

Annual Business Review

Focusing on market orientation and economic returns, the company continues to optimize production organization and resource allocation, promote integrated and coordinated operation on oil and gas production, refining, marketing and trade activities, and improve international operation performance and market competitiveness in service business.

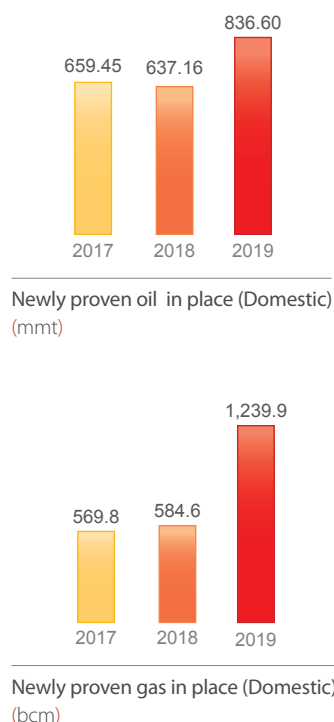


Exploration and Production

2019 was the first year to implement the *Domestic E&P Business Acceleration Plan*. The year saw our significant progress in E&P, thanks to our corporate reform and technological innovation, well-planned and enhanced E&P activities, favorable outcomes from unconventional resources, and active engagement in foreign cooperation in China.

Exploration

Persisting in the resource strategy in 2019, we carefully deployed prospective, concentrated, refined and integrated techniques, with a focus on new and key areas. Strategically significant discoveries were made in Junggar, Ordos, Tarim and Sichuan basins and in shale oil. The full-year increment to proven oil in place and gas in place are 836.60 million tons and 1,239.9 billion cubic meters respectively in China, recording a leap over those in 2018 and the best since our restructuring in 1998.



Reserves and operating data (Domestic)

	2017	2018	2019
Newly proven oil in place (mmt)	659.45	637.16	836.60
Newly proven gas in place (bcm)	569.8	584.6	1,239.9
2D seismic (kilometers)	26,813	18,182	11,478
3D seismic (square kilometers)	7,843	12,570	15,204
Exploration wells	1,774	1,803	1,405
Preliminary prospecting wells	986	997	733
Appraisal wells	788	806	672

Major Discoveries

Exploration in new blocks and domains

14 important discoveries achieved from risk exploration and preliminary prospecting

- High yield oil and gas flows were obtained from risk exploration wells Gaotan-1 and Chetan-1 in Junggar Basin
- A new gas province with one trillion cubic meters of reserves was identified in Bozi-Dabei region in Tarim Basin
- In Ordos Basin, we began explore shale oil in Block Chang-7 and uncovered the first 100 billion cubic meters gas field in the Qingshimao area of Ningxia Hui Autonomous Region
- New progress was made in exploring tight gas in Sichuan Basin
- Important discoveries were made in Songliao, Qaidam, Erlian, and Bohai Bay basins

Exploration in mature blocks

Oil exploration resulted in 18 important achievements and unveiled 5 uncompartimentalized reserves of 100 million tons for each

- In Ordos Basin, we discovered the Qingcheng Oilfield with reserves of more than one billion tons; and newly found more than 300 million tons of probable oil in the Huanjiang region
- Several large-scale oil plays were unveiled in the Manan region of Junggar Basin, the northern part of Tarim Basin, the Yingxi region of Qaidam Basin, and Songliao and Bohai Bay basins

Gas exploration resulted in 10 important achievements and unveiled 9 uncompartimentalized reserves of 100 billion cubic meters

- A 1-trillion-cubic meter shale gas province was found in the southern part of Sichuan Basin, which consisted of more than 700 billion cubic meters of newly proved shale gas in place in the Changning, Weiyuan, and Taiyang blocks
- Several large-scale natural gas plays were newly unveiled in the Sulige region of Ordos Basin, the Keshen-Dabei region of Tarim Basin, etc.



Xinjiang Oilfield

Crude Production

With continued emphasis on both stabilizing production in mature fields and ramping up the profitable production in new blocks, we produced 101.77 million tons of crude oil in China in 2019 by highlighting the organization and implementation of production and accelerating the transformation of development methods.

Stabilizing Production of Mature Fields

With the Stable Production Program, we stabilized production of mature fields, which accounted for most of our onshore fields, by mitigating the decline rate and enhancing the recovery factor. The natural and composite decline rates and the growth of the water cut were reduced, thanks to measures such as fine interpretation and classified and hierarchical management of reservoirs, effective water injection in oilfields, restoration of dormant wells, and pilot development. Based on a combination of secondary and tertiary recovery techniques and deployment of surfactant/polymer flooding, we increased the overall recovery by more than 20 percentage points in Xinjiang, Dagang, and Liaohe oilfields.

Ramping up Production in New Blocks

Focusing on profitability, we ramped up production capacity in new blocks by 14.78 million tons in 2019, thanks to increased single-well output and enhanced efficiency respectively attributable to improved technologies and innovative management. The application of "horizontal wells + SRV fracturing" technologies was extended, and at the same time, new "large-platform, three-dimensional, factory-process" ramp-up model rolled out, which brings new ideas to traditional production concept and development mode. Construction of 13 demonstration zones, one of which was shale oil at Changqing Longdong, was pushed forward, shaping a new model for building the profit-based productivity of unconventional resources.

Exploration and Development Technologies

In 2019, our enhanced R&D gave birth to innovative E&P technologies that created more possibilities for stabilizing and ramping up production. We accelerated the R&D and application of high-precision 3D seismic exploration, deep and long horizontal well drilling and completion, and fracturing stimulation technologies. We also carried out pilot development focusing on "high water cut and high recovery percentage" and "low permeability and low abundance" reservoirs. Our technological systems of complex reservoirs logging evaluation, platform-based arrangement of large well clusters, SRV fracturing, well borehole and operation technology were improved. All these technologies have fully enhanced our capability of engineering and technological support. Remarkable results were achieved with innovative and strategic technologies like oxygen-reduced air drive and natural gas gravity flooding in Liaohe and Xinjiang oilfields. Based on E&P Dream Cloud, eight of our oilfields, such as Changqing, Southwest and Dagang, were fully digitalized.

E&P Dream Cloud 2.0

E&P Dream Cloud is CNPC's first intelligent information sharing platform. It is intended to bolster connectivity for data, technology and research in upstream activities and promote the intelligent E&P. In November 2019, E&P Dream Cloud 2.0 was released, heralding a new stage of IT-based intelligent upstream operation.

