



Annual Business Review

Exploration and Production

In 2015, we maintained reserve growth through fine exploration in favorable zones and strata series in China. A number of reservoirs were identified, each containing 100 million tons of oil or 100 billion cubic meters of natural gas. We aimed at maximizing the investment efficiency and integrated profitability and maintained stable oil and gas production, through optimizing development program and rigid cost control.

Sulige, Block Gaoshiti-Moxi in the Sichuan Basin, and Keshen Block in the Tarim Basin. In addition, more reserves of tight sandstone gas were ascertained in Shilou region of the Ordos Basin; and shale gas reserves totaling more than 100 billion cubic meters were first reported in Changning, Weiyuan and Huangjinba regions in the Sichuan Basin.

Exploration

We made a profit from our focused, fine exploration which boasted a higher success rate, thanks to optimally adjusted deployment which targeted at massive, premium, and producing reserves in large basins and oil/gas enriched sags. We domestically proved 728.17 million tons of oil in place in 2015, exceeding 600 million tons for the tenth consecutive year, and 570.2 billion cubic meters of gas in place, exceeding 400 billion cubic meters for the ninth consecutive year. With a reserve replacement ratio of more than 70% (USD 70/bbl) under SEC classification, we had a sound resource base to sustain robust growth under low oil prices.

Major Discoveries

Our oil exploration was fruitful, including the identification of five areas each with 100 million tons of reserves in Changqing and Xinjiang oilfields, and additional proven or controlled oil in place of more than 30 million tons in Daqing, Liaohe and Tarim oilfields respectively. Enhanced regional geological evaluation resulted in breakthroughs in tight oil exploration in four blocks in Changqing and Daqing oilfields.

Progress in gas exploration included the identification of a number of reserves each with 100 billion cubic meters of gas in Block West-2 and Block South in

Newly proven oil in place
(Domestic)



728.17
mmt

Newly proven gas in place
(Domestic)



570.2
bcm

Our production and operation activities were conducted in an orderly and efficient manner. A range of retrenchment and cost efficiency measures were implemented, facilitating the shift in our growth from a scale and speed-oriented pattern to a more quality and efficiency-focused approach.

Development and Production

In 2015, our domestic oil and gas production maintained steady levels of output through enhancing dynamic adjustment of development programs, optimizing capacity layout, discontinuing marginal and non-performing projects, drilling more horizontal wells, and controlling natural decline at mature fields. We achieved production capacity increments of 12.25 million tons for crude oil and 15.4 billion cubic meters for natural gas, and produced 187.51 million tons of oil equivalent.

Crude Oil

In 2015, we intensified geological study and the application of new technologies with an aim to increase per well output and the profitability of development. Efficient development was realized through well organizing production capacity deployment, exploring new ways in capacity building, and deepening full-process project management. We produced 111.43 million tons of oil throughout the year.

Daqing Oilfield produced 38.39 million tons of oil through fine waterflooding, efficient polymer flooding, extensive deployment of ASP flooding, and

intensive development management. Changqing Oilfield maintained high reserve growth by promoting integrated exploration and development technologies. With these technologies, we located new oil and gas formations

Crude production
(Domestic)



111.43
mmt

Natural gas production
(Domestic)



95.48
bcm

Reserves and operating data (Domestic)

	2013	2014	2015
Newly proven oil in place (mmt)	670.13	689.80	728.17
Newly proven gas in place (bcm)	492.30	484.00	570.20
2D seismic (kilometers)	27,089	19,170	15,909
3D seismic (square kilometers)	12,477	11,739	9,095
Exploration wells	1,746	1,584	1,588
Preliminary prospecting wells	1,006	910	924
Appraisal wells	740	674	664

and favorable blocks as strategic reserve replacement zones, and effectively increased the development profitability of tight oil and gas reservoirs. As a result, Changqing produced 24.81 million tons of oil in 2015. Liaohe Oilfield implemented a new mode of 3D development allowing for the cost-effective extraction of inferior reserves in deep and tight reservoirs. As a result, heavy oil in deep zones can be developed efficiently throughout its life cycle.

Tapping potential of mature fields

As the development of an oil/gas field proceeds, output from its production wells significantly declines. To mitigate this decline, we took a variety of measures to release the potential of mature fields.

Fine reservoir description using six sets of technical solutions was carried out on an extensive basis. 3D digital and dynamic models were set up at all major oilfields. Research programs on chemical flooding, gas flooding, and thermal recovery of heavy oil were conducted to increase the economic results of mature blocks.

Fine waterflooding was intensively applied. With a long-standing system in place, the natural decline rate dropped from 13.84% in 2008 to 9.8% in 2015. In Daqing Oilfield, the natural decline rate of waterflooding and the composite decline rate were cut down to 6.69% and 4.75%, respectively, thanks to third-generation zonal water injection. In Xinjiang Oilfield, stimulation measures for individual wells were combined with comprehensive reservoir treatment to tap residual reserves.

Fine management of the entire process of oil and gas development was promoted. In Changqing Oilfield, gas wells were managed with a "multi-dimensional matrix" and quantified stimulation parameters in a three-level system, increasing the running rate of stripper wells by 2-3%.

Pilot Development

In 2015, we performed research and testing of key technologies and applied proven ones for high-water-cut, low-permeability, and heavy oil reservoirs. Major pilot development projects were pushed forward in an orderly manner, further boosting reserves and production. ASP flooding was industrially applied in 42 units covering 190 million tons of oil in place in Daqing Oilfield. A polymer flooding project increased the annual output from 30,000 tons to 180,000 tons in Xinjiang Oilfield. Surfactant/polymer flooding increased the daily oil output from 63 tons to 360 tons, in a pilot zone at Liaohe Oilfield, with the increase in the recovery factor of 18%. Pilot fire flooding projects in Liaohe Oilfield and Xinjiang Oilfield produced 450,000 tons of oil annually, with the recovery factor increasing by 40%. SAGD for ultra-heavy oil recovery helped 12 wells in Liaohe Oilfield each produce 100 tons per day. In a test of miscible natural gas gravity drive project in Tarim Oilfield, more than 13 million cubic meters of gas were accumulatively injected, yielding 172,000 tons of oil in 2015. Pilot air/foam flooding projects proceeded smoothly in Daqing, Changqing, and Dagang oilfields.

Natural Gas

In 2015, CNPC produced 95.48 billion cubic meters of natural gas, thanks to capacity building in major producing regions and major projects, as well as optimized development plans and well locations. Changqing Oilfield produced 37.46 billion cubic meters of natural gas through capacity building based on overall evaluation and zonal optimization, and by tapping gas well capacity through fine management. Good development results were achieved from the massive deployment of horizontal wells in Sulige Gas Field and large well groups in Shenmu Gas Field, and new breakthroughs were made in reservoir evaluation in the Longdong area. Tarim Oilfield achieved a natural gas output of 23.55 billion cubic meters mainly contributed by the Kela-2, Dina-2, and Keshen fields, being the second-largest gas producing region in China. Southwest Oil and Gas Field produced 15.48 billion cubic meters of natural gas and will be able to more effectively supply gas to the Sichuan and Chongqing region with its 11bcm/a production capacity from Longwangmiao Formation in Moxi Block of Anyue Gas Field.

Sulige Gas Field

Sulige, located on the northern edge of the Ordos Basin, is the largest uncompartimentalized onshore gas field in China. Despite its low permeability, low pressure, and low abundance characteristics which are rare among gas fields around the world, it has been massively and effectively developed by pursuing a low-cost strategy based on integrated technologies, standardized construction, digitalized management, and market-based services. As the number of low-output and marginal wells increase along with development, a series of measures such as optimizing the production profile of belching wells, water discharge gas production and fine management were applied in an effort to increase the recovery of low-yield wells and maintain stable production of the field. In 2015, Sulige reached an output of 23.39 billion cubic meters, registering an accumulative gas production of 124.05 billion cubic meters.



Production Commenced at the Giant Gas Reservoir in Longwangmiao Formation of Anyue Gas Field

On October 20, 2015, production fully commenced at the super-large gas reservoir in Longwangmiao Formation of Anyue Gas Field, with an annual capacity of 11 billion cubic meters.

The reservoir is located in the middle of the Sichuan Basin, spanning Sichuan Province and Chongqing Municipality. With 440.38 billion cubic meters of proven gas in place, it is the largest uncompartimentalized monomer marine-facies carbonate gas reservoir ever discovered in China. Its discovery took place on September 9, 2012, when well Moxi-8 in Anyue Gas Field produced more than 1.9 million cubic meters of gas per day after formation testing.

