United States and Europe will be 2.3 million barrels per day and 1.1 million barrels per day respectively.

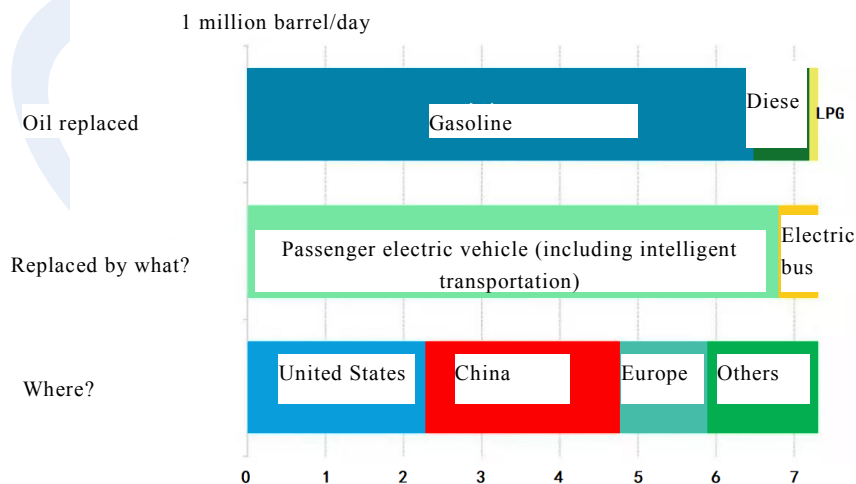


Fig.2-3 Replacement of Fuel by Electrification 2040