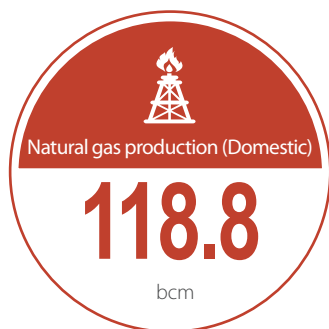
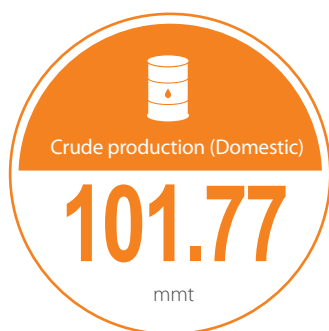
By the end of 2019, the platform's unified data pool had managed six decades of data assets from 360,000 wells, 600 reservoirs, 7,000 seismic sections, and 40,000 stations and storages. These shared data included all our core E&P data in six business segments of 15 disciplines. The collaborative research environment was put into full use and improved the efficiency of comprehensive research data preparation by more than 60 times. More than ten companywide centralized systems and some 100 local systems of oil and gas fields were quickly integrated over the cloud to support more than 30,000 users, which shows the synergy of the six business segments of CNPC.

Natural Gas Production

In 2019, our natural gas output in China recorded a new high of 118.8 billion cubic meters, increasing for three consecutive years after climbing up to 100 billion cubic meters, significantly helping improve the energy structure of China. We achieved this by pushing forward with conventional gas development and emphasizing R&D and investment in unconventional resources such as tight gas and shale gas under the *Natural Gas Business Development Plan*. This increase not only occurred in the major regions of Changqing, Southwest and Tarim fields, but also in Daqing Oilfield for nine consecutive years and was stable in the Qinghai, Huabei and Dagang fields.

Underground Gas Storages

In 2019, we further tapped the potential of operating storages and built new ones to accommodate both regional and seasonal imbalances and ensure supply in the domestic natural gas market. By the end of 2019, our ten operating storages had peak-shaving capability of 10.2 billion cubic meters; and 18 storages were under construction, two of which were being built and the other 16 were under preliminary evaluation and pilot testing.



Unconventional Hydrocarbon and New Energy

E&P of unconventional hydrocarbon such as tight oil, shale oil, tight gas, shale gas and CBM and development of new energy such as geothermal energy and natural gas hydrates have proceeded progressively.

E&P of Unconventional Hydrocarbons

In 2019, we expanded unconventional E&P by enhancing the prediction and evaluation of sweet spots, pilot development, and demonstration of profit-based capacity building.

Tight oil (shale oil): Our E&P of tight oil (shale oil) saw significant results in several regions. In Ordos Basin, we proved the one-billion-ton Qingcheng Oilfield, the largest ever shale oilfield of China. In Bohai Bay Basin and Sichuan Basin, we made new progress in exploring shale oil. In Dagang Oilfield, we started China's first industrial development of continental shale oil. In Junggar Basin, we accelerated the E&P of tight oil (shale oil) in Jimusaer and Mahu regions. Moreover, scaled productivity of tight oil was built in Santanghu Basin and the southern part of Songliao Basin.

Tight gas: Tight gas exploration saw another breakthrough in the middle part of Sichuan Basin, where a new gas province with reserves of one trillion cubic meters was unveiled by multiple exploration wells that produced industrial gas flows. Tight gas accounts for most of the output from Changqing Oilfield, the largest gas producer in China. By upgrading E&P technologies and promoting more efficient development models, the oilfield kept increasing its tight gas output per well and much improved its development efficiency. In 2019, CNPC produced 33 billion cubic meters of tight gas, accounting for more than 1/4 of our total gas output in China.

Shale gas: A shale gas province with reserves of one trillion cubic meters was formed in the southern part of Sichuan Basin, with more than 700 billion cubic meters of shale gas were newly proved. New breakthrough was made in the deep shale gas exploration in Luzhou and Weiyuan blocks. In the Southwest gas province, we built China's largest base of shale gas production with daily output of 30 million cubic meters.

CBM: We kept extending our reach in CBM exploration and development. In Huabei Oilfield, we accelerated R&D for developing CBM in deep layer and of medium rank, and extend the depth from 800m up to about 2,000m. In two major producing fields, namely, Qinshui Basin of Shanxi Province and Edong Gas Field of Shaanxi Province, we increased the output by innovatively tapping potentials of sweet spot resources and comprehensively treating mature reservoirs, especially in the blocks of Baode, Sanjiao, and Hancheng.

New Energy

We have been pushing ahead with our new energy development plans and deployed a series of new energy projects closely related to our core operations. Areas of focus include geothermal energy, natural gas hydrates, biomass, energy storage, hydrogen fuel and uranium.

Geothermal energy: We have been actively promoting the development and utilization of geothermal energy and supporting relative research efforts, and implemented demonstration projects for the development and utilization in Huabei, Liaohe, Daqing and Jidong oilfields. In 2019, our first geothermal well in Xiong'an New Area of Hebei Province was completed, which would considerably help the area "build a clean and environmentally-friendly heat supply system by rationally utilizing geothermal resources".

Joint E&P in China

We have been deepening the cooperation in China with international partners including Shell and Total around low-permeability reservoirs, heavy oil, shallow-water reservoirs, sour gas, high-temperature and high-pressure gas reservoirs, CBM, tight gas and shale gas.

In 2019, CNPC's foreign cooperation E&P projects in China produced 10.71 million tons of oil equivalent, maintaining growth and including 2.39 million tons of crude oil and 10.4 billion cubic meters of natural gas. By the end of 2019, the company had 29 joint E&P projects in operation.

We stepped up collaborative efforts in these projects, where the investment and drilling workload were much increased and new breakthrough was made in developing new projects. The Zhaodong Project, under an extension agreement with our partners, New XCL-China and ROC Oil, yielded more than 100 tons of oil every day from each of the 12 wells among of the 14 wells that were newly put into production. The Changbei Project, with Shell as our partner, produced more than 3 billion cubic meters of gas for 12 consecutive years. The Sulige South Project, with Total as our partner, built up the capacity to supply 10 million cubic meters of gas per day. CNPC was also under joint research agreements with CNOOC and Sinopec to push forward the E&P of oil and gas resources, especially tight gas, shale gas and other unconventional hydrocarbon, in Beibu Bay, Bohai Bay, Junggar and Sichuan basins.



Xiangguosi underground gas storage

Natural Gas and Pipelines

In 2019, we put more importance on the entire value chain of gas business. By actively arranging domestic and foreign gas resources, we stabilized not only the market supply but our sales growth. Moreover, we continuously optimized the operation of our gas pipeline network and put into operation of a number of key pipeline projects.

