Natural Gas

Meeting increasing demand for clean energy

China National Petroleum Corporation
Find & deliver more natural gas

for today and tomorrow
**CNPC** is an integrated international energy company, with businesses covering oil and gas operations, oilfield services, engineering and construction, equipment manufacturing, financial services and new energy development.

- China’s largest oil and gas producer as well as a major provider of refined products
- World’s third largest oil company
- Ranking fourth on 2014 Fortune Global 500
- Operating 14 oil and gas production bases and 26 refining and petrochemical complexes in China
- Oil and gas operations in 38 countries
- Producing 3.28 million barrels of crude and 11.02 billion cubic feet of natural gas, and processing 3.94 million barrels of crude every day

### Financial highlights

<table>
<thead>
<tr>
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<th>2013</th>
<th>2014</th>
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<tbody>
<tr>
<td>Total assets</td>
<td>3,759.31</td>
<td>3,938.37</td>
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<tr>
<td>Operating income</td>
<td>2,759.30</td>
<td>2,729.96</td>
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<td>Total profits</td>
<td>188.03</td>
<td>173.41</td>
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CNPC’s Natural Gas Business

» China’s largest natural gas producer and supplier
» Providing more than 70% of China’s total natural gas supply
» Operating 78% of China’s total gas pipelines
» More than 400 bcm of proven OGIP being newly added annually in the past eight years
» Natural gas production in 2014 being five times of that in 2000

CNPC has built four gas production bases in China’s Changqing, Tarim, Sichuan and Qinghai gas provinces with annual production capacity of nearly 100 bcm. In 2014, we newly proved 484 bcm of natural gas in place, and produced 95.46 bcm, accounting for 75% of China’s total gas production.
Changqing

Located in the Ordos Basin, Changqing gas province has nine proven gas fields, including Sulige, Jingbian, Yulin, Wushenqi and Zizhou, with an annual production capacity of more than 38 bcm. Changqing, by far China’s largest gas production base, mainly ensures gas supply to the Shaanxi-Beijing Gas Pipeline network.

Tarim

Located in the Tarim Basin, the Tarim gas province mainly consists of the Kuche-Tabei, Bachu-Taxinan and Tadong natural gas enrichment zones, where 15 gas fields were proven including Kela-2, Dina-2, Yaha and Hetianhe. Being capable of producing more than 25 bcm of natural gas annually, Tarim is one of the major sources for the West-East Gas Pipelines.
Sichuan

Located in the Sichuan Basin, Sichuan gas province has 112 proven gas fields, including Anyue Guang’an, Hechuan, Dalianchi, Luojiangzai, Moxi, Wolonghe, Weiyuan, Tieshanpo and Dukouhe. With an annual production capacity of more than 15 bcm, Sichuan gas province is the gas source for the Southwest Gas Pipeline Network and the Zhongxian-Wuhan Gas Pipeline.

Qinghai

Located in the Qaidam Basin, Qinghai gas province has the highest-altitude of its kind in the world. It consists of six proven gas fields, including Sebei-1, Sebei-2 and Tainan. With an annual production capacity of 9 bcm, it ensures gas supply to the Sebei-Xining-Lanzhou Gas Pipeline network.
CNPC operated gas pipelines in China

We have built and now operate a 50,836-km gas pipeline network, including trunk lines such as the West-East, Shaanxi-Beijing, Zhongxian-Wuhan, Sebei-Xining-Lanzhou and Zhongwei-Guiyang, supplying natural gas to 29 provinces, municipalities and autonomous regions, as well as Hong Kong SAR.

These natural gas pipelines are under the control of our Oil & Gas Pipeline Control Center in Beijing for integrated dispatch and monitoring, with an annual delivery capacity of 120 bcm. The center is one of such in the world that manages the operation of most long-distance oil and gas pipelines with the most complete transportation media.

Natural gas consumption mix in China

36% Domestic gas
31% Industrial fuel
18% Chemical industry
16% Power generation
CNPC operated gas pipelines in China

50,836 Kilometers
78% of China’s total
West-East Gas Pipeline

Runs from: Lunnan, Xinjiang
To: Baihe, Shanghai
Total length: 5,800 km (one trunk and three branches)
Pipe diameter: 1,016 mm
Design pressure: 10 MPa
Major gas source: Tarim gas province
Annual delivery capacity: 17 bcm
Became operational in 2004
Coverage: 10 provinces, autonomous regions and municipalities
Second West-East Gas Pipeline

