As an integrated international energy company and a leading oil and gas producer and supplier in China, CNPC plays an important role in ensuring sustainable energy supply and promoting Socioeconomic development in China. To this end, we keep intensifying oil and gas exploration and development, constantly increase our efficiency in resource development, and vigorously promote the natural gas business and explore new energy development. We advocate environmental protection, energy conservation and emission reduction, and the efficient use of energy resources, promote international energy cooperation, and strive to build a clean, efficient, safe and sustainable energy system, in order to provide a sustained driving force for socioeconomic development.
1. Intensifying Exploration and Development

In 2014, upholding the strategy of increasing our resources, we continued to intensify our efforts in exploration and development, and kept promoting projects for the peak period of reserve growth. In China, we registered 690 million tons of newly added proven oil in place, exceeding 600 million tons for the ninth consecutive year; and 484 billion cubic meters of newly added proven gas in place, exceeding 400 billion cubic meters for the eighth consecutive year. Our oil and gas production reached 254.938 million tons of oil equivalent, including domestic production of 113.67 million tons of crude oil and 95.46 billion cubic meters of natural gas. Both our oil production and gas production had hit a record high in 2014.

We focused on precise exploration in key zones and strengthened preliminary exploration and risk exploration in key areas and basins, making remarkable achievements in oil and gas exploration. A number of important oil and gas discoveries and breakthroughs were made in petrolierous basins including Tarim, Ordos and Qaidam. In particular, we discovered Moxi Longwangniao Gas Reservoir in the Sichuan Basin, the largest monomer marine uncompartmentalized gas reservoir in China.

To increase the efficiency and production of oil and gas development, we optimized the overall development plan, giving priority to new capacity building and stabilization of mature oilfield production. As most of our new resources are low grade, whereas the mature oilfields are in the late stages of development with high water cut, we carried out fine reservoir characterization, precise water injection, and significant development testing, and controlled the production decline of mature oilfields. In Daqing Oilfield, in the development stage of ultra-high water cut and ultra-high recovery degree, we focused on potential tapping by waterflooding and chemical flooding, and achieved stable production of 40 million tons for 12 consecutive years after stabilizing production at over 50 million tons for 27 consecutive years. In Changqing Oilfield, by continuously improving tight oil and gas development technologies, and promoting the application of horizontal wells, the oilfield has become the largest oil and gas field in China. In 2014, its oil and gas equivalent production made up approximately one-sixth of China’s total oil and gas production.

Case Study

ASP Flooding Technology - A Powerful Tool for the Sustainable Development of Daqing Oilfield

In Daqing Oilfield, after producing from natural flows, and with the help of waterflooding and polymer flooding, it is very important that we find a way to free the residual resources.

In the early development stage when Daqing Oilfield experienced robust growth in oil production, we had already started research on EOR technology. Based on the successful development and large-scale application of polymer flooding technology, we carried out research on ASP flooding since the 1980s. Through laboratory evaluation, pilot field tests, industrial field tests, and industrial demonstration development, progress has been made in many aspects. Application of ASP flooding in low-acid crude oil, challenging the traditional view that ASP flooding can only be used for high-acid crude oil; independent production of heavy alkyl benzene sulfonate (HABS) surfactants, solving the core problem of ASP flooding; solution for scaling of produced fluids; and transformation from strong base ASP flooding to weak base ASP flooding to alkali-free SP flooding. While improving our technology, we also made great efforts to cut production costs and improve economic efficiency.

Through over 30 years of research, ASP flooding was put into industrial use in Daqing Oilfield. The technology was applied in more than 4,000 wells in 11 blocks, involving over 97 million tons of oil and gas in place. Annual production of ASP flooding had been exceeding one million tons since 2009 until 2014, when production reached two million tons for the first time. A total of over 12 million tons of oil has been produced by ASP flooding, with a recovery rate of over 60% in main oilfields, 20% higher than their counterparts. On top of waterflooding, more than 200 million tons of new recoverable reserves have become accessible by ASP flooding, which has become a leading development technology for sustainable development.

Daqing Oilfield has long been the world’s largest EOR production and R&D base, with a steady annual increase in EOR production represented by polymer flooding and ASP flooding. In 2014, its EOR production reached 14.59 million tons, accounting for 36% of the total production of 40 million tons. Thanks to the EOR technology, more than 100 million tons of oil has been cumulatively produced by the oilfield.