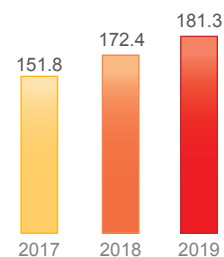
Natural Gas Sales

2019 saw faster transformation of China's energy structure and thereby higher demand for natural gas. In a market-oriented way, we optimized the portfolio of domestic and foreign resources, as well as the market layout and sales structure. Moreover, we improved our differentiated marketing strategies. In the key regions of Beijing-Tianjin-Hebei, the Yangtze River Delta and the Pearl River Delta, we advanced the "Gasification" campaign. In winter, measures were taken to meet the demand for heating purposes. All these efforts ensured stable market supply and increased gas sales. In 2019, we sold 181.3 billion cubic meters of gas in China, up 5.1% year-on-year.

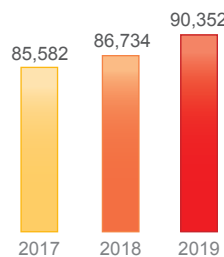
Natural Gas Marketing

In natural gas marketing, we focused on expanding our market share by direct supply to end users. We also worked out marketing strategies pursuant to the trend of market and the industry and policy changes. With optimized retail portfolios, we quickly expanded our end-user sales of urban gas supply, CNG and LNG refueling stations, gas-fueled power generation, and distributed energy, etc.

To extend our reach on the end-user market, we initiated joint-venture or cooperation projects with Heilongjiang Province, the Xinjiang Uygur Autonomous Region, the provincial capitals of Wuhan and Yinchuan, etc., as well as local enterprises. Progress was made in key projects. To develop the market, we signed cooperation framework agreements for 551 projects and sold 34.5 billion cubic meters of retail gas in the year.



Natural gas sales (Domestic)
(bcm)



Pipeline mileage (Domestic)
(km)



Dalian LNG receiving terminal

Construction of urban gas distribution networks saw progress. Changsha-Yiyang Branch began gas supply. Yueyang-Baling-Changling-Linxiang and Duyun-Kaili branches were mainly completed. The Honghe and Chaozhou branches were built as planned.

By the end of 2019, CNPC supplied gas to 31 provinces, municipalities, and autonomous regions, and the Hong Kong Special Administrative Region (HKSAR). While maintaining dominance in North China, Southwest China, Northwest China, Central China, and Northeast China, we expanded our presence in the East China and South China markets.

Liquefied Natural Gas (LNG)

CNPC stepped up to strengthen its peak-shaving capability of gas supply. Based on a holistic plan of LNG operations, we built new LNG facilities and expanded existing capacity to create an offshore hub of gas resources. Our Shenzhen LNG peak-shaving station, Phase 3 of Tangshan Project and Jiangsu Project saw advancement. Progress was made with two LNG projects, one in Maoming City of Guangdong Province, and the other in Fujian Province.

By the end of 2019, CNPC had three LNG terminals in Jiangsu, Dalian and Tangshan, as well as 24 LNG plants, which unloaded 18.56 billion cubic meters of LNG in the year. In 2019, we sold 1.53 billion cubic meters of gas to LNG-powered vehicles and vessels, up 7.7% year-on-year, marking the increased application of LNG in the transportation industry.

Oil and Gas Pipelines and Key Pipeline Projects

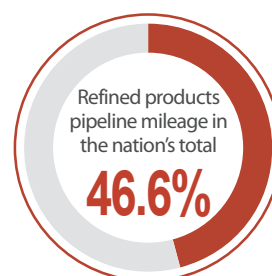
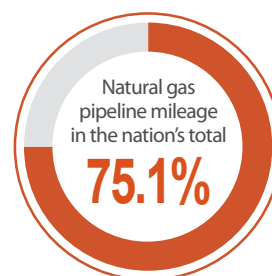
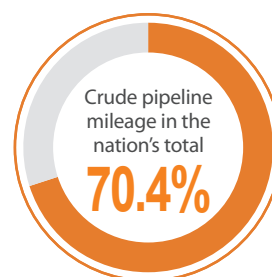
In 2019, we optimized the operation of our oil and gas pipelines. By upgrading their safety management, we significantly reduced legacy risks and maintained smooth production of those long-distance important ones such as the West-East Gas Pipelines, Shaanxi-Beijing Gas Pipelines, and Northeast Oil and Gas Pipeline.

With improved top-level design, CNPC incorporated intelligence into all business processes related to pipeline networks. The north section of the Eastern Russia-China Natural Gas Pipeline became operational in 2019. 21 major projects for pipeline connectivity, including the Fujian-Guangdong branch trunk line of the Third West-East Gas Pipeline and the upgrading of the Fourth Shaanxi-Beijing Gas Pipeline, were completed or started operation.

By the end of 2019, we operated 90,352 kilometers of pipelines in China, including 20,779 kilometers for crude oil, 55,810 kilometers for natural gas, and 13,762 kilometers for refined products, accounting for 70.4%, 75.1%, and 46.6% of China's total respectively.

The Eastern Russia-China Natural Gas Pipeline

On December 2, 2019, the Eastern Russia-China Natural Gas Pipeline began supplying gas. It consists of a Russian section ("Power of Siberia"), a cross-border section, and a section in China. The Chinese section was planned to be built and put into operation in three subsections, including the northern subsection (Heihe-Changling) already put into operation, and the middle subsection (Changling-Yongqing) and the southern subsection (Yongqing-Shanghai) are scheduled to come on stream in 2020 and 2023, respectively. The pipeline will further optimize China's regional gas consumption structure and enable a multisource supply of gas, which is of great significance for China to ensure gas supply in winter and to control air pollution.



Promoting the use of natural gas

Accelerating the utilization of natural gas is a practical solution for China to transform its energy structure and control air pollution. This is why CNPC promotes healthy growth of the natural gas industry and guarantees stable gas supply to contribute to the socio-economic development and ecology.



Beijing-Tianjin-Hebei Region

To implement the three-year Blue Sky Program, CNPC enhanced cooperation with local governments to maintain stable gas supply to the Beijing-Tianjin-Hebei Region, one of the major regions for air pollution control. We also promoted the "Replace coal with natural gas" initiative. In five months, we helped more than 130,000 households of two counties in Xiong'an New Area to burn gas instead of coal for heating before the coming winter of 2019-2020. All existing end users in the northern part of China under the initiative received sufficient gas in the winter, thanks to our coordination of supply. In 2019, we supplied 36.2 billion cubic meters of gas to the Region.



Yangtze River Delta

To meet the huge energy demand of the economically developed Yangtze River Delta, we supplied 33.9 billion cubic meters of gas in 2019 to help with the gas-fueled power generation, "Replace coal with natural gas" initiative, and natural gas-powered vehicles and vessels industries in the region.