During the development of the reservoir, we improved our geological understanding and innovated a "high-yield well incubator" technology. We deployed 30 target locations for high-yield wells in the first place in "two blocks and ten zones" that were most favorable for development. The number of production wells was greatly reduced by drilling horizontal or highly-deviated wells based on studies of the geography, landform, and reservoir thickness and distribution. This enabled us to efficiently develop the gas field. By the end of 2015, the average daily gas output per single well during production test at Longwangmiao Formation exceeded 1.64 million cubic meters.

Gas layer identification and gas production were conducted simultaneously, thanks to an innovative mode comprising integrated exploration and development, modular engineering design, factory equipment manufacturing, and skid-based and "PMT+EPC" construction. Compared with traditional approaches, this mode not only reduced the land use by 20%, but also significantly curtailed the construction period and time to marketplace. In fact, it took only three years to prove the reserves and complete 11 bcm/a capacity building since its discovery.

Aiming at "zero pollution and zero emissions", the development program employed the most proven technologies for the treatment of waste water and gas in order to build an environmentally friendly gas field. A recently completed gas purification plant can recover 99.8% of sulfur in total through a CPS process and Shell Claus Off-gas Treatment (SCOT). And all produced wastewater can be recycled by using "evaporation and crystallization" technology.

As the reservoir is in full production, it can meet half of the newly added gas consumption of the country, and plays an important role in optimizing the energy consumption structure in the Sichuan area.



Exploration and Development of Unconventional Oil and Gas

In 2015, CNPC made important progress in the exploration, development, and technological innovation of CBM, shale oil and gas, tight oil and gas, and other unconventional hydrocarbons. We developed key technologies for the exploration and development of tight oil, proved new tight oil reserves, and pushed forward the construction of CBM industrial bases and shale gas demonstration zones.

CBM

CNPC supplied 1.76 billion cubic meters of CBM to the market in 2015, a steady increase of 28.5% year-on-year. We obtained a more profound understanding on the development pattern of the CBM fields based in Erdong and Qinshui areas. We have built China's largest medium-to-low-coal-rank CBM field in Block Baode, and developed the first medium-coal-rank CBM field in the country in Block Hancheng. In the Zhengzhuang and Hancheng blocks, automatic water drainage and gas extraction based on bottom-hole flowing pressure control was applied. We also promoted 3D exploration and development in coal measure strata and improved pilot development by drilling cluster wells and horizontal wells. In 2015, we completed 31 exploration wells and 261 development wells, adding 170mcm/a production capacity, with the accumulative capacity totaling 2.3bcm/a.

Shale Gas

In 2015, our shale gas operations focused on two demonstration zones of Changning-Weiyuan and Zhaotong. We drilled 55 new wells and completed 80 ones, and obtained 100kcm/d from single well on average. Moreover, we built 2.85bcm/a production capacity, and supplied 1.3 billion cubic meters of commercial gas. Internal gathering and transportation facilities, water supply facilities, four dewatering stations, and five export pipelines were completed and commenced operations. After nearly two years of development and evaluation, we gained an understanding of the enrichment pattern of each block. In 2015, we reported reserves totaling 163.5 billion cubic meters of shale gas in place in Changning, Weiyuan, and Huangjinba regions for the first time. Major development technologies, technologies for the fostering of high-yield wells, and efficient management modes took shape. The average daily output per production testing well and their expected final output for the first year met the conceptual design.

Tight Oil

In 2015, we made important achievements in tight oil exploration and development in China's Ordos, Sichuan, Songliao, Qaidam, and Santanghu basins.



Sand fracturing operation at Weiyuan shale gas block in Sichuan

In Changqing Oilfield, integrated exploration and development in Block Chang-7 led to new industrial oil flows from 103 wells and further proved three highly abundant zones in Longdong, Xin'anbian, and Shaanbei. Moreover, a 1.07Mt/a production capacity was built by the end of 2015. Daqing Oilfield found more than 100 million tons of controlled and predicted oil in place by emphasizing geological evaluation in sweet point zones and favorable zones, improving and rolling out stimulated reservoir volume (SRV) fracturing in horizontal wells, and integrating exploration and development in Fuyu oil formation. Jilin Oilfield considerably reduced its drilling and fracturing costs by seeking measures to tap its inferior resources with lower costs and higher returns. Moreover, new industrial flows were obtained from seven horizontal wells in the Linzijing-Biezijing region, with favorable results in production test. Tuha Oilfield lowered its drilling and fracturing costs by integrated technical solutions and newly proved 30.09 million tons of tight oil in place and built 138kt/a production capacity in Block Ma-56 in Malang Sag of Santanghu Basin.

Joint E&P in China

As authorized by the Chinese government, CNPC works with international partners to explore and develop oil and gas resources in China. Most of the joint projects focus on low-permeability reservoirs, heavy oil, tidal and shallow water zones, sour gas, high-temperature and high-pressure gas reservoirs, CBM, and shale gas.

By the end of 2015, we had 35 joint E&P projects in operation, producing 3.92 million tons of crude oil and 6.6 billion cubic meters of natural gas, which totaled 9.17 million tons of oil equivalent.

Executive Summary of Major Projects

Zhaodong Oil Project

The project covers 77 square kilometers at the tidal and shallow water zone in the Bohai Bay Basin. New XCL-China LLC. and Australia's ROC Oil (Bohai) Company are our partners.

This is the first joint project in the tidal and shallow water zone where CNPC took over the operatorship in April 2015. The project proceeded in a safe and smooth manner after takeover, and high yield was obtained from five wells newly put into production.

Changbei Natural Gas Project

The project covers 1,691 square kilometers in the Ordos Basin. Shell Group is our partner in the project.

It maintained a high output of 3.64 billion cubic meters of natural gas in 2015. CNPC became the operator in January 1, 2016 pursuant to a handover agreement that CNPC and Shell Group signed with respect to the operatorship of the Changbei Phase I Project under the project contract.

Chuandongbei Natural Gas Project

The project covers 876 square kilometers in the Sichuan Basin. Chevron is our partner in the project.

Well group A in Luojiashai Sour Gas Field was smoothly put into production in Kaixian County of Chongqing Municipality on December 30, 2015.

South Sulige Natural Gas Project

The project covers 2,392 square kilometers in the Ordos Basin. Total is our partner and CNPC is the operator.

With continuously improved factory development program, the project proceeded efficiently through optimal selection of well locations, deployment of cluster wells, standardized design and construction, and modular surface construction. In 2015, the block produced 1.48 billion cubic meters of natural gas.

Crude output from
joint E&P projects



3.92
mmt

Natural gas output
from joint E&P projects



6.6
bcm

Natural Gas and Pipelines

2015 saw steady momentum in our natural gas business. Gas production from major producing regions remained stable. Construction of pipelines and gas storages in key regions witnessed steady progress. Despite the weak market, we registered a slight increase in natural gas output and marketed 122.66 billion cubic meters, an increase of 2.7% year-on-year.

By the end of 2015, we operated 79,936 kilometers of pipelines in China, including 18,917 kilometers for crude oil, 50,928 kilometers for natural gas, and 10,091 kilometers for refined products, around 69.8%, 76.2%, and 46.3% of China's total respectively. These pipelines constitute a safe and reliable network with flexible dispatch capacity to deliver multiple sources of oil and gas.

Pipeline Operation and Control

In 2015, faced with ample gas supply in the market, we rationally arranged pipeline gas imports and LNG purchase on spot, made the best use of the storage capacity of pipelines, and increased gas injection into underground storages.

We operated pipelines more efficiently through optimized management. Stable gas supply in peak consumption periods was guaranteed by optimizing operation and eliminating transmission bottlenecks. Through improving management and coordination among gas production, transportation and marketing, pipeline network deliverability were further optimized and resources more effectively allocated. Self-produced and imported gas, peak-shaving gas from underground gas storages, and coastal LNG were made available to consuming regions to secure supply in key periods and regions.

Underground Gas Storages

We continued to expand our underground gas storage capacity. By the end of 2015, we had 10 storages including Dagang, Jintan, Liuzhuang, Suqiao and Hutubi. With a peak shaving capacity of up to 5.2 billion cubic meters, these storages further secured supply in case of emergency. Underground gas storage Shaan-224, the first one in Changqing Oilfield, became operational for gas injection. With a designed capacity of 1.04 billion cubic meters, the storage received a daily average of 2.5 million cubic meters of gas, helping to stabilize the supply of the Shaan-Jing Gas Pipelines.

Crude pipeline mileage
in the nation's total



69.8%

Natural gas pipeline mileage
in the nation's total



76.2%

Storage and Transportation Facilities

In 2015, several major oil and gas pipelines and their associated facilities were completed and put into operation. These included the upgraded Mohe-Daqing Crude Pipeline, the Harbin-Shenyang Gas Pipeline (Changchun-Shenyang Section) and the Shandong Gas Pipe Network (Qingdao-Weihai Section). Construction of the eastern section of the Third West-East Gas Pipeline and Jinzhou-Zhengzhou and Yunnan Refined Products Pipelines proceeded smoothly.

