



# **Two viewpoints on natural gas resource and the development strategy**

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## **I) Two viewpoints on the natural gas resource**

# 1. Natural gas development still be young and will keep growing at high speed

- Natural gas reserves increment doubled every five years since the sixth “Five-year Plan”

	<b>2003/1990</b>	<b>Average annual increment (Billion m<sup>3</sup>)</b>	<b>Average annual growth rate (%)</b>
<b>Natural gas reserves</b>	<b>3.64</b>	<b>280.9</b>	<b>10.5</b>
<b>Non-associated gas reserves</b>	<b>5.72</b>	<b>245.2</b>	<b>14.4</b>
<b>Natural gas output</b>	<b>2.39</b>	<b>1.562</b>	<b>6.9</b>



# Projection

- **The high growth rate will be kept to 2020**
- **Non-associated gas reserves**
  - ~2010 Average annual increment 200B m<sup>3</sup>
  - ~2020 Average annual increment 150B m<sup>3</sup>
- **Output**
  - 2010 70B m<sup>3</sup>
  - 2020 100~120B m<sup>3</sup>
  - 2003~2020 Average annual growth rate 8.6%~10.2%
- **Need more 4.5~6.2 pipeline from Luntai to Shanghai, constructing new pipeline every 3.3~2.4 years**

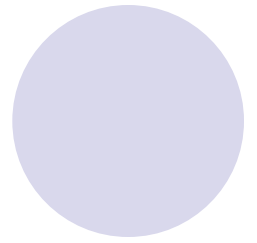
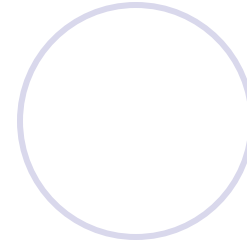
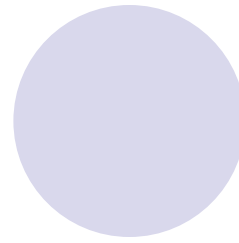
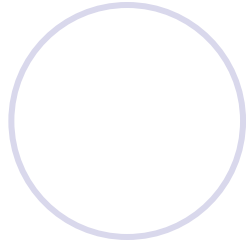
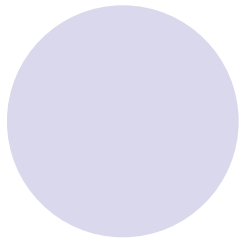
## 2. The abundance of natural gas is lower than oil, large amount NG import will be needed in the future

- Compared with Oil

<b>Resource</b>	<b>Oil</b>	<b>110~160 (132.5)</b>	<b><math>114.4 \times 10^8 \text{ t}</math></b>
	<b>Natural gas</b>	<b>90~130 (9.66)</b>	<b><math>93.1 \times 10^8 \text{ t}</math></b>
<b>Remaining minable reserves</b>	<b>Oil</b>	<b><math>23.87 \times 10^8 \text{ t}</math></b>	<b>100%</b>
	<b>Natural gas</b>	<b><math>22.29 \times 10^{11} \text{ m}^3</math></b>	<b>93.40%</b>
	<b>Non-associated gas</b>	<b><math>20.86 \times 10^{11} \text{ m}^3</math></b>	<b>87.40%</b>

**Output (Gas/Oil)**

<b>2003</b>	<b>20.9%</b>
<b>2020</b>	<b>57.1~68.6%</b>



- **Compared with the world (Abundance  $10^4 \text{ m}^3 / \text{km}^2$ )**

	<b>Resources</b>	<b>Reserves</b>	<b>Output</b>
<b>World</b>	<b>2191.9</b>	<b>117.6</b>	<b>1.75</b>
<b>China</b>	<b>1006.3</b>	<b>23.2</b>	<b>0.36</b>

- **All the parameters of oil and gas are less than half of world average by “abundance”, especially the gas.**

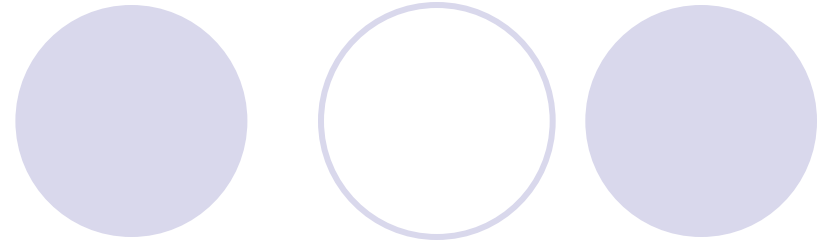
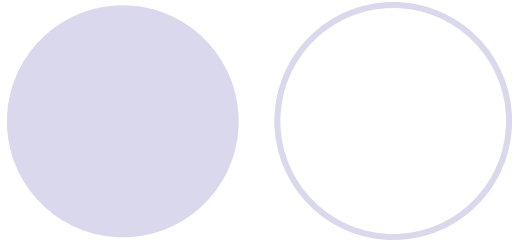
# Natural gas production can't meet demand in the future