Pearl River Delta

We increased gas supply to the Pearl River Delta, where the economy is most vigorous in China, to help them build a system of green and clean energy in line with the energy plans of Guangdong Province and the Guangdong-Hong Kong-Macao Greater Bay Area. In 2019, we supplied 4.6 billion cubic meters of gas to Guangdong Province, and 1.5 billion cubic meters to Hong Kong Special Administrative Region (HKSAR).

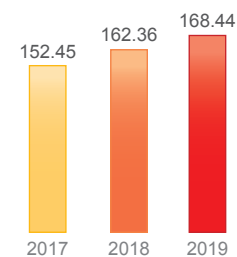
Refining and Chemicals

To face the challenges brought out by China's ever-competitive refining market which was much changed due to soaring productivity, we optimized product portfolio by reducing crude runs and increasing output of chemicals. We also transformed and upgraded the operations at a faster pace and ensured their high-quality development.

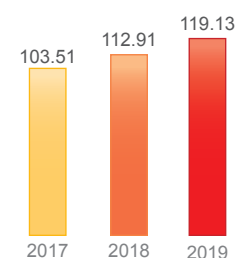
To guarantee high utilization of our integrated refining and chemical complexes and high-performing refining units, we allocated resources based on the market demand and the characteristics of these facilities. In 2019, we processed 168.44 million tons of crude oil and produced 119.13 million tons of refined products and 5.86 million tons of ethylene in China, an increase than those in 2018.

Construction and Operation of Large Refining & Petrochemical Bases

In 2019, we overhauled more refining facilities than in any single year in the past three years. All these overhauls were performed in non-peak hours. We also rationalized the processing load of our facilities and optimize their running to keep long-term stable production even better. By doing so, 99.87% of the facilities maintained smooth operation. By the end of 2019, CNPC had seven large integrated refining-petrochemical complexes and eleven 10Mt/a refineries.



Crude runs (Domestic)
(mmt)



Refined products output (Domestic)
(mmt)

Refining and chemicals operating data (Domestic)

	2017	2018	2019
Crude runs (mmt)	152.45	162.36	168.44
Utilization rate of refining units (%)	80.8	83.1	85.1
Refined products output (mmt)	103.51	112.91	119.13
Gasoline	40.98	45.90	50.44
Kerosene	10.18	12.54	14.02
Diesel	52.35	54.46	54.68
Lub oil output (mmt)	1.64	1.60	1.63
Ethylene output (mmt)	5.76	5.57	5.86
Synthetic resin output (mmt)	9.40	9.17	9.58
Synthetic fiber output (mmt)	0.06	0.05	0.04
Synthetic rubber output (mmt)	0.81	0.87	0.91
Urea output (mmt)	1.44	0.83	1.21
Synthetic ammonia output (mmt)	1.36	1.05	1.32

Projects were pushed ahead to transform or upgrade the refining and chemical operations or ensure their high-quality development. We inaugurated the production of the 10Mt/a refinery upgrade work at Huabei Petrochemical, the needle coke unit at Jinzhou Petrochemical, the lube oil hydrogenation units at Liaohu Petrochemical and Karamay Petrochemical, and the jet fuel units at Daqing Refining and Chemical, Jilin Petrochemical, and Sichuan Petrochemical, in addition to the alkylation units at Jilin Petrochemical, Daqing Refining and Chemical, and other eight enterprises. We also started building three major projects for high-quality development, including the integrated refining and chemicals project at Guangdong Petrochemical and the ethane-to-ethylene units at Changqing and Tarim.

Optimizing the Portfolio of Refining and Chemical Products

We further optimized the portfolio of refining and chemical products. In 2019, our refineries improved 24 out of 28 key technical and economic

indicators over the past year, pressing down the diesel-gasoline ratio for ten consecutive years, and elevating the percentage of high-value products by 2.6 percentage points year-on-year. We made new breakthrough in the jet fuel market by starting the operation of projects at Huabei Petrochemical and Jilin Petrochemical, and again, increased our annual output of jet fuel by more than one million tons. We also developed and began trial production of low-sulfur marine fuel at a number of refineries to satisfy the sulfur reduction requirement under International Maritime Organization (IMO) standards.

We increased the chemicals output and strengthened its R&D. 2019 saw higher output of major chemicals including ethylene, PX, synthetic resin and synthetic rubber. In addition, new products under 72 brands were developed. Some of the new products were put into commercial production, such as the polypropylene resin for medical fibers at Dalian Petrochemical, SBS waterproofing film at Dushanzi Petrochemical, and an ABS resin for electroplating and high-flow applications at Jilin Petrochemical. A metallocene polypropylene (mPP) fiber material for filaments was successfully produced on the first trial at Dushanzi Petrochemical.

Supplying jet fuel to Beijing Daxing International Airport

Beijing Daxing International Airport began pre-operation calibration flights in January 2019. As the only supplier of premium jet fuel for the commissioning, trial operation and initial operation of the airport, CNPC affiliated Huabei Petrochemical ensured sufficient supply by improving its capacity of production and transportation, thanks to a 10Mt/a refinery upgrading work completed in June and a dedicated pipeline from its facility to the airport becoming operational in July.



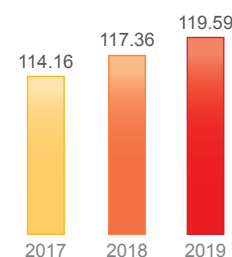
Beijing Daxing International Airport

Marketing and Sales

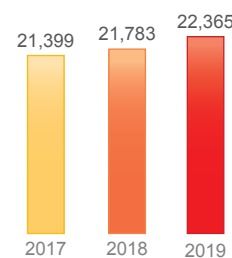
In 2019, we insisted on integrated marketing for oil products, pre-paid fuel cards, non-fuel products, lubricants and natural gas, in order to expand market share, increase retail volume per nozzle and improve profitability. By carrying out market-oriented reform, fine marketing, data-based operation and diversified development, the performance and development quality of our marketing and sales business were further enhanced.

Refined Products

Despite tough competition in the domestic market in 2019, we increased our sales of refined products by adjusting marketing strategies. Our wholesale and retail marketing was integrated, with marketing strategies differentiated by region, product, and business. We also developed and maintained special users, small and micro users, and end users. In 2019, we sold 119.59 million tons of refined products in China.



Refined products sales (Domestic)
(mmt)



Service stations (Domestic)

Marketing Network

To optimize the layout of marketing network, we deployed service stations at lucrative areas, such as city downtown, areas along highways and tourist destinations. Among a total of 505 newly built service stations, 471 became operational, adding 2.72 million tons to our annual retailing capacity according to feasibility study. By the end of 2019, we had totally 22,365 service stations operating in China.