The Third West-East Gas Pipeline

The Third West-East Gas Pipeline, including one trunk and eight branches, runs from Horgos in the Xinjiang Uygur Autonomous Region to Fuzhou in Fujian Province, with a total length of 7,378 kilometers. The 5,220km-long trunk line has a designed pipe diameter of 1,016-1,219mm, transport pressure of 10-12MPa and an annual delivery capacity of 30 billion cubic meters. It was constructed and put into operation on a section-by-section basis.

The western section runs from Horgos to Zhongwei in the Ningxia Hui Autonomous Region, with a total length of 2,445 kilometers. Construction of this section began in October 2012, and was completed on August 25, 2014. The eastern section runs from Ji'an in Jiangxi Province to Fuzhou in Fujian Province, with a total length of 827 kilometers. It has a designed pipe diameter of 1,016-1,219mm, transport pressure of 10MPa, and an annual delivery capacity of 15 billion cubic meters. Construction of this section commenced in May 2013. By the end of 2015, 815 kilometers of the pipeline had been welded. The section is expected to become operational in 2016.

Jinzhou-Zhengzhou Products Pipeline

Jinzhou-Zhengzhou Products Pipeline starts at Jinzhou in Liaoning Province and ends at Zhengzhou in Henan Province. Consisting of one trunk, two input branches, and seven output branches, the pipeline has a total length of 1,636 kilometers, with a designed pipeline diameter of 219-660mm, transport pressure of 8-10MPa, and annual delivery capacity of 13 million tons. When completed, it will help establish a sophisticated supply network of refined products and optimize the allocation of refined products in Northeast China and the central and eastern regions of the country.

Construction of the pipeline commenced on August 18, 2012, and 57% of it had been completed by the end of 2015, including 1,290 kilometers pipeline welded, 1,118 kilometers backfilled, and 152 railway, road and river crossings.

Natural Gas Utilization and Marketing

In 2015, CNPC marketed 122.66 billion cubic meters of natural gas, 68% of China's total, through pipelines reaching 30 provinces, municipalities and autonomous regions.

Faced with slowing growth in gas demand, we launched promotion activities, and sold gas directly to industrial users and major customers at favorable prices. Moreover, we continued to develop the markets along major new pipelines, including the middle-section trunk and Fujian-Guangdong sub-trunk of the Third West-East Gas Pipeline, as well as economically-developed areas in eastern coastal region. Throughout the year, we signed 84 long-term sales contracts, with annual contract volume of nearly 10 billion cubic meters, in which urban and industrial users taking up 70%.

New breakthroughs were made in developing the city gas and CNG market. Projects in Chaozhou and Jiayang in Guangdong Province and the Wafangdian-Changxing Island Project in Dalian, Liaoning Province, saw smooth progress. Construction of the Hunan Branch and Yunnan Branch was implemented at a faster speed.

We actively promoted the market reform of the natural gas industry. In July 2015, Shanghai Petroleum & Natural Gas Exchange (SHPGX), a joint venture of ten parties including CNPC, Sinopec and CNOOC, started trial operation successfully. There have been over 100 downstream registered users on this trade and settlement platform, and a total amount of 3.5 billion cubic meters of pipeline gas was traded on line in 2015.

Liquefied Natural Gas (LNG)

In 2015, our LNG business witnessed smooth progress in market development and capacity building. By the end of 2015, we had 12 LNG plants in operation with total capacity of 7 million cubic meters per day and produced 560 million cubic meters in 2015. Five LNG plants were in pilot operation, including Huanggang in Hubei Province, Guangyuan in Sichuan Province, and Taian in Shandong Province. Three LNG plants were being built, including one at Wuhai in the Inner Mongolia Autonomous Region, one at Zhaoqing in Guangdong Province, and one at Weinan in Shaanxi Province, with a total capacity of 1.9 million cubic meters per day. We had 550 LNG refueling stations in operation and another 136 under construction. The year-round terminal sales were 1.54 billion cubic meters, accounting for 27.3% of the total sales by all LNG refueling stations in China.

Jiangsu, Dalian and Tangshan terminals kept playing their role in gas supply and peak shaving. In 2015, they received 5.8 billion cubic meters of LNG. The 10Mt/a gasification plant as part of Phase-II of Jiangsu Terminal was successfully put into operation upon its first startup. Mechanical works of Phase-II of the Dalian terminal was completed. The two projects will further secure the smooth supply of natural gas to the Yangtze River Delta and North China regions.

We also made progress in the development of LNG vehicles, LNG transportation, and the formulation of relevant standards. In 2015, we co-developed 105,000 LNG vehicles, accounting for 52.5% of LNG vehicles in China. We also set up demonstration stations for the refitting of LNG vehicles in Chongqing Municipality, Wuhai in the Inner Mongolia Autonomous Region, and Wuhan in Hubei Province, and worked out a series of refitting techniques and solutions. We built/renovated 33 LNG vessels, accounting for 30% of the LNG vessels in China. We also completed a number of tests for LNG transportation by container ships, small ships and railways in 2015.



Routing inspection at gas station

Refining and Chemicals

In 2015, we reorganized production arrangement and optimized product portfolio of refining and chemical business in response to market changes, and allocated resources and workload to installations with higher profit and closed marginal ones. We also improved the efficiency of our facilities and ensured their safe and smooth operation through well-organized overhauls. A total of 21 major technical and economic indicators improved compared to 2014.

Domestically, we processed 151.32 million tons of crude, and produced 103.69 million tons of refined products. Production of profitable products increased, with the yield of refined products growing by 0.7% and the percentage of black products decreasing by 0.5%. Outputs of jet fuel, -35# diesel, and aromatic hydrocarbons increased by 14.5%, 15.4%, and 12.4%, respectively. The production of green products, such as high-grade gasoline and National V standard diesel increased by 1.6% and 7%, respectively.

We improved the profitability of our chemical business by increasing the output of high value-added chemicals and enhancing terminal marketing. In 2015, we produced 5.03 million tons of ethylene and 1.85 million tons of synthetic ammonia, and sold 25.22 million tons of chemicals, up 3% year-on-year. In particular, we increased production of synthetic resins by 3.1%, and boosted sales of 15 high value-added products by 21%.

Crude runs
(Domestic)



151.32

mmt

Refined products
output (Domestic)



103.69

mmt

Refining and chemicals operating data (Domestic)

	2013	2014	2015
Crude runs (mmt)	146.02	150.16	151.32
Utilization rate of refining units (%)	86.9	82.6	84.5
Refine products output (mmt)	97.90	101.84	103.69
Gasoline	32.97	34.10	36.47
Kerosene	6.06	7.14	8.34
Diesel	58.87	60.60	58.88
Lubricating oil output (mmt)	1.89	1.58	1.21
Ethylene output (mmt)	3.98	4.98	5.03
Synthetic resin output (mmt)	6.64	8.07	8.32
Synthetic fiber output (mmt)	0.07	0.07	0.07
Synthetic rubber output (mmt)	0.67	0.75	0.71
Urea output (mmt)	3.77	2.66	2.57
Synthetic ammonia output (mmt)	2.58	1.89	1.85



Construction and Operation of Large Refining & Petrochemical Bases

Our major petrochemical facilities in China operated smoothly in 2015. Urumqi Petrochemical optimized process parameters and processing flows, strengthened process control, and maintained the safe and smooth operation under high workload. Ningxia Petrochemical's 5Mt/a refining unit ran for 500 days in its second long period operation, with all of its economic and technical indicators continuously optimized.

Construction of major refining and petrochemical projects proceeded smoothly. Yunnan Petrochemical's 10Mt/a Refinery was completed, with the equipment and process piping installed and the mechanical works of atmospheric-vacuum distillation unit, gas fractionation unit, and another six units finished. In addition, steady progress was made in the refinery upgrading and HSE system renovation at Guangdong Petrochemical and Huabei Petrochemical, and the efficiency improvement renovation at Liaoyang Petrochemical.