Knowledge: The alkali-surfactant-polymer (ASP) flooding technology is an EOR technology developed in the 1980s, by injecting alkali, surfactant and polymer in a certain proportion into the formation. Under the synergy effect of multiple displacing agents, it can increase the viscosity of the displacement fluid, improve the water/oil mobility ratio and displacement efficiency, and significantly enhance oil recovery.
Sustainable Energy Supply

2. Development of Natural Gas

Fossil fuels are and will remain the main driving force for global economic development in the foreseeable future. As a low-carbon fossil fuel, natural gas is playing an increasingly important role, especially amid the worldwide campaign to address ecological issues and pursue green development. In China as well, natural gas has become an important energy guarantee of the country’s ecological civilization construction in the process of urbanization and industrialization.

Striving to provide more clean energy represented by natural gas, CNPC continuously intensifies natural gas exploration and development, accelerates capacity building, and enhances production and supply capabilities. Additionally, we promote the construction of gas pipeline networks and facilities to efficiently and stably deliver resources to the market, and expand gas import channels in order to enhance gas supply capability through a diversified supply system. In 2014, we produced 95.46 billion cubic meters of natural gas in China, and supplied 119.5 billion cubic meters of natural gas. Gas delivery consists of our domestic production and gas and LNG imports, and increased 8.1% over 2013.

In 2014, CNPC continued to improve the building of our natural gas pipeline network to enhance resource allocation and guarantee market supply. The western section of the Third West-East Gas Pipeline, the Liangxiang-Xishatun section of the Third Shaanxi-Beijing Gas Pipeline, and Line C of the Central Asia-China Gas Pipeline were completed and put into operation. Now natural gas from Central Asia and coal gas from Xinjiang can be transported to the Yangtze River Delta, the Pearl River Delta, the Bohai Rim, Sichuan and Chongqing through the Third West-East Gas Pipeline, the Shaanxi-Beijing Gas Pipelines, and the Zhongwei-Guiyang Gas Pipeline, benefiting millions of people. In addition, six gas storages including Hutubi Storage in Xinjiang and Xiangguosi Storage in Southwest China were put into operation, further enhancing our gas supply and peak-shaving capabilities.

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We have established a supply system featuring diverse sources and efficient operation. By the end of 2014, we operated 51,000 kilometers of gas pipelines in 29 provinces (municipalities and autonomous regions) and the Hong Kong SAR, and built 10 gas storages (complexes) and three coastal LNG terminals.

Case Study

Large-scale Development of Ultra Heavy Oil in Fengcheng Oilfield

The ultra heavy oil in Fengcheng Oilfield is a type of naphthenic crude oil, accounting for only 2.2% of the world’s proven oil reserves. A total of 75 types of high-end chemical products can be produced from naphthenic crude oil.

In 2014, Fengcheng Oilfield became the largest uncompartmentalized ultra heavy oilfield in China, with oil production of 2.237 million tons. Located in the Junggar Basin, the oilfield was discovered in the 1950s with 210 million tons of proven reserves. However, as the oil viscosity could be as high as 100,000 mPa.s, in order to find an effective and economical way for large-scale development, CNPC has been carrying out technical research on super heavy oil recovery since the 1980s, through a variety of pilot tests including SAGD, steam flooding for small well spacing, and VHSD. We overcome technical difficulties such as transforming heavy oil from “solid” to liquid, insufficient steam force, and high drilling costs, by developing multiple supporting technologies including steam assisted gravity drainage (SAGD) for dual horizontal wells, steam flooding for “vertical wells + horizontal wells”, superheated steam injection, and drilling of shallow super-heavy oil horizontal wells. As a result, we have achieved the large-scale development of super heavy oil in Fengcheng Oilfield.

2. Development of Natural Gas

Fossil fuels are and will remain the main driving force for global economic development in the foreseeable future. As a low-carbon fossil fuel, natural gas is playing an increasingly important role, especially amid the worldwide campaign to address ecological issues and pursue green development. In China as well, natural gas has become an important energy guarantee of the country’s ecological civilization construction in the process of urbanization and industrialization.

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Q: Technological innovation is the main driving force of the sustainable development of an enterprise. How does CNPC enhance its technology innovation capabilities?