We launched the Service Station 3.0 demonstration program to promote a new retail model. A number of service stations that incorporate Internet technologies, cross over marketing, and online and offline channels were put into trial operation to meet diversified needs of our consumers.

Embracing an innovative service model, we deepened our cooperation with different industries. In 2019, we launched Kunlun ETC cards, which could also be used for payment at our service stations, in corporation with China's Ministry of Transport and the Industrial and Commercial Bank of China. By the end of 2019, we had issued more than 1.8 million such cards nationwide.

According to the brand ranking and analysis report of the 2019 China Customer Satisfaction Index (C-CSI) released by brand rating and consulting institute Chnbrand, CNPC service stations ranked the first for the fourth consecutive year.

Non-fuel Business

To promote non-fuel business, we managed our convenience stores in a targeted, professional and refined approach in 2019. By strengthening self-made product marketing, commodities out-sourcing, as well as strict quality control measures, vehicle services business were speeded up and fast food, advertising, insurance, and imported products were made available at service stations. We initiated "uSmile Premium Lifestyle" and upgraded "uSmile Premium+" products to build up our non-fuel brand image.

Lube Oil

We actively promoted the upgrading of our "Kunlun Lube" brand. The brand gained impact thanks to a new marketing model of "Products + Service" & "Offline + Online", and our capabilities in integrated R&D, production, distribution and technical services. We also made breakthroughs in the development of new products, such as multifunction hydraulic-transmission-brake fluid, cylinder oil, and transformer oil. In 2019, we sold 1.61 million tons of lube oil.

Miscellaneous Refined Products

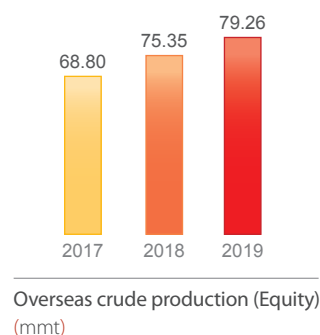
In 2019, we sold 31.12 million tons of miscellaneous refined products. Our asphalt sales registered a new record, securing our position as China's largest asphalt supplier, thanks to our delivery of branded high-end asphalt to end users and our development of potential markets. Our sales of fuel oil, solvent oil, and distillates exceeded targets.



Service station 3.0

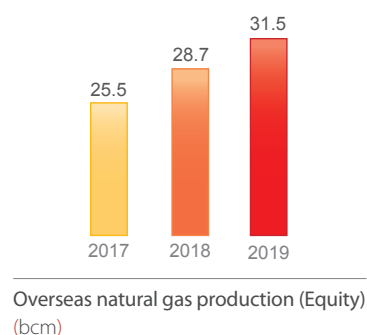
Overseas Oil and Gas Operations

In 2019, we continued to promote international cooperation particularly along the Belt and Road route based on optimized investment structure and regional footprint in Central Asia-Russia, Middle East, Africa, Latin America, and Asia Pacific. Our managerial capability of global operation was steadily enhanced. We achieved new breakthroughs in developing new projects in key areas. In addition to obtaining new exploratory discoveries, our equity production of oil and gas equivalent exceeded 100 million tons for the first time and a number of major capacity boosting projects were put into operation. All these have increased our profitability. By the end of 2019, our investment in oil and gas business covered 35 countries and regions around the world.



Oil and Gas Exploration

In 2019, we made many new discoveries from expanded exploration scale and scope in overseas blocks. Breakthroughs were achieved in the Doseo and Bongor basins in Chad. Potential resources were revealed in the T-slope of Niger's Bilma block. The eastern accumulation belt in the central block of Kazakhstan's pre-Caspian Basin was expected to become an important reserve replacement. Additionally, progress was made from rolling exploration in the mature blocks of Ecuador's Andes and Kazakhstan's PK and Aktobe. These activities added 28.15 million tons to our equity recoverable reserves, including 23.87 million tons of crude oil and 5.4 billion cubic meters of natural gas.



Oil and Gas Production

In 2019, with a cost-efficient strategy on overseas operations, we steadily increased oil and gas production and boosted our equity production to over 100 million tons for the first time. This was attributable to the enhanced full-cycle management of development plans, application of new techniques, intensive research of reservoir geology, on-going application of waterflooding, effective drilling and startup of new wells, as well as dynamic tracking of oil wells. In 2019, our overseas operations yielded 182.21 million tons of oil and gas equivalent, in which CNPC's share was 104.36 million tons. The operating and equity production of crude oil were 152.18 million tons and 79.26 million tons respectively; and those of natural gas were 37.7 billion cubic meters and 31.5 billion cubic meters respectively.

Layout of overseas oil and gas operations



Central Asia-Russia

With advancement of the Belt and Road construction, CNPC made progress in oil and gas cooperation in Central Asia-Russia, one of our core cooperation zones under the Belt and Road Initiative. In Russia, the three LNG trains of the Yamal project already started operation and ran smoothly, with the fourth train built as scheduled. In Turkmenistan, the Amu Darya project saw higher gas production capacity as its Territory B East Phase I went on stream. In Uzbekistan, three major gas fields of the New Silk Road Project began to produce 1.8 million cubic meters of gas per day. The project was the first fully intelligent and digital gas field project in the country. In Kazakhstan, our Aktobe and PK projects maintained stable production.

The Middle East

Under a multiplex development concept, CNPC continued to optimize asset structure and business layout. With an innovated multi-level cooperation mechanism of different forms, we registered a robust growth in oil and gas operation. In Iraq, with well tie-ins started at a faster pace, the Halfaya project realized the peak production target of 400,000 bbl per day, becoming the first of all the oilfields awarded in the same period to reach the promissory peak production. The output of Rumaila project also recorded a new high. In the UAE, the Abu Dhabi project reached the target of 10 million tons of equity oil output one year ahead of schedule. Our Dubai and Abu Dhabi sub-centers for technical support and the Middle East oilfield service center were founded in the year, to boost high-quality oil and gas development in the Middle East.

Africa

Africa is one of our key overseas conventional oil and gas cooperation regions. In Western Africa, our operating oil production was higher than that in 2018. We made progress in several capacity building projects in 2019. With the capacity building efforts, the Chad Project Phase 2.2 produced more than 5 million tons of oil throughout the year. In Niger, construction of Agadem Oilfield Phase II was commenced. In South Sudan, we completely resumed production of Block 1/2/4. The capacity of the Coral Gas Field Phase I as part of our LNG project in Mozambique was pushed forward as planned.

Latin America

We continued to improve the development efficiency of the ultra-heavy oil project in Venezuela, and to improve our management capabilities for the deep-water project in Brazil. In 2019, we registered growth in oil and gas production in Latin America. Our projects in Brazil, Ecuador, and Peru have all exceeded output objectives. In Brazil, the Libra Oilfield saw faster development with Mero 1 in its north-western block built as scheduled. In Ecuador, Andes Project continuously increased reserves and output of a 40-year-old mature oilfield by using a package of development technologies combining subtle-trap oil discovery, directional drilling, and jungle-specific streamlined process.