Runs from: Horgos, Xinjiang
To: Guangzhou (South)/Shanghai (East)
Total length: 9,102 km (one trunk and eight branches)
Pipe diameter: 1,219 mm
Design pressure: 10-12 MPa
Major gas source: Central Asian countries & Tarim gas province
Annual delivery capacity: 30 bcm
Became operational in 2011
Coverage: 15 provinces, autonomous regions and municipalities
Third West-East Gas Pipeline

Runs from: Horgos, Xinjiang
To: Fuzhou, Fujian
Total length: 7,378 km (1 trunk and 8 branches)
Pipe diameter: 1,016mm/1,219 mm
Designed delivery pressure: 10-12Mpa
Major gas source: Central Asian countries & Tarim gas province
Annual delivery capacity: 30 bcm
Became operational in 2015 (the western section)
Coverage: 10 provinces and autonomous regions
First Shaanxi-Beijing Gas Pipeline

Runs from: Jingbian, Shaanxi
To: Beijing
Total length: 1,105 km
Pipe diameter: 660 mm
Design pressure: 10 MPa
Major gas source: Changqing gas province
Annual delivery capacity: 8 bcm
Became operational in 1997
Second Shaanxi-Beijing Gas Pipeline

Runs from: Jingbian, Shaanxi
To: Beijing
Total length: 935 km
Pipe diameter: 1,016 mm
Design pressure: 10 MPa
Major gas source: Changqing gas province
Annual delivery capacity: 12 bcm
Became operational in 2005

Third Shaanxi-Beijing Gas Pipeline

Runs from: Yulin, Shaanxi
To: Beijing
Total Length: 896 km
Pipe diameter: 1,016 mm
Design pressure: 10 MPa
Major gas source: Changqing gas province
Annual delivery capacity: 15 bcm
Became operational in 2011
Zhongxian-Wuhan Gas Pipeline

Runs from: Zhongxian, Sichuan
To: Wuhan, Hubei
Total length: 1,375 km (one trunk and three branches)
Pipe diameter: 711 mm
Design pressure: 6.3-7.0 MPa
Major gas source: Sichuan gas province
Annual delivery capacity: 3 bcm
Became operational in 2004
Sebei-Xining-Lanzhou Gas Pipeline

Runs from: Sebei Gas Field, Qinghai
To: Lanzhou, Gansu
Total length: 931 km
Pipe diameter: 660 mm
Major gas source: Qinghai gas province
Annual delivery capacity: 3.4 bcm
Became operational in 2001
Central Asia-China Gas Pipeline

(Line A, Line B and Line C in parallel)
Runs from: Gedaim, Turkmen-Uzbek border
To: Horgos, Xinjiang
Total length: 1,830 km (single line)
Pipe diameter: 1,067 mm (Line A and Line B)/1,279 mm (Line C)
Annual delivery capacity: 55 bcm
Became operational in 2009 (Line A), 2010 (Line B), and 2014 (Line C) respectively
Natural Gas Development Technologies

CNPC has developed a series of unique development technologies for different types of gas reservoirs through years of research and practice.

Low Permeability Gas Reservoirs

Sulige is a low permeability, low pressure and low abundance gas field with a reservoir burial depth of 3,300-3,600 meters and a formation permeability of 0.1-1.0mD. The gas resources are difficult to tap in a cost-efficient way by using conventional or even some advanced technologies due to the tight, thin and dispersive heterogeneous reservoirs. Through technological integration and innovation, well location optimization as well as separate layer fracturing and commingled production, single well output has been increased. Surface gathering and transportation at low and medium pressure has been realized by using downhole choking technology. And highly efficient management of the gas field has been achieved via remote control and digitized means. As a result, Sulige Gas Field has been developed in a cost-efficient manner.

Gas Fields with Abnormally High Pressure and High Yield

Kela-2 is an abnormally high pressure and ultra-high yield gas field at a mountain front high-steep structure that is rare in the world. It has a formation pressure of 74.5 MPa. We have successfully tackled technical difficulties in the geological evaluation of the mountain front high-steep structure, the drilling and completion of abnormally high pressure wells, and high-pressure gathering and processing, building Kela-2 into a large gas field capable of producing more than 10 bcm of natural gas per year.