A: At CNPC, we keep increasing our science and technology input to create a good environment for technological innovation. Aiming to stay ahead in advantageous fields, realize accelerated development in fields where we lag behind, and take the lead in technical reserves, we keep building the technology innovation system. As a result, over 80% of our key technologies and major equipment have been independently developed, and over 53% of our growth has been attributable to technological progress. Making remarkable economic and social benefits through technology innovation, CNPC has been named an “innovation-driven enterprise”.
Securing Gas Supply to Beijing

On January 7, 2015, the Liangxiang-Xishatun section of the Third Shaanxi-Beijing Gas Pipeline started gas delivery, indicating that the whole pipeline project has been completed and became operational. Beijing and North China used to depend on the first and second Shaanxi-Beijing Gas Pipelines for gas supply of 20 billion cubic meters annually. In recent years, with rapid economic development and continuously improving living standards in North China, gas consumption has been on the rise rapidly. Beijing in particular, has seen an average annual growth of over 20% in gas demand. Therefore, gas delivery from existing pipelines could hardly meet market demand, leaving natural gas in short supply, especially in winter peak demand periods. In the winter of 2013, the peak daily gas consumption in Beijing registered 53.43 million cubic meters. As the Shaanxi-Beijing Gas Pipelines were operating at full capacity, the gas supply for many industrial users along the pipelines had to be suspended to secure supplies for household use.

To alleviate gas shortages in Beijing and North China, CNPC started the construction of the Third Shaanxi-Beijing Gas Pipeline in September 2009 in two phases. The phase-I project (Yulin-Liangxiang Section) started supplying gas to Beijing in early 2011, whereas the Phase-II project (Liangxiang-Xishatun Section) became operational in 2014, which altogether has increased the city’s daily gas transmission and distribution capacity by 20 million cubic meters. This has improved the layout of gas sources surrounding Beijing, and helped the city achieve its goal of gas transmission. It has also met the gas demand of replacement of coal for heating boilers, and enhanced the guarantee capability of gas pipeline network in Beijing.

Interconnected with the first and second West-East Gas Pipelines, the first and second Shaanxi-Beijing Gas Pipelines, Ji-Ning branch of West-East Gas Pipeline, and Yongqing-Tangshan-Qinhuangdao Pipeline, the Third Shaanxi-Beijing Gas Pipeline is an important link line to guarantee gas distribution in the pipeline network. Natural gas is mainly delivered from Changqing Oilfield and Central Asian countries including Turkmenistan and Kazakhstan, to Beijing and Shandong as the major target markets, and also to provinces and municipalities such as Tianjin, Hebei, Shanxi and Liaoning. The Third Shaanxi-Beijing Gas Pipeline will supply high-quality gas to the Bohai Economic Rim through multiple channels, which will effectively relieve the pressure on gas supply in Beijing, optimize the regional energy mix, and improve the environment and people’s lives.

Fueling buses with natural gas in Lhasa

In Lhasa, Tibet, the Qinghai Oilfield Company launched a bus refitting campaign with Lhasa Public Transport Corporation to replace oil with natural gas for bus fuel. On February 5, 2015, the first bus was successfully refitted and put into operation. Subsequently, all the existing 200 buses in Lhasa will be refitted, ushering in an era of natural gas for the city’s bus system.

Qinghai Oilfield supplies natural gas to Qinghai and Tibet. In order to accelerate green economic development in Tibet by supplying the region with more natural gas, Qinghai Oilfield has actively developed the vehicle gas market while promoting urban gas projects in Lhasa.

In 2014, Qinghai Oilfield and Lhasa Public Transport Corporation worked together to promote a gasification project in Lhasa City. Apart from refitting buses to change the bus fuel from oil to gas, another 107 gas-fueled buses are planned to be purchased and put into operation. This will play a positive role in reducing exhaust emissions and protecting the environment in Tibet.
In response to the decline in easy-to-tap and high-quality conventional hydrocarbon resources, we are extending our exploration and development to new areas, such as shale gas, coal-bed methane and deep water. In these areas, we face great challenges not only in the safe and economical development of the resources, but more importantly in obtaining these resources at the lowest environmental and social costs. In order to secure future energy supply, CNPC actively promotes the development of unconventional oil and gas resources and strengthens research, tests and cooperation in these fields.