Asia-Pacific

Our oil and gas development and integration projects in Indonesia, Mongolia and Australia maintained stable operation. Progress was made at the Canada LNG Phase I project.



The gas distribution station in Mandalay along the Myanmar-China gas pipeline

Pipeline Construction and Operation

With a focus on operation management, coordination and hazard control, our overseas long-distance pipelines, including the Central Asia-China Gas Pipeline, Myanmar-China Oil and Gas Pipelines and Kazakhstan-China Crude Pipeline, remained safe and stable operation, delivering 26.92 million tons of crude oil and 51.9 billion cubic meters of natural gas throughout the year. By the end of 2019, CNPC has built a total of 16,500 kilometers overseas oil and gas pipelines, including 8,597 kilometers for crude oil and 7,903 kilometers for natural gas.

New achievements were made in overseas pipeline construction. We commenced the construction of the Niger-Benin Crude Pipeline, a transnational pipeline receiving our largest investment in Africa. Phase I of the Kazakhstan-China Crude Pipeline (Northwest) revamp project was mechanically completed ahead of schedule, and was able to transport 3Mt/a oil in the reverse direction. The New Bukhara Control Center for the Uzbekistan-China Gas Pipeline was completed on schedule. The Phase II pipeline revamp project in Chad was steadily advanced.

Refining and Chemicals

In 2019, our joint-stock refineries in Kazakhstan, Niger, Singapore, UK and France maintained safe and stable production, processing 39.53 million tons of crude oil. In the renovated Shymkent Refinery in Kazakhstan, we handed over all upgraded facilities to Kazakh employees for their independent operation. We also conducted high quality overhaul on the Zinder Refinery in Niger and the N'Djamena Refinery in Chad, among others, as scheduled.

New Project Cooperation and Development

With active yet prudent joint venture and cooperation throughout the industrial chain, we shared opportunities with international partners and achieved important progress in new project development. We signed equity acquisition agreement on the Arctic LNG-2 project and already completed the transaction. In Brazil, we won bids for the Buzios Oilfield, a large deep-sea oilfield under production, and the pre-salt Aram risk-exploration block. We also inked memorandum of understanding to further oil and gas cooperation with Kazakh partners, equity transfer agreement for Block M in Mozambique and extension contract of Block 5 in Oman.

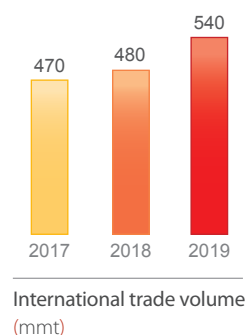
In 2019, we kept expanding and deepening international cooperation by holding the Second Belt and Road Roundtable for Oil & Gas Cooperation, CNPC International Cooperation Forum, the Second China-Russia Energy Business Forum, and the 11th International Petroleum Technology Conference (IPTC). We concluded strategic cooperation agreements and procurement contracts with many partners and suppliers on the Second China International Import Expo.



The project in Umm Shaif and Nasr offshore concessions, Abu Dhabi

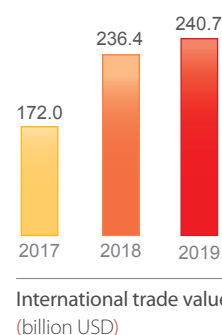
International Trade

In 2019, our trading activities in more than 80 countries and regions maintained a focus on resource allocation and global deployment. Trading and shipping of crude oil, refined products, natural gas and chemicals remained robust, thanks to optimized imports of oil and gas, enhanced sales of our shares in overseas oil production, higher export of refined products, an extended high-end market, and an improved trading network. With improved operating management, our three international operation hubs in Asia, Europe and America became more capable of operating and transacting oil and gas in cross-regional markets. In 2019, we reported trading volume of 540 million tons, worth USD 240.7 billion, up 12.5% and 1.8% year-on-year respectively, with sales revenue above RMB 1 trillion.



Crude Trading

By customizing service for different oils, we efficiently marketed our share of oil of overseas projects. We also enhanced our coordination on crude imports and conducted cross-regional crude transactions on a routine basis. All these translated to excellent profits. In addition, we traded oil futures and delivered the highest volume at the Shanghai Futures Exchange. Moreover, we participated in the launch of the ICE Futures Abu Dhabi (IFAD).



Refined Products Trading

Thanks to the expansion to the high-end and profitable market beyond our designated zone, our exports of refined products were up by 15.5% year-on-year, with exports of gasoline and diesel seeing breakthroughs in the markets of Nigeria, India, and Europe. We pushed forward with jet fuel trading by supplying bonded jet fuel at airports in the Chinese cities of Kunming, Chengdu, Dalian, and Shenyang, and expanding refueling to 13 countries or regions worldwide. Our service stations ran well in Kazakhstan, Singapore, and Myanmar, and our ship bunkering market share kept increasing. In addition, we made a profit by intensively trading fuel oil futures at the Shanghai Futures Exchange.

Natural Gas Trading

We supplied natural gas from diversified sources and coordinated the pipeline imports according to market demand. The Eastern Russia-China Natural Gas Pipeline began gas supply. We also optimized our long-term LNG supply contracts to ensure stable gas provision in China. We deployed our worldwide LNG value chain by building a global LNG pool and constructing LNG tankers.

Chemicals Trading

Consolidating resources and markets at home and abroad, we continued to expand imports and exports of polyolefin, alcohol ether, chemical fiber materials and other chemicals. Our olefin became more popular in the US market.

Freight Shipping

Our freight shipping operations have refocused on a global network, optimized service offering to ensure continuous improvement in service capabilities and operational efficiency. Despite emergencies, we secured transport for the import of crude oil and export of refined products. We have deepened business ties with domestic shipping companies, including COSCO Shipping and China Merchants Group.

International Operation Hubs

Our three international operation hubs in Asia, Europe and America showed progress in bolstering operational efficiency. By operating across regions, markets, and products, they were upgraded to "global hubs" running on a 7x24 global relay.

The Asian operation hub coordinated the global sales of Basra crude oil and played on key regional markets of India, Thailand, and Japan by introducing the concept of "crude oil supermarket" and offering "one-stop" solutions to end users. The hub became an important trader of high-end refined products in the markets of Myanmar, Indonesia, Thailand, and Australia by taking advantage of our downstream network and time-charter logistics. By expanding LNG resale to Japan, Korea, India, Pakistan etc., it consolidated the "boom in both oil and gas trading".

