



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 11bcm/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.

Chuangdongbei 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