



# Natural Gas

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A Real Energy Solution for a Low  
Carbon Economy

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Magazine



China National Petroleum Corporation





**70%**

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**Provide more than**

70% of China's total natural gas supply



78%

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Construct and  
operate

78% of China's total gas pipelines



**16%**

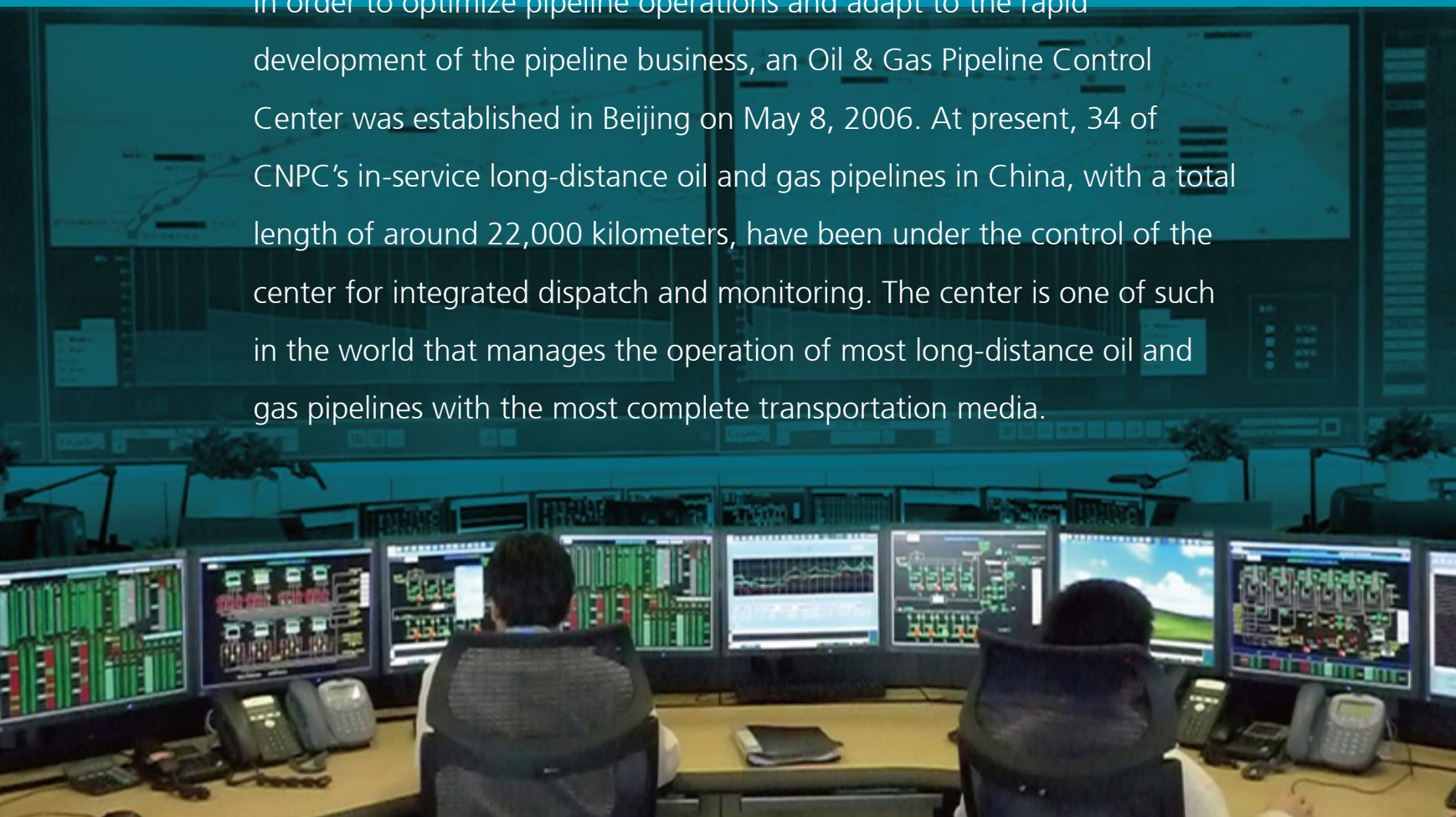
**Natural gas  
output**

grows at an average rate of 16% every  
year since 2000

Since large-scale natural gas exploration and production began in China's Sichuan Basin in the 1950s, CNPC has discovered 175 gas fields in major petroliferous basins, such as the Sichuan, Tarim, Ordos, Qaidam, Songliao and Bohai Bay basins, with cumulative proven recoverable gas reserves of 2.87 trillion cubic meters and remaining recoverable reserves of 2.44 trillion cubic meters. Four natural gas provinces have been built — Sichuan, Tarim, Changqing and Qinghai, among which three natural gas