Upgrading of Refined Products and Development of New Products

Vehicle emission is a source of pollutants for haze in China's medium and large-sized cities. CNPC has accelerated the pace of its upgrading of gasoline and diesel quality to help mitigate air pollution aligned with the government's intensified environmental concerns. In 2015, we made progress in 10 projects for upgrading to the National V standard, including the units at Dalian Petrochemical, Guangxi Petrochemical, and Karamay Petrochemical. These units have started to produce National V products which were supplied to 11 eastern provinces and cities. Moreover, preliminary work commenced on 47 National V standard upgrading projects. By the end of 2015, we had 19 refining and chemical enterprises capable of producing National V standard motor gasoline, and all our enterprises were ready to deliver National V standard motor diesel. In addition, we enhanced top-down design and conducted research programs on technologies for clean-burning oil products upgrading, and developed technical solutions for the production of clean-burning gasoline and diesel, which were applied extensively at Dagang Petrochemical and Urumqi Petrochemical.

In 2015, we launched 75 new chemical products with a total output of 1.12 million tons, including PE pipes, hollow materials, and PP impact materials. Sichuan Petrochemical, Fushun Petrochemical and Daqing Petrochemical were enabled to produce more types of ethylene products. Achievements were made in the promotion of 20 new products, including Jilin Petrochemical's ABS, Fushun Petrochemical's PP fiber, Sichuan Petrochemical's PE100 pipe material, and Lanzhou Petrochemical's SBR feedstock.

Marketing and Sales

In 2015, our marketing and sales business became more market-oriented and customer-based, by continuously optimizing sales structure. We focused on integrated marketing of refined products, pre-paid fuel cards, non-fuel products and lube oil, and actively exploring new modes such as "Internet + Marketing". As a result, our market responsiveness was considerably improved.

Refined Products

In 2015, we sold 116.25 million tons of refined products, 80.54 million tons, or 69.3%, of which were retail. The contribution of high value-added products, including high-grade gasoline and jet fuel, kept increasing.

Marketing Network

We continued to build up our marketing network by optimizing its layout, focusing on development of key stations in a flexible way, and enhancing brand promotion. In 2015, 321 new service stations were developed, adding 2.53 million tons to the existing sales capacity; and 11 depots were built, renovated or upgraded, increasing the storage capacity by 235,000 cubic meters. By the end of 2015, we had 20,714 service stations operating in China.

We improved the operation efficiency of existing stations, especially those with poor sales and low profitability, by rolling out fine and 6S management. Some of our stations were upgraded into smart stations with internet technologies. With an optimized logistics and storage structure, we reduced the inventory, maximized the efficiency of depot turnover, and ensured market supply. The Kunlun fuel card was promoted to the market at a faster pace, with 17,210,000 cards issued in 2015, increasing the total number issued to 81,280,000.

Refined products sales
(Domestic)



116.25
mmt

Refined products retail
volumes (Domestic)



80.54
mmt

Non-Fuel Products

Further consolidated as part of our core business, non-fuel products became a new profit growth point. Taking advantages of the retail network, we realized integrated marketing at service stations by upgrading our convenience stores and carefully selecting of commodities. We pushed forward the development of our self-produced commodities and, in particular, strengthened the promotion of the Kunlun Star commodity family. Vehicle services were offered at service stations, either by ourselves or our JVs, or by renters. Overall profitability was improved by utilizing the resources of non-fuel suppliers through joint marketing and brand integration. In 2015, our non-fuel products reported revenue and profit of RMB 12.42 billion and RMB 1.45 billion, up 25.6% and 42.5% year-on-year, respectively. The number of convenience stores with annual revenue of more than RMB 1 million each increased by 23% year-on-year, with daily average revenue per store growing by 17%.

Lube Oil and Miscellaneous Refined Products

In 2015, CNPC pushed forward the standardized management at production sites and optimized the layout of production capacity, and improved our customer service capability by strengthening ties between production and marketing. Moreover, lube oil and refined products were integrated in our retail network of service stations. We improved our marketing system for all products, including motor oil, industrial oil, service oil, special oil and bunker oil. With intensified research programs, we launched new products, such as metal working fluids, grinding lubricants, aluminum roll oils, and long-acting anti-rust oil. In 2015, we sold 1.27 million tons of lube oil (grease). Sales of premium motor oils and byproducts grew year-on-year significantly.

Sales of miscellaneous refined products increased steadily by 2.42 million tons year-on-year. In 2015, we sold 6.7 million tons of asphalt products, an increase of 270,000 tons year-on-year, by targeting at major engineering projects, intensifying research on special asphalts, and strengthening marketing management. To add even more value to miscellaneous refined products, a blend of FCC slurry and crude oil was processed to produce asphalt on an industrial scale, and progress was made in naphtha and bunker fuels marketing.

"Internet +" Powers Smart Service Stations

Our first smart service station powered by "Internet +" became operational in Shijiazhuang, Hebei Province, on August 15, 2015.

Based on the sales system and network of conventional stations, our smart stations aim to "care for you, your car, and your life", and provide one-stop services by leveraging the Internet-based Big Data, Cloud, the Internet of Vehicles (IoV), the Internet of Things (IoT), and mobile payment. Services include vehicle decoration, inspection, insurance agency, and maintenance. More than 1,000 commodities are available in convenience store inside station. Customers can choose to pay online by their pre-paid fuel cards, WeChat, or Alipay, and then pick their purchase at the nearest service station, where they can also send and receive parcels, book tickets, withdraw money, and pay utilities charges, etc.

Based on internet technologies, our smart service stations provide services in a more diversified way online and offline, inside and outside the station. Smart station expands services from oil products marketing to vehicle life span care, upgrades the operation mode from traditional service station to a more open and consolidated mode, from entity marketing to big data marketing.

By the end of 2015, the first 26 smart stations saw an increase of 38% and 59% in terms of revenues from oil and non-oil products, respectively. Now the brand new business mode is rolling out across China.



Overseas Oil and Gas Operations

In response to the declining oil prices and fluctuating exchange rates in 2015, we proactively adjusted our operational strategy and achieved safe, stable and effective growth in our overseas oil and gas operations. Risk exploration and progressive exploration led to a number of discoveries. Oil and gas production saw sustained growth. Pipelines and refining and chemical projects operated smoothly, while ones under construction saw progress. Besides, our cooperation with Belt and Road Initiative countries was further deepened.

Exploration and Development

In 2015, we optimized the deployment of our overseas exploration, by focusing on effective exploration, enhancing progressive exploration, and holding back risk exploration. We postponed offshore exploration and unconventional resource exploration that featured high risk, huge investment, and a long return cycle. Through technical innovation and well-organized exploration program, we obtained a number of major breakthroughs and discoveries.

Progressive exploration: New reserves were added in oil-rich blocks by progressive exploration. In Sudan, we discovered two reserves of 100 million tons of oil for each, one in Sufyan sag of Block 6 and the other in Hilba region of Block 4. In Chad, a high-yield oil reserve was found in buried hills in Block H. In Kazakhstan, we made progress in No. 1057 central uplift area and Block Doshan of the South Turgai Basin, and had more outcomes from lithologic exploration on the western slope of Hope Oilfield in the Pre-Caspian Basin. Moreover, we revealed potential in new bed series for the first time in the west of Block T of the Andes project in Ecuador, and obtained important discoveries in new bed series and low-resistance reservoirs in Block Jabung of Indonesia.

Risk exploration: We focused on the preliminary prospecting at the eastern piedmont zone on the Right Bank of Amu-Darya in Turkmenistan. Natural gas flows of more than 1 million cubic meters per day were obtained from well testing in each of the two formations of the Joramergen structure. Testing of exploration wells in the Gokmiyar structure showed good results in Upper Jurassic limestone and Jurassic and Lower Jurassic sandstone. Appraisal wells in the Agayry structure further proved gas reserves, leading to the formation of two gas zones with the reserves of 100 billion cubic meters for each, one being Hojakashmir-Gokmiyar in the south, and the other being Agayry-Tagara in the north.

Offshore exploration: By deploying key exploration wells, we obtained a high-yield oil flow from the first deep-water subsalt exploration well in two formations being tested in our Libra project in Brazil. The flow essentially proved an uncompartimentalized oilfield with a reserve of 500 million tons in the western Libra structure.

Production

In 2015, we took a series of measures to ensure the efficient and sustainable development of overseas projects, and achieved an increment in profitable production, under the principle of profit-oriented and project-specific management. These measures included pushing forward the redevelopment of mature oilfields, focusing on waterflooding, optimizing development program, cutting down the number of newly drilled wells and stimulation work, reducing cost, and promoting technological innovation.

We produced 138.26 million tons of oil equivalent, of which CNPC's equity oil was 72.03 million tons, up 10.5% year-on-year, including 115.50 million tons of crude oil and 28.65 billion cubic meters of natural gas, with CNPC's taking up of 55.15 million tons and 21.19 billion cubic meters.