The European operation hub made progress in long-term contracts - renewing those for Kashagan and Doba crude and winning new contracts for three grades of North Sea crude. By enhancing the trade between the European and American markets, we had much increased our share in the biodiesel market, and stepped forward in LNG trade. In Spain, we marked a preliminary success in developing the natural gas market of the country. In 2019, by opening trading offices in Nigeria and the Netherlands, we built close relationship with local traders and suppliers.

The American operation hub optimized its crude portfolio by adjusting pipeline oil business and integrating shipping trade in North America. In 2019, we renewed the long-term supply contract of jet fuel to Delta Airlines, and entered the Peruvian market by winning a supply agreement of ultra-low-sulfur diesel fuel for the first time. We also marketed natural gas from upstream Canadian projects, and its LNG trade achieved breakthrough in the Caribbean market.



Our European operation hub in London, UK

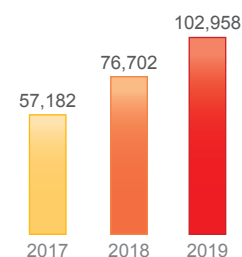
Services Business

Leveraging its integrated business capabilities and expertise, CNPC kept optimizing market layout and enhancing technological innovation and lean management. Our service quality, market competitiveness and operating results in oilfield services, engineering and construction, equipment manufacturing and financial services continued to improve in 2019.

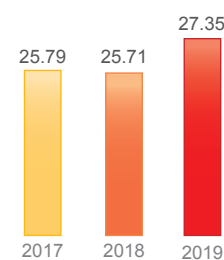
Oilfield Services

In 2019, our oilfield services arm launched "Service Guarantee Year" campaign. To accelerate the application of new technologies, we implemented key measures like demonstrating drilling technologies and improving fracturing speed and efficiency. By doing so, we made breakthrough in the quality, quantity, speed and profit of the services, greatly supporting the increase of both reserves and production.

In the international market development, we signed contracts on drilling, geophysical prospecting and cementing services in Ecuador, Iraq, Indonesia etc., and solidified traditional markets such as Niger, Kazakhstan, and the UAE. As an important global provider of marine geophysical prospecting services, we bettered all our global peers in OBN market share.



3D seismic data acquired
(square kilometers)



Drilling footage
(million meters)

Oilfield services operations

		2017	2018	2019
Geophysical prospecting	2D seismic data acquired (kilometers)	154,904	105,739	56,551
	3D seismic data acquired (square kilometers)	57,182	76,702	102,958
Drilling	Wells completed	11,687	11,264	11,403
	Drilling footage (million meters)	25.79	25.71	27.35
Well Logging	Well logging operations (well-times)	101,531	106,963	105,746
Mud logging	Mud logging operations	13,187	14,256	13,175
Downhole operations	Downhole operations (well-times)	110,844	87,007	87,563
	Formation test (layers)	9,237	11,969	7,602
Offshore engineering	Offshore drilling footage (meters)	18,500	72,000	264,700

By the end of 2019, CNPC offered geophysical prospecting, drilling, well logging, mud logging, downhole operation and offshore engineering services in 55 countries.

Geophysical Prospecting

In 2019, CNPC acquired data of 56,551 kilometers of 2D lines and 102,958 square kilometers of 3D profiles, with the average daily efficiency up by 16% and 18% year-on-year for the onshore 2D and 3D seismic acquisition, respectively.

With enhanced R&D efforts in core software, core equipment, and key technologies, as well as application of innovative technologies in risk exploration, new areas, and new types of resources, we provided technical support to many major oil and gas discoveries. Our geophysical prospecting became more efficient and automated thanks to the newly developed GeoEast V3.3 software, the fiber-optic-based, ultra-sensitive Distributed Acoustic Sensing (uDAS) seismograph and GPR Ocean Bottom Node (OBN), as well as the improvement and deployment of precise vibroseis, geophysical prospecting UAVs, and all-terrain vehicles.

With upgraded management, optimized technical plans, and innovative organization and operation, we made progress in a batch of key projects. The Saudi Aramco's S78 in Red Sea project and the Nigeria's OBN project were completed consecutively. The onshore/offshore 3D seismic acquisition project in the UAE was commenced and efficiently advanced.

Drilling

In 2019, we spudded 11,596 wells and completed 11,403 wells, with a total footage of 27.35 million meters, up 6.4% year-on-year.

Not only did we elevate the number of deep wells, but also rapidly increased the annual average footage per drilling crew by developing and deploying drilling technologies and rolling out factory-drilling and technological demonstration projects. Our operation capability was further enhanced. Directed by expert teams dispatched to site, our drilling in key zones was performed much faster and more efficiently.

Our drilling capabilities of deep and horizontal wells kept improving. Compared with 2018, the number of deep wells over 4,000 meters and that of horizontal wells completed in 2019 were increased by 55% and 80%, with footage increased by 53% and 73% respectively. Moreover, the drilling cycle of deep wells was shortened by 15%. We also registered records on onshore drilled depth in Asia and on horizontal interval among China's onshore wells in Tarim, Changqing, and Liaohe oilfields.

Well Logging and Mud Logging

In 2019, we completed 105,746 well-times of well logging and perforation and 13,175 well-times of mud logging. Our first-trip success rate of well logging was up to 98.27% in China.

Focusing on imaging logging, fast logging and logging while drilling, we sped up integration and R&D of cutting-edge technologies as well as application of matured technologies. Breakthroughs were continuously made in core technologies and high-end equipment R&D, including the new-generation CLog system, well logging chips, fiber-optic transmission, and 3D printing. We also boosted our capabilities to log deep and complex wells in sophisticated geological conditions. Important progress was made on logging evaluation technologies for continental shale oil development. The success rate of formation testing and the hit rate of sweep spot prediction were improved from 35% and 70% respectively to 100%.

Targeted at reservoirs of different characteristics, we established a complete system of mud logging technologies. With compound logging playing a major role, the system was also supported by geochemical logging, element logging, and other unique techniques. We also developed and deployed an early and fast monitoring system for the overflow and loss of drilling fluid and a system for online monitoring and evaluation of flowback cuttings.

Downhole Operations

In 2019, we completed 87,563 well-times of downhole operation, including 7,602 layers of formation testing.

By optimizing operating modes and deploying factory fracturing, we increased our efficiency in conventional fracturing by 23.1% and factory fracturing by 34.4% year-on-year, particularly in our three major blocks of Sichuan-Chongqing shale gas, as well as Mahu Jimusar and Changqing Longdong tight oil. We strengthened the R&D and application of new downhole techniques and equipment. Breakthroughs were achieved in the FrSmart fracturing system software and the factory testing techniques for mountainous shale gas blocks. We also independently developed heavy-duty fracturing trucks, electric fracturing skids, core downhole materials, and high-end downhole staged tools.