provinces — Sichuan, Tarim and Changqing — have an annual production capacity of more than 10 billion cubic meters respectively. In 2008, CNPC's natural gas production reached 61.7 billion cubic meters, accounting for 80% of the total in China.

In 1963, CNPC built China's first long-distance natural gas pipeline from Baxian in Sichuan to Chongqing. Today, our natural gas pipeline network has nationwide coverage, including trunk lines such as West-East, Shaan-Jing, Zhongxian-Wuhan and Sebei-Xining-Lanzhou. CNPC operated gas pipelines have a total length of 24,000 kilometers, accounting for 78% of the nation's total.

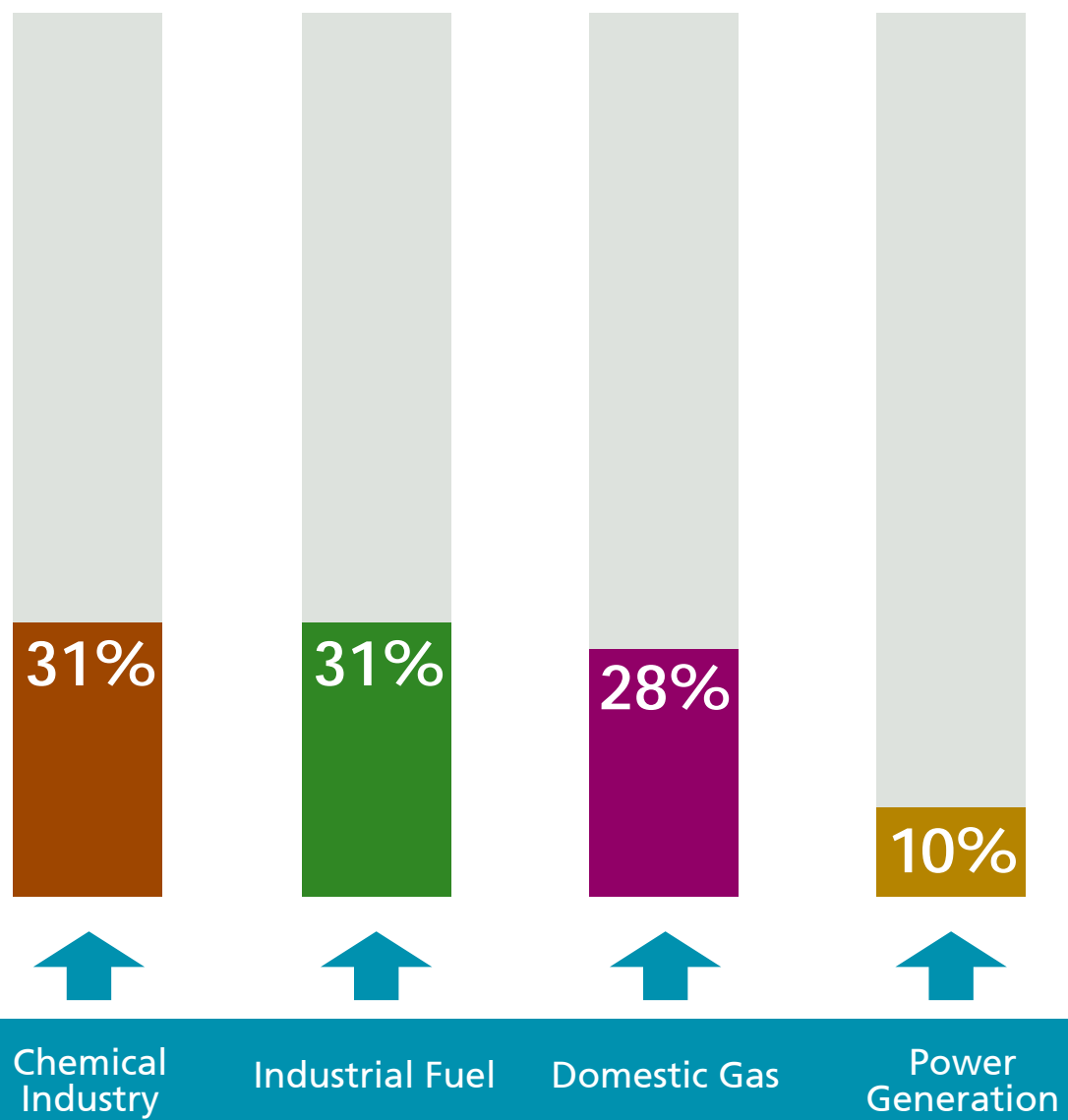
In order to optimize pipeline operations and adapt to the rapid development of the pipeline business, an Oil & Gas Pipeline Control Center was established in Beijing on May 8, 2006. At present, 34 of CNPC's in-service long-distance oil and gas pipelines in China, with a total length of around 22,000 kilometers, have been under the control of the center for integrated dispatch and monitoring. 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.