Central Asia and Russia: Despite the number of new wells greatly reduced, our Kazakh company withheld the fast decrease in output from some major oilfields by optimizing E&P program and surface engineering design. AktobeMunaiGas started Phase-III production of its Third Oil & Gas Processing Plant in Zhanazhol Oilfield. Completion of water injection facilities in North Truva Oilfield greatly mitigated the decline in formation pressure and improved development profitability. Amu Darya project in Turkmenistan ran smoothly. The captive power station expansion project and surface construction works in Girsan, Bota, Tangiguyi and Uzyngyi gas fields were put into operation, with CNPC's equity gas of 11.9 billion cubic meters in 2015. The Yamal LNG project, an integrated condensate gas development and gas liquefaction project together with Russia's Novatek and France's Total, was launched and progressed smoothly in Russia near the Arctic.

CNPC's share in overseas
crude production



55.15
mmt

CNPC's share in overseas
natural gas production



21.19
bcm

Latin America: Our Latin American company kept stable production through enhancing oilfield management, achieving an output of 14.02 million tons of oil and 820 million cubic meters of natural gas in 2015. In Venezuela, the 40,000 bbl/d production buildup project and a new diluting agent pipeline were put into operation in the MPE3 project.

Middle East: Our Iraqi company produced more than 57 million tons of oil by continuous waterflooding. In Iran, our North Azadegan project began trial production and the MIS project progressed smoothly to resume production. In the United Arab Emirates, high yield was obtained in the formation testing of the first offshore appraisal well in our Al Yasat UAE project.

Africa: Despite the unfavorable conditions in Sudan and South Sudan, we achieved an equity oil production of 6.91 million tons in 2015, thanks to an optimized investment structure, accelerated commissioning of new wells, and improved production management. Daily production of 160,000 bbls was maintained through fine management and potential release in Block 3/7 in South Sudan; and the capacity building project in Sufyan Oilfield of Block 6 in Sudan started production ahead of schedule. In Chad, we enhanced study on reservoir geology and optimized stimulating operations, achieving an equity production of 2.6 million tons. Our newly built degassing tower and settling tanks were put into operation as planned. In Niger, we completed the surface construction of the Agadi Oilfield, greatly increasing its production capacity.

Pipeline Construction and Operation

In 2015, we operated 14,507 kilometers of overseas oil/gas pipelines, including 6,604 kilometers for crude and 7,903 kilometers for gas, which transported 26.54 million tons of crude and 40.3 billion cubic meters of natural gas throughout the year. The Central Asia-China Gas Pipeline, the Kazakhstan-China Crude Pipeline, the Russia-China Crude Pipeline, and the Myanmar-China Gas Pipeline (Myanmar Section) saw safe and stable operation. Major pipeline construction projects proceeded smoothly. The Myanmar-China Crude Pipeline (Myanmar Section) started trial operation and Maday Island Port was opened for operation. The 306km-long Stage-2 of Phase-II Kazakhstan-China Gas Pipeline (Southern Kazakhstan Line) was completed and put into operation. Construction of the Chinese section of eastern route of the Russia-China Gas Pipeline commenced.

Refining and Chemicals

In 2015, our overseas refineries processed 43.92 million tons of crude oil. Khartoum Refinery in Sudan, N'Djamena Refinery in Chad and Zinder Refinery in Niger achieved safe, steady and efficient operation with optimized processes and production plans. In Kazakhstan, Phase-I of PetroKazakhstan's refinery revamping project was pushed ahead with a 4kt/a sulfur production unit brought into operation.

Project Cooperation and Development

In 2015, CNPC kept conducting extensive international petroleum cooperation. We signed a series of JV and cooperation agreements with peer companies in the energy sector, further expanding the areas of our collaboration. Meanwhile, we expeditiously implemented the joint projects with the countries along the Belt and Road, in pursuit of mutually beneficial results.

Our energy cooperation with Russian partners was further deepened. CNPC and Gazprom signed an agreement to design and construct the cross-border section of the Eastern Route of the Russia-China Gas Pipeline, and an MOU on cooperation between CNPC and Gazprom Neft. The agreement set the procedures for the design, engineering and construction of the cross-border section, and provided requirements on project quality and environmental protection. According to the MOU, the two sides will jointly seek upstream cooperation opportunities in Russia and third countries, and conduct cooperation in petroleum exploration and development, oil products marketing, oilfield services, and trading of petroleum equipment.

In the Middle East, CNPC and Mubadala Petroleum signed a strategic cooperation agreement. Under the agreement, the two companies will cooperate in upstream investment and relevant project services outside the United Arab Emirates, specifically in conventional onshore projects, offshore projects, and LNG projects, etc.

In Africa, CPECC, a subsidiary of CNPC, signed a JV agreement with ENH Logística (ENHL) of Mozambique to set up China-Mozambique Petroleum Engineering Company, which will provide consultation, survey, measurement, design and construction services for oil/gas field surface works, long-distance pipelines, storage and transportation, refining and chemical installations.

In addition, CNPC and BP signed a framework agreement on strategic cooperation to further strengthen cooperation in oil and gas development, and continuously develop fuel retailing cooperation in China in both scope and mode. The two sides will push forward with cooperation in the redevelopment of Rumaila oilfield in Iraq, explore cooperation opportunities in international marketing of crude oil, oil products and natural gas, and carbon emissions trading, and share best practices and experience on technology and corporate governance.

Regarding technical cooperation, CNPC and GE signed an MOU on R&D cooperation in CCUS, low carbon and environmental protection technologies, and the development of unconventional oil and gas.

Eastern Route of Russia-China Gas Pipeline

Construction commenced of the Chinese section of the eastern route of the Russia-China Gas Pipeline in Heihe, Heilongjiang Province, on June 29, 2015.

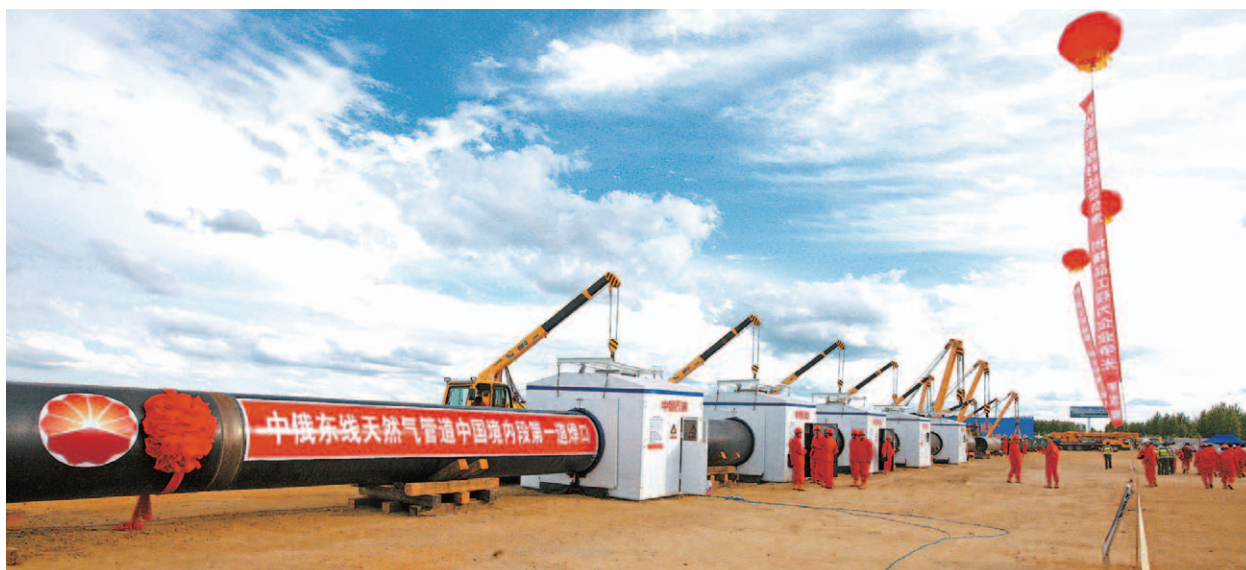
The pipeline runs from the Kovykta Gas Field in Irkutsk Oblast of East Siberia and the Chayanda Gas Field in the Sakha Republic, and enters China at the Russia-China border at Heihe, Heilongjiang Province, before running through eight provinces, municipalities and autonomous regions such as Heilongjiang, Jilin and Inner Mongolia and ending in Shanghai. Construction of the 2,680km-long Russian section started on September 1, 2014. In China, a 3,170km-long pipeline and auxiliary underground gas storages will be built, and an existing 1,800km-long pipeline in parallel will be used.

The eastern route is expected to be completed and become operational in 2018. According to a gas purchase and sales contract with CNPC, Gazprom will export gas to China via the route for 30 years since its commencement of operation, with the delivery gradually increasing to 38 billion cubic meters per year.