High Pressure Condensate Gas Fields

Tabei is a high-pressure condensate gas field with an average reservoir burial depth of over 5,000 meters, a formation pressure of over 50 MPa and a wax content of more than 15%. We have successfully solved the difficulties in geology and development for condensate gas reservoirs with high wax content, and developed a package of advanced technologies for an integrated high-pressure gas gathering, processing and injection system, high-pressure cyclic gas injection and well drilling in bad ground conditions. Tabei has been developed by cyclic gas injection at a pressure of 50MPa with a daily injection volume of 3.5 million cubic meters, achieving a recovery efficiency of over 50%.
Major LNG Projects

We have built three LNG projects in Jiangsu, Dalian and Tangshan, which have done a good job in peak shaving since they became operational. In 2014, the three terminals delivered a total of 7.16 bcm of natural gas to the Yangtze Delta, Beijing, Tianjin, Hebei and Northeast China.
Dalian LNG Project

Max. cargo unloading capacity of 350,000 cubic meters
Phase-I: 3 Mt/a, annual gas deliverability of 4.2 bcm
(being operational in Dec. 2011)
Phase-II: 6 Mt/a, annual gas deliverability of 8.4 bcm (to be operational at the end of 2013)
Expected capacity: 10 Mt/a, annual gas deliverability of 13.5 bcm
Storage capacity: 480,000 cubic meters

LNG sources are mainly from Qatar, Australia and Iran. After gasification at the terminal, natural gas supply can be connected to China’s northeastern and northern gas pipeline networks through the pipeline from Dalian to Shenyang, to cover Northeast China and part of North China.
Jiangsu LNG Project

Max. cargo unloading capacity of 267,000 cubic meters
Phase-I: 3.5 Mt/a, annual gas deliverability of 4.8 bcm
(being operational in Nov. 2011)
Phase-II: 6.5 Mt/a, annual gas deliverability of 8.7 bcm
(to be operational at the end of 2013)
Expected capacity: 10 Mt/a, annual gas deliverability
of 13.5 bcm
Storage capacity: 480,000 cubic meters

The project mainly receives, stores, and gasifies overseas
LNG. It is connected to the West-East Gas Pipeline and
the Ji-Ning branch through export pipelines. It delivers
gas supply to Yangtze Delta and surrounding regions.
Tangshan LNG Project

Max. cargo unloading capacity of 270,000 cubic meters
Phase-I: 3.5 Mt/a, annual gas deliverability of 8.7 bcm (being operational in Nov. 2013)
Phase-II: 6.5 Mt/a (under construction)
Expected capacity: 10 Mt/a
Storage capacity: 640,000 cubic meters

LNG sources are mainly from Qatar and Australia. After gasification at the terminal, the natural gas is supplied to Beijing and Northeast China via the Yongqing-Tangshan-Qinhuangdao gas pipeline network.
Unconventional Natural Gas

Unconventional natural gases, such as CBM, tight gas and shale gas, are important supplement to conventional hydrocarbon resources in meeting ever increasing demand for clean energy. We are making progress in tapping and delivering more unconventional gases.

Tight gas

CNPC has identified 12.7 tcm of recoverable tight gas resources, mainly in the Ordos and Sichuan basins. We produced 26.7 bcm of tight gas in 2014, accounting for 30% of the company’s total gas production. Sulige contributed 23.5 bcm, making it the largest gas field in China.

Technologies for developing low pressure, low abundance, low permeability gas reservoirs:

» Gas enrichment area screening & well site optimization
» Fast drilling with low cost
» Vertical well multilayer remolding / horizontal well multi-stage fracturing
» Downhole choke and low pressure gas gathering
» Digital production management
CNPC has identified 2.9 tcm of CBM resources and 390.4 bcm proven OGIP in the Qinshui and Ordos basins. We delivered 1.5 bcm of commercial CBM in 2014, with a daily output of 5 million cubic meters.

CBM development technologies:
- High rank coal favorable area screening
- Flow pressure control for drainage
- Variable displacement active water fracturing
- Optimization & simplification of ground gathering

CNPC has identified approximately 7 tcm of shale gas resources, mainly in the Sichuan Basin. We have built three national shale gas demonstration bases and are accelerating shale gas development through cooperation with both domestic and international partners, risk operation, and independent operation. A total of 41 horizontal wells were drilled in 2014, producing 177 million cubic meters of shale gas.

Shale gas development technologies:
- Comprehensive geological evaluation
- Horizontal well drilling& completion
- Fracturing seismic monitoring
- Development optimization
- Horizontal well hydraulic fracturing
- Ground gathering
Natural gas business outlook

- Seek for national policy support and meet new HSE requirements.
- Strengthen exploration for high quality and scalable reserves.
- Develop applicable technologies to enhance single-well output and economic return.
- More international cooperation with win-win partnership.

CNPC production forecast

- Shale gas
- CBM
- Tight gas
- Conventional gas
Energize · Harmonize · Realize