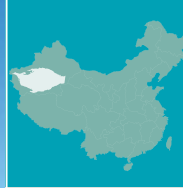
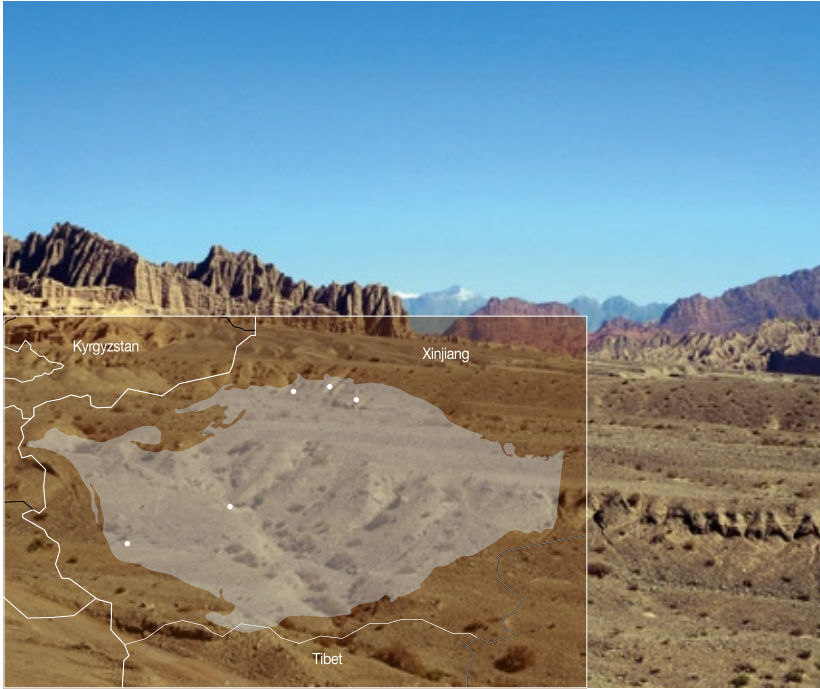


CNPC sells natural gas to 26 provinces, municipalities and autonomous regions in China with its sales volume growing at an annual rate of 20%. The gas is mainly used in the natural gas chemical industry, industrial fuel, domestic gas and power generation.