To build the route, which is China's first long-distance gas pipeline of 1,422mm in diameter, we initiated research on the application of X80 steel pipes of 1,422mm in diameter beforehand. We took three years to overcome the difficulties in pipe making, fracture control, and equipment development, and formulated 13 technical standards.

Construction of the Chinese section faces challenges from the complex geology, rivers, frosts, and natural reserves, as well as permafrost along most of its route. In the preliminary planning of the section, we took into full consideration the potential environmental risks, and took measures for water protection, forest-fire prevention, and layered backfill to minimize the environmental impact.

The eastern route is one of the underpinning projects of China's Belt and Road Initiative. Its construction and operation will drive the development of infrastructure and associated industries, which will create job opportunities and boost the local economy along its route.



International Trade

Supported by our overseas operation hubs and distribution networks, we conduct trading in crude oil, refined products, natural gas, and petrochemicals, as well as international carbon trading, sales of our overseas equity oil and transactions in oil and refined products futures in over 80 countries around the world. The trade was improved in both scale and operating quality in 2015. Throughout the year, we posted a trade volume of 430 million tons, worth USD168.7 billion.

With improved capability to regulate and secure supply and optimize resource allocation, we reduced purchase cost of crude through groupage, optimized shipping schedule and inventory operation, helping our refining and chemical companies lower their costs and enhance profitability. In addition to maintaining our current advantages in existing markets, we extended our presence in North American and North European markets. We also enhanced benchmark crude operations to enhance cross-region synergy and trading flexibility.

In terms of refined products, we further expanded processing volume of pipeline oil from Russia, conducted naphtha import, deepened trade cooperation with Venezuelan partners, got access to high cost-effective fuel oil and jet fuel resources, and actively participated in Platts window benchmark oil trading. By enhancing cross-market operations and opening more routes, we maintained our position as the largest aviation fuel supplier in Singapore and Hong Kong, and explored new markets in Ireland and Latin America. We also consolidated and increased our market share in Southeast Asia and the Middle East, and even reached the high-end market in Australia, to which we first exported our National V standard gasoline and diesel.

Our natural gas procurement cost was reduced by coordinating and optimizing import schemes for pipeline gas and LNG. Positive results were achieved in the negotiations of the 10bcm/a gas supply contract with Turkmen gas, the gas supply agreement via the Western Route of the Russia-China Gas Pipeline, and volume and price reduction of long-term LNG supply.

As to chemicals business, we built more channels for sulfur export, established a monitoring model for polyolefin production from naphtha, and locked in forward margin by leveraging Singapore's paper market and China's future market. We made satisfactory profits by increasing physical trading of PX and PTA together with arbitrage, financial operations, and inventory operations.

In ocean shipping, we prevented major accidents of oil contamination and cargo damage for many years by effectively controlling risks, and stipulating and amending safety management provisions on prevention and control measures for time-chartered vessels in risky waters. We also optimized the capacity structure of our own fleet of time-chartered vessels with further increased scale and operating capacity.

In Asia, we built and perfected regional network to enhance our cross-area and cross-market operational capability, with our market shares in Myanmar and Sri Lanka exceeding 40%, and our aggregate oil & gas sales volume occupying 22% of Hong Kong's terminal market. We managed to build a regional oil supply network with Hong Kong as the hub and radiation effect to markets like Taiwan and Thailand, and established stable channels for export of jet fuels. We achieved new progress in developing Japanese and Korean markets, with the volume of Middle East crude and South America heavy oil marketed by us increasing by 82% and 20% respectively. In Europe, we successfully developed transit trade of Black Sea heavy oil and entrepot trade in Western Europe. We further optimized the operation of our JV refineries in UK and France, yielding fairly good profits. We won the diesel, jet fuel and marine diesel oil procurement tenders in Tunisia, Ireland and UK Ministry of Defense respectively. We perfected our Brent benchmark oil trading portfolio, and enhanced the degree of our participation in the market. In America, we took an active part in the operation of WTI benchmark oil, achieving crude blending trade and physical delivery of future contracts, becoming one of the largest crude traders in Bakken area of the US. We initiated transit trade of gas condensate and NGL business in the US, and realized direct export of oil products to Mexico and Brazil for the first time. And our crude trading with Brazil witnessed rapid growth.

Trade volume



430
mmt

Trade value



168.7
billion USD

Oilfield Services, Engineering & Construction, and Equipment Manufacturing

In 2015, we continued to speed up the transformation and upgrading of oilfield services, engineering & construction and equipment manufacturing sectors, enhance innovation of technologies and management, optimize business structure, expand high-end market, and intensify R&D as well as industrial application of advanced products. These efforts made us more competitive and competent in supporting our oil and gas businesses. Globally, we provide technical services in geophysical prospecting, well drilling, well logging and mud logging, downhole operations, as well as construction and engineering services for oil/gas field surface works, large refining and chemical facilities, pipelines and storage tanks. Our petroleum equipment and materials were exported to 81 countries and regions around the world.

Oilfield Services

2015 saw increased operational efficiency in our oilfield services, thanks to improved operating speed and profitability from innovative management and technologies, new modes of production organization such as EPC and factory drilling, and the application of new technologies.

Geophysical Prospecting

In 2015, CNPC deployed 163 seismic crew-times (84 2D and 79 3D) in 206 projects, acquiring data of 132,714 kilometers of 2D lines and 47,219 square

kilometers of 3D profiles. With data acquisition registering 100% acceptance of on-site profiles and final processed profiles, the 2D and 3D surveys recorded shots per average day increase by 5.6% and 6.8%, respectively.

We consolidated our position in the domestic geophysical prospecting market by promoting economic and technical integration, optimally allocating resources and organizing production, and improving the operation and profitability of projects. In the 2D seismic project of Nyima Basin & Long'en-Esima in northern Tibet, BGP acquired satisfactory seismic data and recorded good results in shot density and folds in the Qiangtang Basin, by selecting a landform-based optimal plan comprising high-density wide-line observation, low frequency vibroseis, and strictly controlled operating steps.

In 2015, our innovative mode of development achieved good results in the depressed international geophysical prospecting market. In the Middle East, we maintained steady growth and increased our share in the high-end market with contracts awarded on data acquisition of the Saudi Arabian S78 transition zone in the Red Sea and on a PDO project in Oman.

With enhanced market development, our deep-sea exploration saw steady growth in multi-user business. We completed offshore towing acquisition in the Australian blocks of Numbat & Quoll and Bilby, as well as Block Yucatan in the Gulf of Mexico. Processing and interpretation delivered higher profitability through proactive services and integration. The building of three major processing centers in the Middle East, South America and Southeast Asia has been improving. Information, reservoir geophysics, borehole seismic exploration, unconventional geophysics, and integrated geophysical & chemical prospecting services achieved synergy and steady development.

We intensified R&D in core software and equipment for geophysical prospecting and obtained considerable results in the application of matching technologies. The GeoEast software family gained new members and kept improving its functionality and performance. Important progress was made in velocity modeling, anisotropic migration, Q-migration, and full waveform inversion. KLSeis II software was upgraded with enhanced functionality in efficient data acquisition, complex-zone design, and static correction. G3iHD wired seismograph was launched and the performance of the Hawk wireless-node seismograph kept improving. LfV3 low frequency vibroseis was put into widespread application; and production tests were conducted on EV56 precise vibroseis. Our proprietary "wide azimuth, broadband and high density" exploration technology + efficient acquisition technology with low frequency vibroseis saw extensive application in nine Chinese 3D seismic projects covering 1,840 square kilometers, and in six overseas projects covering 10,396 square kilometers.

Geophysical prospecting operations

	2013	2014	2015
Seismic crews in operation	165	166	166
Domestic	95	96	96
Overseas	70	70	70
2D seismic data acquired (kilometers)	114,364	103,645	132,714
Domestic	40,274	42,798	22,521
Overseas	74,090	60,847	110,193
3D seismic data acquired (square kilometers)	64,491	63,990	47,219
Domestic	17,542	14,485	10,722
Overseas	46,949	49,505	36,497

Well Drilling

In 2015, our 1,230 drilling rigs spudded 9,390 wells and completed 9,387 wells, with a total footage of 20.89 million meters.