In 2014, we continued to strengthen the exploration of unconventional oil and gas resources including tight oil, tight gas, shale gas and coalbed methane. We intensified technical R&D, established a national R&D center for tight oil and gas, and set up two national shale gas demonstration zones in Changning-Weiyuan, Sichuan Province and Zhaotong, Yunnan Province.

We took the lead in carrying out comprehensive geological evaluation of shale gas in China to select favorable formations. We applied innovative mechanisms to the industrial development of shale gas, and developed a model for its efficient exploration and development featuring “platform-based well placement, industrial drilling and fracturing, skid-mounted construction, and digital production management”. Relying on our experience and advantages in low-permeability reservoir fracturing, we have developed the exploration and staged fracturing technologies for shale gas recovery with independent intellectual property, which have been successfully applied to the fracturing of vertical wells and horizontal wells.

In recent years, the Company has cumulatively invested RMB 7.3 billion, completed 41 shale gas wells and produced 177 million cubic meters of commercial shale gas.

We were engaged in shale gas development in a clean and intensive manner. We have established a sound HSE management system adapted to the characteristics of shale gas development. We promptly collected and treated drilling waste by applying treatment-while-drilling technology; and fully recycled oil-based mud and reduced the amount of waste, with a recycling rate of over 90% for fracturing flowback fluid. Furthermore, we saved water resources by actively exploring anhydrous fracturing technology; and saved over 70% of land use through the platform-based well placement technology compared with single-well placement.

In 2014, in CBM exploration and development, we made major breakthroughs in the theoretical research and technological development of exploration and development of medium-to-low rank coalbed methane. Our CBM production capacity has experienced steady growth in Qinshui Basin, Ordos Basin and the 500-million-cubic-meter development project in North Baode in Shanxi Province. The annual capacity at the North Baode project has reached 360 million cubic meters, making it the first demonstration base for the development of medium-to-low rank coalbed methane in China.
4. Accelerating Upgrading of Oil Products

As the vehicle population grows in China, traffic emissions are exerting an increasing impact on air pollution. In response to the National Plan on Climate Change (2014-2020) and the Air Pollution Prevention and Control Action Plan, we have accelerated the upgrading of gasoline and diesel products, and committed ourselves to independent technology R&D and the upgrading of equipment and processes. By the end of 2013, all of our motor gasoline products met the National IV standard, whereas in 2014, we made full preparations for the production and supply of motor diesel in compliance with the National IV standard, and engaged in the R&D of technologies for motor gasoline and diesel of National V standard. We have established technological projects involving oil product upgrading, including low-quality heavy oil processing, refining catalysts, and production technology for National VI and National V gasoline. As a result, a series of independent R&D achievements have been made, providing powerful technological support for the upgrading of gasoline and diesel products. We also committed ourselves to the relevant renovation work at the refining, pipeline transportation and marketing enterprises, building and refitting a number of ancillary facilities for atmospheric and vacuum distillation, catalysis, coking, and hydrocracking. In 2014, all our refineries could produce National VI motor diesel as we completed the 14 upgrading projects on schedule. On the first day of 2015, CNPC officially started supply of National IV motor diesel, and provided sufficient National V oil products to key regions in the country.

Q: What research programs has CNPC conducted for future energy development and clean energy utilization?

A: We attach great importance to the sustainable development of new areas and future energy, and focus on fundamental research and research for technical reserves. Major alternative technologies have been developed in fields such as tight oil and gas exploration and development, EOR for high water-cut, extra/ultra low-permeability oil and gas fields, and new catalytic materials. To promote clean energy utilization, as well as safety and environmental protection performance, we carried out research on exploration and development, engineering technology, oil and gas storage and transportation, refining and chemicals, and new energy. Our major research programs include “Research on Key Low-carbon Technologies” and “Research and Promotion of Key Safety and Environmental Technologies”. Meanwhile, we actively promoted the application of advanced technologies and equipment to boost safety and protect the environment. Our technological package for clean gasoline production in compliance with National IV standard has been applied and promoted successfully.
5. Ensuring Stable Oil Supply

In 2014, CNPC continued to optimize its refinery layout, restructuring, and allocation of resources. We accelerated equipment upgrading, improved the product mix and sales network, and strived to ensure market stability. Sichuan Petrochemical Company’s refining project was put into operation; Guangxi Petrochemical Company’s sour crude supporting project was completed; and the refining project of Yunnan Petrochemical Company was accelerated. In 2014, we processed 150.16 million tons of crude oil, produced 101.84 million tons of oil products, and sold 117.02 million tons of oil products in China. While enhancing our supply capability to the market, we have established and improved emergency response mechanisms, developed plans for emergency allocation, and strived to ensure oil supply during special periods and in case of emergency.