## Natural gas sales structure in 2008





# Tarim

## Gas Province

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 proved with recoverable reserves of 593.3 billion cubic meters. Kela-2, Dina-2, Yaha and Hetianhe gas fields have been developed to build an annual production capacity of more than 20 billion cubic meters, making Tarim the biggest gas producing province in China as well as a major source for the West-East Gas Pipeline.

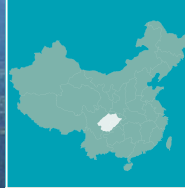


# Changqing

## Gas Province

Located in the Ordos Basin, Changqing gas province has nine proven gas fields, including Sulige, Jingbian, Yulin, Wushenqi and Zizhou. With recoverable reserves of 940.9 billion cubic meters and an annual production capacity of 19.4 billion cubic meters, Changqing gas province ensures gas supply to the Shaan-Jing Gas Pipeline network.





## Sichuan Gas Province

Located in the Sichuan Basin, Sichuan gas province has 112 proven gas fields, including Guang'an, Hechuan, Datianchi, Luojiashai, Moxi, Wolonghe, Weiyuan, Tieshanpo and Dukouhe. With recoverable reserves of 710.2 billion cubic meters and an annual production capacity of about 15 billion cubic meters, Sichuan gas province is the gas source for the Sichuan Gas Pipeline Network and the Zhongxian-Wuhan Gas Pipeline.



# Qinghai

## Gas Province

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 recoverable reserves of 157.9 billion cubic meters and an annual production capacity of 7.7 billion cubic meters, it ensures gas supply to the Sebei-Xining-Lanzhou Gas Pipeline network.



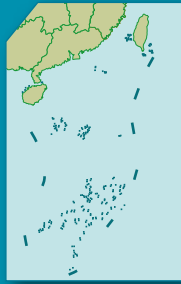


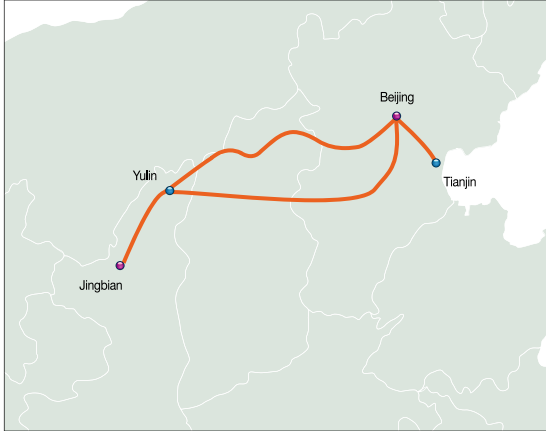


**Second Shaan-Jing Gas Pipeline**  
Initial station: Jingbian, Shaanxi  
Terminal station: Beijing

**First Shaan-Jing Gas Pipeline**  
Initial station: Jingbian, Shaanxi  
Terminal station: Beijing

**Zhongxian-Wuhan Gas Pipeline**  
Initial station: Zhongxian, Sichuan  
Terminal station: Wuhan, Hubei





# Shaan-Jing Gas Pipeline

## First Shaan-Jing Gas Pipeline

Initial station: Jingbian, Shaanxi  
Terminal station: Beijing  
Total length: 1,105 km  
Pipe diameter: 660 mm  
Design pressure: 6.4 MPa  
Gas source: Changqing gas province  
Annual delivery capacity: 3.6 billion m<sup>3</sup>  
Operational from: 1997

## Second Shaan-Jing Gas Pipeline

Initial station: Jingbian, Shaanxi  
Terminal station: Beijing  
Total length: 935 km  
Pipe diameter: 1,016 mm  
Design pressure: 10 MPa  
Annual delivery capacity: 12 billion m<sup>3</sup>  
Gas source: Changqing gas province  
Operational from: 2005