We promoted the EPC mode of drilling operation and kept improving the drilling speed and efficiency. Deep wells were drilled much faster, with the penetration rate increasing by 4.9% year-on-year and the average drilling cycle of wells deeper than 4,000 meters reducing by 8.5%. Our Xibu Drilling Engineering Company, as the EPC drilling contractor in Block Zhahaquan of Qinghai Oilfield, recorded several highs, with the monthly drilling rate and penetration rate increasing by 24.8% and 14.6% and the well construction cycle decreasing by 31% over 2014. These achievements were made by assigning a dedicated management team for the block and applying premium and fast drilling technology. In Chuanqing Drilling's Tazhong EPC project, 24 wells were completed with an average depth of 5,377 meters, and the average monthly drilling rate and penetration rate increased by 37% and 16.6% and the drilling cycle decreased by 16 days year-on-year. The project saw the completion of our deepest well, Keshen-902, at a depth of 8,038 meters. Our Great Wall Drilling Company finished the drilling of well Ga-E31P 16 days ahead of schedule in its EPC-contracted Block Garraf in Iraq. The company recorded the quickest drilling and completion of highly-deviated directional wells with an inclination of over 40° in the block.

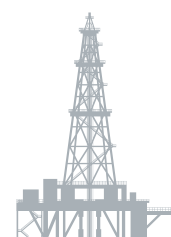
Factory operations were deployed extensively in the development of tight oil and shale gas. Applied in more than 50 platforms and over 300 wells, the operation increased efficiency by 40% and decreased costs by more than 30%. In factory tight oil operations, our Daqing Drilling Engineering Company greatly increased its drilling efficiency by furnishing key equipment such as rig-walkers, top-drive drilling equipment, and crawlers, formulating six sets of code of practices on drilling and completion, and improving the technical templates for increasing speed in seven blocks. In a joint development project in Sulige Gas Field, Great Wall Drilling Company maintained high standard in single well controllable reserves, stage-specific recovery rate, as well as drilling, completion, and reservoir stimulation, by taking the lead in using an overall development mode of "horizontal wells + multi-stage fracturing" as well as a large-platform "well factory" operating mode. In the Weiyuan shale gas project, the operation efficiency was greatly enhanced by combining engineering with geology to predict and encounter sweet points and by using a mode comprising "dual-rig factory operation" and "zipper factory fracturing".

The spread of new technologies achieved remarkable results. The vertical drilling system, precise PCD system, and drilling acceleration tools were extensively used. Further breakthroughs were made in new technologies such as coiled-tubing sidetracking. Our Bohai Drilling Engineering Company kept researching and upgrading domestic manufacturing of vertical drilling tools, with stability and reliability further improved. In Tarim Oilfield, the BH-VDT vertical drilling tool registered the longest single well footage of 3,959 meters and greatest drilling depth of 4,303 meters. The precise PCD system was deployed in Sichuan and Xinjiang in China and in the Indonesian Block Jabung. Our drilling acceleration tools such as hydraulic rotary impact tools and hydro-oscillators were extensively used, greatly increasing the percentage of net drilling time and reducing the drilling cycle.

In 2015, we extended our reach in the international drilling market and won new contracts in Kazakhstan, Uzbekistan, Venezuela, Indonesia, the United Arab Emirates, Iraq, Iran and Kenya. We were also awarded the EPC contracts for the Maysan project and an integrated project of LUKOIL's Block 10 in Iraq.

Drilling operations

	2013	2014	2015
Drilling rigs in operation	1,018	1,018	1,230
Domestic	823	824	979
Overseas	195	194	251
Wells drilled	13,378	12,286	9,387
Domestic	12,035	10,970	8,289
Overseas	1,343	1,316	998
Footage drilled (million meters)	27.50	24.92	20.89
Domestic	24.32	21.98	18.38
Overseas	3.18	2.94	2.51



Well logging operations

	2013	2014	2015
Logging crews	725	760	803
Domestic	587	623	662
Overseas	138	137	141
Well logging operations (well-time)	106,092	93,533	88,926
Domestic	100,129	88,000	85,953
Overseas	5,963	5,533	4,993

Well Logging and Mud Logging

In 2015, CNPC deployed 803 well logging crews and completed 88,926 well times of logging in 18 countries; and 1,252 mud logging crews and completed mud logging on 9,718 wells.

We actively changed our mode of well logging service based on the present service and production needs at oilfields. To reveal hydrocarbon content, we used imaging logging to tackle reservoir complexity and maximize output of single well. Moreover, new technologies and techniques were extensively employed to help reduce costs and enhance the profitability.

ELLog, our independently developed imaging logging outfit, was widely deployed. It greatly reduced the average time taken for operation in single uncased hole compared with conventional methods. The 15-meter "One-String" fast logging tools reduced the logging duration per well by four hours, increasing the efficiency by more than 30%. Hard-cable well logging technology was applied on a large scale, reducing the logging duration per well by 22.96 hours. The pup joint for logging cables in horizontal wells resulted in cable protection, lower costs, a higher success rate and lower operating risks since its first application at Block Longdong in 2012. We developed digital core imaging techniques, which reduced the time taken to fully describe cores from one or two months in the past down to three or four days. We also rolled out a synergistic work platform for well logging and independently developed a synchronized remote control system for mud logging, to establish highway to transmit digital information. To perform well logging under complex conditions in horizontal or highly-deviated wells, we improved and furnished techniques such as through-drill-pipe logging, crawler, coiled tubing, memory logging, and logging while drilling. These operations improved the operation capacity of each crew, reduced well-occupying time for logging, and increased the efficiency and success rate of well logging under complex conditions.

In 2015, our well logging and mud logging services proceeded smoothly in Iraq, Iran, Uzbekistan, Bangladesh, Russia and Canada. To promote the global application of our new technologies, we set up an overseas technical support center for R&D and services, as well as interpretation and evaluation of well logging data.

Downhole Operations

In 2015, our 2,153 downhole crews completed 128,879 downhole operations and 7,782 layers of formation testing.

We rolled out new technologies and techniques to improve the quality of downhole operations. High-efficiency hydraulic jet SRV fracturing delivered much greater efficiency when it was extensively used in horizontal wells for tight oil development. Sand fracturing performed at well Qing-2-40 in Yumen Oilfield at an altitude of 2,600m registered the highest pressure of 177.6MPa and the highest displacement with 960 cubic meters of fluid being pumped. This also proved our capacity for reservoir stimulation in high altitude regions. In PDM Block in Venezuela, we completed chemical plug removal with coiled tubing and gas lift by liquid nitrogen.

Factory fracturing was widely used in shale gas development, with efficiency much improved by specialized, modular, and streamlined operation under procedural control. Good results were shown with technologies of staged fracturing with drilling-free large-bore bridge plugs and fast bridge plugs, multi-cluster perforation with pump-down bridge plugs, fracture monitoring and continuous on-site blending. In Sichuan Province, well Wei-202H1-4 registered CNPC's highest amount of fluid, up to 51,600 cubic meters, pumped

Downhole operations

	2013	2014	2015
Downhole operation crews	2,052	2,090	2,153
Domestic	1,831	1,849	1,929
Overseas	221	241	224
Downhole operations (well-time)	143,100	143,405	128,879
Domestic	141,019	140,713	126,062
Overseas	2,081	2,692	2,817
Formation test (layers)	7,558	6,965	7,782
Domestic	6,251	5,099	5,051
Overseas	1,307	1,866	2,731

into a single well; and platform Wei-204H3 for shale gas development recorded CNPC's highest efficiency, up to six stages in a single day, of factory fracturing. After the fracturing, the highest single well output of shale gas was up to 328,600 cubic meters.

New breakthroughs were made in downhole operation technologies. Dry sand fracturing with CO₂ saw success in six wells at Changqing and Jilin oilfields, pioneering a new approach for waterless fracturing. Our independently developed drilling-free large-bore bridge plugs were successfully sent downhole and provided excellent packing and fracturing in Sulige. BH-SFP, a technology and a tool for selective multi-stage fracturing and extraction control, performed well in separate layer stimulation, testing, result evaluation, and extraction control for each layer and interval. Formation testing techniques for ultra-deep wells were improved. We designed an innovative "5-valve + 1-packer" string technique for formation testing, which addressed the challenges of mud displacement, well killing, and unpacking in its successful application in ultra-deep well Keshen-902 in Tarim Oilfield.

Engineering and Construction

In 2015, we steadily proceeded with our major engineering and construction projects by intensifying prior coordination and risk prevention, improving contractor management, enhancing project control, and perfecting our plans throughout the production management process. We implemented 21 major engineering and construction projects throughout the year.

We strengthened top-level design of market development, and explored the commercial modes of BOT, BOOT, financing + EPC, and equity investment and vigorously developed the markets along the Belt and Road, especially the high-end external market and emerging strategic markets. By doing so, we set up a market network of Central Asia, the Middle East, Africa, Asia-Pacific, the Americas, and key countries.

We kept adjusting and optimizing our business structure, in which the contribution by EPC, design, consulting, and other high-end business in our revenue increased from 47% to more than 60% in 2015. Our influential brands included CPP, CPECC, CPE, China Huanqiu and Daqing Oilfield Engineering, which had been listed as ENR Top 250 International Contractors for consecutive years. And Kunlun Engineering Corporation has become a renowned supplier of techniques and outfits for polyester and PTA production.