Offshore Engineering

We delivered offshore engineering services for well drilling, well completion, well cementing, formation testing and production testing, downhole operation as well as the design and construction of offshore projects in the Bohai Bay, South China Sea, and Persian Gulf. In 2019, we spudded 106 offshore wells and completed 87 throughout the year. The total footage was 264,700 meters, up significantly over the last year.

In 2019, we won a general contract for the pilot production of natural gas hydrates in deep water. This made us more capable and competitive in deep-water operations. We also completed a general contract for three offshore wind-farm booster stations in Jiangsu province.

Engineering and Construction

In 2019, we improved construction quality and project execution efficiency by strengthening project lifecycle management and pushing ahead with standardized design, factory precasting, modular construction, mechanized operation, and IT-based management.

Key projects were closely tracked, coordinated and supervised, to ensure quality and smooth progress, such as the non-patented unit project at the Amur Natural Gas Processing Plant in Russia, the middle section of the Eastern Russia-China Natural Gas Pipeline, the natural gas pipeline interconnectivity projects, and the integrated refining and chemicals project at Guangdong Petrochemical, among others.

Progress was made in utilizing new models, such as EPC+OM, in market development. We won contracts for the Basra Natural Gas Processing Plant in Iraq, the Lawe-Lawe single-point mooring and marine pipeline project in Indonesia, and the oil products pipeline in northeast Thailand, etc.

In 2019, we executed 79 key projects in oil and gas field surface engineering, refining and chemicals, and storage and transportation at home and abroad.

Oil and gas field surface engineering: Capacity building projects of the Southwest Gaomo Phase 2 Natural Gas Purification Plant, Amu Darya Gas Field Territory B East Phase I in Turkmenistan and Chad Project Phase 2.2 began operation. A boosting and deep-cooling project was generally completed in the Kelameili Gas Field in Xinjiang. To increase gas production and secure supply, we built the Changning-Weiyuan shale gas capacity building project as scheduled. The Belt and Road projects, including the non-patented unit project at the Amur Natural Gas Processing Plant in Russia, and the revamp of integrated facilities at the Bab Oilfield in the UAE were making steady headway. Construction of the 3/4/5 train crude processing project at Garraf Oilfield in Iraq and Agadem Oilfield Phase II in Niger commenced.



Downhole fracturing operation in Tarim Basin

Storage and transportation: The north section of the Eastern Russia-China Natural Gas Pipeline became operational and construction of the middle section was kicked off. Projects aimed at strengthening gas pipeline interconnectivity, such as the Fujian-Guangdong branch trunk line of the Third West-East Gas Pipeline and the upgrading of the Fourth Shaanxi-Beijing Gas Pipeline, completed construction or began operation. The Tangshan, Jiangsu and Shenzhen LNG terminals projects were pushed forward as scheduled. Key overseas pipeline projects, such as the projects in Saudi Arabia and the single-point mooring (SPM) project in Bangladesh, advanced at a faster pace.

Refining and chemicals facilities: A number of projects were put into operation, including the revamp of the ethylene unit at Dushanzi Petrochemical, the high-pressure hydrogenation unit for naphthenic base lubricants at Liaohe Petrochemical, the revamp of the aromatics unit at Liaoyang Petrochemical, the Algiers Refinery Brownfield project, the polyester unit in Vietnam, the polypropylene unit of a refinery and petrochemical integrated development project (RAPID) in Malaysia, and the second line of the polypropylene project in India. The restructuring and upgrading projects at Daqing, Jinxi and Jinzhou Petrochemical companies, and the EPC project of Sinochem's Quanzhou EVA unit saw smooth progress. Construction of more than 20 polyester units located in places including Chongqing Municipality, Zhejiang province, Indonesia, Saudi Arabia, was going on smoothly. Construction of the ethane-to-ethylene facilities in Changqing and Tarim oilfields commenced. We won the National Quality Engineering Gold Awards 2019 issued by China Association of Construction Enterprise Management for the revamping of Shymkent Refinery in Kazakhstan and the Yunnan Petrochemical Project.

Petroleum Equipment Manufacturing

Our manufacturing enterprises gained higher productivity and profitability, thanks to faster transformation and upgrading, lean management, and service-oriented manufacturing.

Particularly, the lean management was turning from "lean production" to "full-process improvement" across marketing, production, research and purchasing. As a result, production became more process-based, standardized and intelligent, and thereby much more efficient. The production cycle of drilling rigs was shortened by 14.5% and average cycle of commissioning by 12%. We built intelligent production lines of straight seam pipes, and researched the manufacturing techniques of pipes for long-distance transportation, which were successfully used in the Eastern Russia-China Natural Gas Pipeline project with over 10% less of on-site welds.

Centering on a "Manufacturing + Services" model, we continued to push ahead with the integration of product R&D, manufacturing, marketing and services. We persistently improved user experience and further elevated our service. Covering full lifecycle of products, we offered customer-centered technical services in different forms. For example, we researched

and customized patented equipment for oil and gas development while providing technical support for production ramp-up; we provided equipment lease, renovation, package solutions and quality inspection.

A range of new products were developed and launched, including fracturing pump QPI-7000, which is the world's most powerful of its kind, a 9,000m quadruple-stand AC VFD drilling rig for ultra-deep wells, a horizontal subsea Xmas tree, and a new diesel engine for drilling. Our independently developed products such as $\Phi 1,422\text{mm}$ X80 steel pipes, coiled tubing CT130, and special-thread casing were used in the Eastern Russia-China Natural Gas Pipeline and in the E&P in Southwest, Changqing, and Xinjiang oil and gas fields.

We improved our marketing and service network in Central Asia, Latin America, the Middle East, Africa, and Asia-Pacific. By the end of 2019, we had exported petroleum equipment to more than 80 countries and regions of the world.

Financial Services

CNPC provides a wide range of financial services, including in-house banking, banking, financial leasing, trust, insurance, insurance brokerage, and securities, etc. Centering on serving oil and gas business, our financial services arm scored higher revenue and better performance in 2019 by further exploring markets and controlling risks.

We ensured compliance and prudence, and intensified full-process management of high-risk projects, yielding evident effects in financial risk management and control. We improved capital operation by aligning financial services with production needs and coordinating different financial institutions. To maintain vitality and competitiveness, we expanded our space of development in consumer finance and Techfin with the help of new technologies and business.

Green financing remained a priority for the company. Financial resources were directed into the green industry to boost the development of clean energy. We provided financial support to green projects including natural gas, "Replace coal with natural gas", oil and gas storage, and pipeline transport, through green loans, green bonds, and green leasing.



A refining unit under construction