Beijing





# West-East Gas Pipeline

Initial station: Lunnan, Xinjiang

Terminal station: Baihe, Shanghai

Total length: 5,800 km (one trunk and three branches)

Pipe diameter: 1,016 mm

Design pressure: 10 MPa

Coverage: 10 provinces, autonomous regions and municipalities

Gas source: Tarim gas province

Annual delivery capacity: 17 billion m<sup>3</sup>

Operational from: 2004



## Shanghai



# Zhongxian-Wuhan

## Gas Pipeline

Initial station: Zhongxian, Sichuan

Terminal station: Wuhan, Hubei

Total length: 1,375 km (one trunk and three branches)

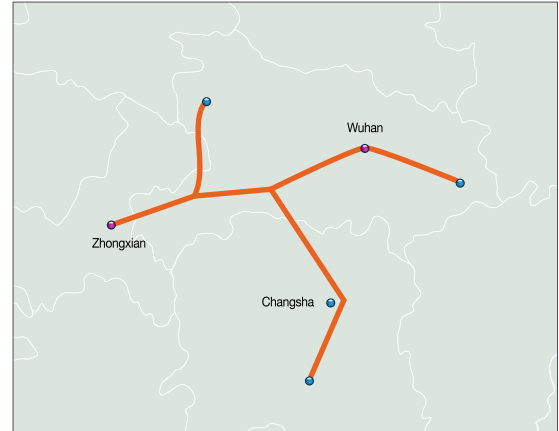
Pipe diameter: 711 mm

Design pressure: 6.3-7.0 MPa

Gas source: Sichuan gas province

Annual delivery capacity: 3 billion m<sup>3</sup>

Operational from: 2005



## Wuhan





# Second West-East Gas Pipeline

Initial station: Horgos, Xinjiang

Terminal station: Guangzhou / Shanghai

Total length: 8,704 km (one trunk and eight branches)

Pipe diameter: 1,219 mm

Design pressure: 10-12 MPa

Coverage: 14 provinces, autonomous regions and municipalities

Gas source: Natural gas imported from Central Asia

Annual delivery capacity: 30 billion m<sup>3</sup>

Planned to be operational in 2011



## Hong Kong





# Partnership

## — Meeting Challenges Together

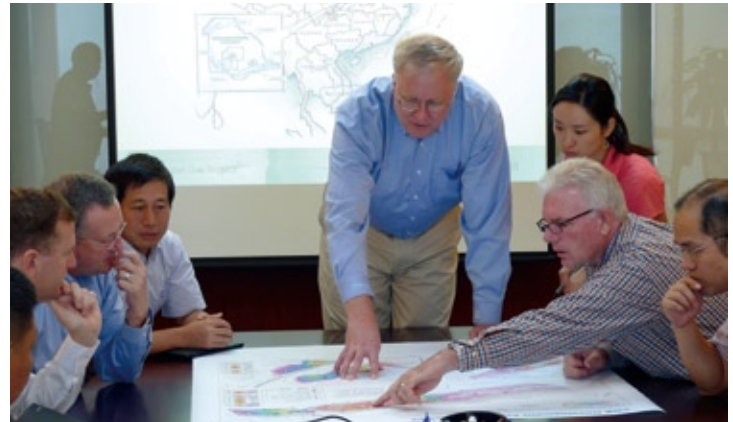
While independently developing technologies for the exploration and development of natural gas, CNPC is also actively strengthening cooperation with international oil companies to address technical challenges posed by difficult-to-tap natural gas resources. CNPC has signed cooperation projects with Shell, Chevron and Total respectively to jointly explore and develop natural gas resources in Changbei, Chuandongbei and South Sulige in a cost-efficient manner.