Gas processing plant in Tanzania

Oil and Gas Field Surface Engineering

We maintained leading position in China in production capacity building in onshore oil and gas fields. We have surface engineering technology packages for conventional fields, for high water cut, low permeability, ultra-heavy oil and high condensate content oil fields, as well as high pressure, high yield, and high sulfur content gas fields. In addition, we are capable of building 20Mt/a oil production capacity and 10bcm/a gas production capacity.

In 2015, our major capacity building projects proceeded smoothly. The surface engineering work for 6bcm/a development of Longwangmiao gas reservoir of Anyue Gas Field in Sichuan Province and the project for coal-fired boiler at Fengcheng Oilfield in the Xinjiang Uygur Autonomous Region were completed and put into operation. Construction of the 4Mt/a indirect liquefaction unit at Ningxia Coal of China Shenhua Corporation was pushed ahead as planned.

Overseas, we completed and put several major projects into operation, including the surface engineering work at North Azadegan Oilfield in Iran, Phase-II of the Halfaya project in Iraq, and the 8bcm/a renovation and upgrading project in Block A of Amu-Darya in Turkmenistan. Construction of a natural gas processing plant in Tanzania was generally completed. Smooth progress was made in gathering and transportation works at Girsan, Bota, Tangiguyi, Uzyngyi, and Odjarly-Sandykly gas fields in Block B of Amu-Darya in Turkmenistan and in the expansion of AktobeMunaiGas' No. 45 captive power station. Moreover, we were awarded many engineering and construction contracts, including an EPC contract for a clean energy project in Texas, USA.

Construction of Refining and Chemicals Facilities

In 2015, we proceeded with major domestic projects as planned and completed a number of gasoline and diesel upgrading projects. A diesel hydrogenation unit was completed and became operational at Urumqi Petrochemical. The 10Mt/a refinery is expected to be completed at Yunnan Petrochemical in 2016.

2015 also saw new progress in our overseas projects. Construction of the modern renovation project (Phase I) at Shymkent Refinery in Kazakhstan proceeded smoothly. We further extended our overseas reach by signing EPC contracts, with Petronas for a RAPID PP project in Malaysia and with Uzbekistan for a PVC project.

Pipeline and Storage Tank Construction

Regarding construction capacity and engineering technology for long-distance pipelines, we can build 6,700-9,700 kilometers of pipeline with a diameter larger than 711mm every year. In addition, we have the technologies to design and build 150kcm crude tanks and 10kcm spherical tanks. We are capable of building 26 million cubic meters of crude tanks and 16 million cubic meters of refined product tanks annually.

In 2015, the construction of a number of oil and gas pipeline made new progress. The Fangchenggang Branch of the Myanmar-China Gas Pipeline (Chinese Section) was completed and became operational. The Myanmar-

China Oil Pipeline (Chinese section) was welded, pressure-tested, and ready for operation. The main part of the Yunnan Products Pipeline was completed. Construction of the eastern section of the Third West-East Gas Pipeline, Jinzhou-Zhengzhou Refined Products Pipeline, Tianjin Port-Huabei Petrochemical Crude Pipeline and Dayawan Offshore Pipeline in Huizhou City was pushed forward in an orderly manner. Construction of the Chinese section of the eastern route of the Russia-China Gas Pipeline commenced.

Our overseas pipeline construction projects proceeded smoothly. We completed and put into operation the Myanmar-China Oil Pipeline (Myanmar Section), Tanzania natural gas pipeline and Halfaya export pipeline in Iraq; finished the pilot operation of the Nakhon Sawan Gas Pipeline Project in Thailand; and steadily pushed forward Badra Crude Gathering and Transportation Pipeline and Majinoo FCP Gas Pipeline in Iraq, the Shahdol-Phulpur project in India, and the GULF project in Thailand. In addition, we also signed several pipeline construction contracts, including those for the Limbe-Yaounde Products Pipeline in Cameroon and the MEPE Gas Pipeline in Myanmar.

New progress was made in storage projects. The main part of the State Petroleum Storage Base in Jinzhou was completed. Expansion of the State Petroleum Storage Base in Zhoushan and Phase-II of the Jiangsu LNG Terminal proceeded smoothly. Internationally, we completed and put into operation the Angola Product Depot Expansion Project, completed the main part of a tank yard for asphalt and refined products in Myanmar, and proceeded with the Nassiriya oil depot project and Rumaila crude storage tanks in Iraq and petroleum storage tank project for a refinery in Papua New Guinea. We were also awarded an EPC contract for the LAUGFS LPG tank yard in Sri Lanka and the TEMA storage yard project in Ghana.

Offshore Engineering

We have the capability to provide integrated and comprehensive services for offshore production, well drilling, well completion, well cementing, production test, downhole operation, design and construction of marine engineering, and vessel services. By the end of 2015, we had 16 offshore drilling and operating platforms and 25 vessels. In 2015, we recorded 56.4% utilization with drilling platforms and 85% utilization with operating platforms. Seven platforms realized a drilling footage of more than 10,000 meters. Our vessels provided service for 4,217 working days, with the vessels of 4,000HP or higher duty utilized by 79.3%.



In 2015, our Offshore Engineering Ltd. (CPOE) completed a total drilling footage of 131,000 meters in the Bohai Sea, Yellow Sea, and the Persian Gulf. The company spudded 59 wells, completed 33 wells, and provided downhole operations for 28 well-times, acid fracturing and sand control for 81 layer-times, and formation testing in six layers.

With improved support provided by the Qingdao offshore engineering construction base and the Tangshan production support base, CPOE commenced construction of MWP4 and FWP5 engineering packages for the Russian Yamal Project at the Qingdao base in January 2015. By the end of 2015, FWP5 was completed and MWP4 proceeded smoothly. Following these packages, CPOE won the bidding for MWP10A and FWP1D engineering packages and contracted reels for MWP8 and spray painting for MWP1 as part of the Yamal Project, becoming the subcontractor involved in most engineering packages in the project.

Petroleum Equipment Manufacturing

Thanks to the "Made in China 2025" plan, our petroleum equipment manufacturing business underwent greater structural adjustment. It has been transformed and upgraded from sheer production to integrated business of product R&D, manufacturing, sales, and service offering. In addition to emphasizing core and advantageous categories of drilling equipment, recovery equipment, petroleum steel pipes, and power units, we sped up the R&D and industrial manufacturing of new high-end products, thereby increasing the percentage of high value-added products and optimizing product portfolio. We actively expanded the international market and improved the layout of our overseas marketing network. Our petroleum materials and equipment were exported to 81 countries and regions.

Progress in the R&D of petroleum equipment included the following: intermediate results were achieved in the research on the automatic handling system of deep-water rigs and strings; the first domestically made automatic rig with 7,000m string was put into use; the prototype of the Model 2500 fracturing truck passed the industrial test; 27 sets of 105MPa well-control outfits for fracturing and extraction of shale gas were applied; BJC-I premium connection casings passed downhole testing; X80-grade $\Phi 1422 \times 21.4$ mm longitudinal submerged arc welded pipes and spiral submerged arc welded pipes were produced for 1,000 tons on trial; field tests of 52MPa natural gas compressor commenced; and the integrated V-type compressor passed the industrial test.

Major equipment projects saw smooth progress. We made steel pipes for a natural gas processing plant and transportation pipeline in Tanzania by following a scientific plan based on the world-leading design principle of "skid-based stations and modular plants". Our standard was for premium steel pipes, higher than that in the technical specifications of the owner's order. Subsea pipes with anchors were locally made in facilities established in Tanzania. The second batch of 16 rigs supplied to UAE National Drilling Company (NDC) was delivered, and manufacturing of 14 rigs for Venezuela commenced.

We beefed up overseas market development. In 2015, we were awarded contracts to supply 10 rigs to Turkmenistan, the third batch of 12 fast-moving desert rigs (a total of 39 rigs), to NDC of the UAE, 64,000 tons of SSAW pipes to Saudi Aramco, and 110,000 tons of piling tubes to Port Said in Egypt, as well as electric submersible pumps on a rental basis to Block 3/7 in South Sudan.

We actively conducted joint venture cooperation and collaboration with foreign enterprises. We improved the manufacturing level of hydraulic drilling rigs by setting up a JV with Herrenknecht AG and elevated the technical performance of domestically made fracturing equipment by cooperating with Schlumberger. Also, we cooperated with other international manufacturers and set up manufacturing plants overseas. Major projects, including the construction of a steel pipe plant in Kazakhstan proceeded as planned.



Construction of MWP4 engineering package of Yamal LNG project