Securing Oil Supply in Agricultural Peak Periods

In the summer of 2014, oil products were in short supply due to agricultural activities in many regions in China. Paying close attention to oil supply during the summer period, we developed oil supply programs for key areas in advance, and provided quality products and services through rational allocation of resources, establishing green channels for agricultural refueling, and sending skid-mounted refueling facilities and mobile fuel trucks to the farms. In 2014, we supplied 2.3 million tons of diesel in the peak period lasting for about a month, in the nine key provinces of Hebei, Shanxi, Hubei, Anhui, Henan, Shandong, Jiangsu, Sichuan, and Shaanxi, meeting local agricultural demand with high-quality oil products.

Guaranteeing Oil Supply for Disaster Relief

In response to natural disasters such as low temperatures, floods, droughts and earthquakes in recent years, we have established effective emergency mechanisms, conducted regular emergency dispatching, and set up comprehensive oil supply networks, in order to secure oil supply. In 2014, a 6.5-magnitude earthquake struck Ludian County of Zhaotong City in Yunnan. Yunnan Marketing Company immediately activated its emergency plan to send 29 oil tankers to the disaster area, and opened 23 green fuel channels along the roads to Ludian. Within three days of the earthquake, we had supplied 1,013 tons of oil products to the disaster area.
6. Deepening International Energy Cooperation

Upholding the principle of “mutually beneficial cooperation for common development” and in compliance with the laws and regulations of host countries, we participate in global oil and gas exploration and development by giving play to our advantages in integrated businesses, capital, technology and management. By the end of 2014, we operated more than 90 oil and gas cooperation projects in over 30 countries.

Participating in International Energy Development

New progress was made in international oil and gas cooperation in 2014. We saw smooth progress in our existing cooperation projects, steady development in new projects, and deepened oil and gas cooperation in countries including Russia.

We entered into a purchase and sales contract on gas supply of 38bcm/a via the Eastern Route of the Russia-China Gas Pipeline, a framework agreement on gas imports of 30bcm/a from Russia via the Western Route, and a cooperation framework agreement on the Vankor Oilfield Project. We also signed a number of cooperation agreements with countries including Kazakhstan, Uzbekistan, Tajikistan and Turkmenistan, to enhance cooperation in pipeline construction, exploration and development, and international trade.

Phase II of the Halfaya Project in Iraq, a project built in partnership with Total and Petronas, has become operational. New breakthroughs were also made in risk exploration and progressive exploration in our project in Chad, the Amu Darya Project in Turkmenistan and the PK project in Kazakhstan, obtaining new oil and gas recoverable reserves. By strengthening risk control and coordination of production and operations, and actively implementing water injection, horizontal wells and EOR projects, we saw increased output in new oil and gas fields in Iraq, Latin America, Turkmenistan and other regions. In 2014, we maintained rapid growth in overseas oil and gas output, with equity production of 65.2 million tons of oil equivalent, an increase of 10.1%.

Boosting Global Oil and Gas Trade

The Company actively boosts its global oil and gas trade and keeps improving its global trading network, and has witnessed steady growth in international trade volume and operational quality. We also maintained progress at our three operating centers in Asia, Europe, and the Americas. In 2014, our trade volume grew by over 9.2%.

Promoting Cooperation with International Companies in China

In China, we actively enhance our cooperation with international companies not only in conventional fields, but also in unconventional oil and gas including shale gas. In 2014, we entered into an agreement with HESS for the joint research of shale gas in Rongchang North Block in the Sichuan Basin; Changbei Project in cooperation with Shell continued to maintain high and stable production; Chuandongbei Project in partnership with Unocal has seen mechanical completion of the purification plant and Well Site A; and South Sulige Project in cooperation with Total was fully developed, hailed by Total as a “world-class project”. Throughout the year, our joint blocks in China yielded 9.20 million tons of oil equivalent, an increase of 11.2% over 2013.