Changbei is a low permeability tight gas field located in the Ordos Basin. During the development of the field, we have made full use of our own advantages in engineering design, construction and services, as well as the advanced technologies and management experience of Shell. Based on the concept of “critical drilling”, dual extended-reach horizontal well technology was used to develop this tight gas field. The annual production capacity of Changbei has reached 3 billion cubic meters and vital experience has been gained in HSE management.



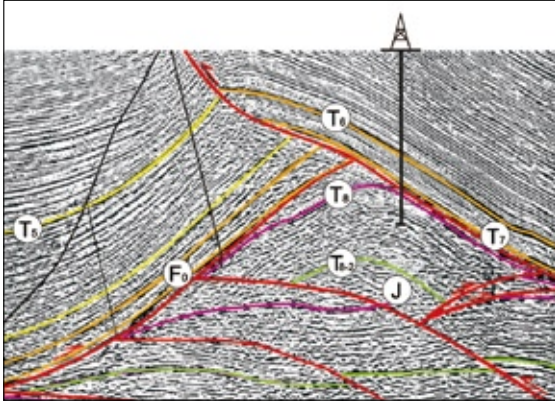
South Sulige is a low permeability tight block located in the Ordos Basin. With the combination of CNPC’s advantages in engineering design, construction and services, and Total’s technological expertise and working practices applied to the specific working conditions of the Ordos geological basin, the two parties will search for an economical and effective way to tap the tight gas reservoirs in the block.



Chuangdongbei is a high-sulfur gas field located in densely populated area in the Sichuan Basin, with a maximum sulfur content of 15%. It is by far the largest onshore Sino-foreign cooperation project in China, and is expected to produce 7 billion cubic meters of natural gas a year. Chevron’s technologies for high-sulfur gas field development and an advanced HSE management system will play a positive role in the safe and effective development of this gas field.

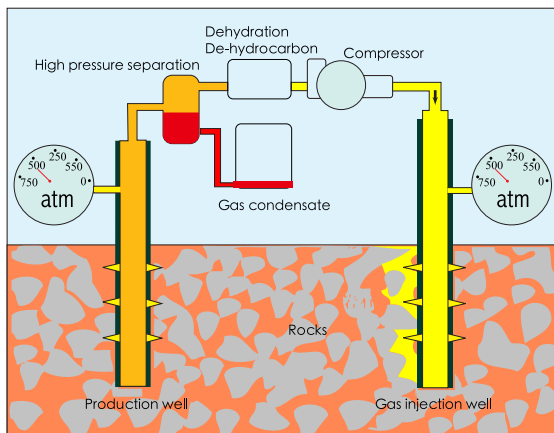


CNPC has developed a series of unique development technologies for different types of gas reservoirs as a result of years of research and practice.



### Development of Kela-2 Gas Field in Tarim Basin

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 proven gas reserves of 284 billion cubic meters and 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 10.7 billion cubic meters of natural gas a year.

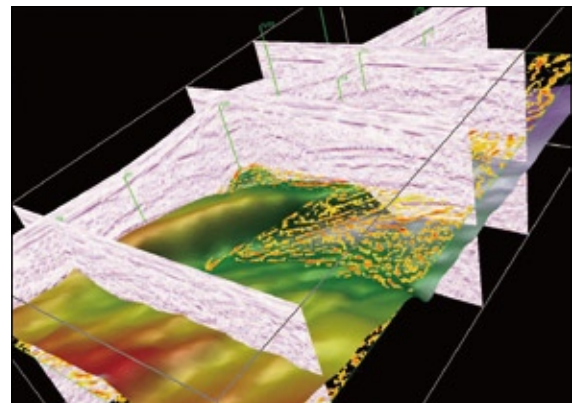


### Development of Tabai Gas Field in Tarim Basin

Tabai 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. Tabai 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%.

### Development of Sulige Gas Field in Ordos Basin

Sulige is a low permeability, low pressure and low abundance gas field with a reservoir burial depth of 3,300 to 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.



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