## ○ Low demand in 2020

Demand (Billion m <sup>3</sup> )	160~200
Import (Billion m <sup>3</sup> )	60~80
Import in pipeline (Billion m <sup>3</sup> )	30~40
LNG Import (Billion m <sup>3</sup> )	30~40; 22~30 Million tons (10 ports)

## ○ High demand with high LNG import in 2020

Demand (Billion m <sup>3</sup> )	200~240
LNG Import (Billion m <sup>3</sup> )	67.5; Or 50 Million tons 3 million tons (16.6 ports)



## **II) The limited factors for NG development**

# 1. Quality of the natural gas field in China (Minable reserves)

## ○ 1) Small scale

Minable reserves (Billion m <sup>3</sup> )	Number of the gas field	Share
>100	3	30.80%
>30	12	26.70%
>10	6	5.00%
<10	335	37.50%

- Most of the long distance pipeline in the foreign countries built for the gas fields whose reserves more than 10 Billion m<sup>3</sup> natural gas.

## 2) Low abundance

- >10Billion m<sup>3</sup> (totally 21)

(10 <sup>8</sup> m <sup>3</sup> /km <sup>2</sup> )	Number of the gas field	
≥10	4	16.20%
5-10	3	4.50%
1-5	9	13.20%
<1	5	28.60%

## 3) Hypotonic and fractured gas field (extremely anisotropy)

Similar :

Eerduosi + Sichuan	13075 × 10 <sup>8</sup> m <sup>3</sup>	53.10%
Oversee	2830 × 10 <sup>8</sup> m <sup>3</sup>	11.50%

## **2. Natural gas resource is far away from the developed regions**

### **○ 1) Solute gas is the main gas in the east**

#### **● Solute gas/total gas:**

- Output: 26.3%**
- Storage: 41.1%**

#### **● Solute gas output in the east shares 58.5% of the national total**

### **○ 2) Non-associated gas mainly distributed in the central and the northwest**

#### **● Movable reserves:**

- central Region: 53.1%**
- southwest region: 27.0%**

#### **● Long pipeline transportation distance (High transportation cost)**



### **3. Weak infrastructure**

- **1) long distance pipeline and pipe network**
- **2) pipe network and associated equipments for civil used gas, huge peak-valley difference**
- **3) Investment and construction period for industry used gas**
  - **downstream:  $100 \times 10^8 \text{m}^3$  ¥ 60~80 Billion(\$10Billion)**

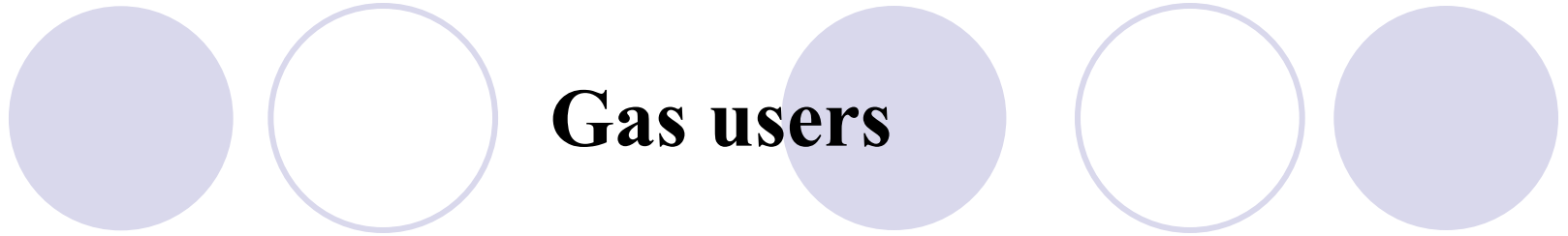


## 4. **Key factor: high gas price**

- **1) high wellhead price: 0.3~0.6 yuan/m<sup>3</sup>**
- **2) high transportation price**
  - **No profit if lower than 75% of the design transport capacity**

# Gas price comparison

- **In 11 of 23 countries, gas price is suitable (100~140 dollar/10<sup>3</sup>m<sup>3</sup>)**
  - **Civil: 1.994 yuan/m<sup>3</sup>    Industry: 1.013 yuan/m<sup>3</sup>~**
  - **Price ratio: 196.8%**
- **America (1997):**
  - **Civil: 2.03 yuan/m<sup>3</sup>    Electricity generation: 0.82 yuan/m<sup>3</sup>**
  - **Price ratio: 247.6%**
- **Shanghai:**
  - **Civil: 1.46 yuan/m<sup>3</sup>    Electricity generation 1.20 yuan/m<sup>3</sup>,**
  - **Price ratio: 121.7%**
- **The price of civil used gas in China is relatively lower**



## **Gas users**

- In foreign country, most gases are for electricity generation, especially in the early period.**
- In China, most gases are for civil use High standard for civil used gas pipe network , low growth rate**
- Huge peak-valley difference of civil used gas, to meet the peak, we need reduce storage cost.**
- The lessons learned from gas using in Beijing.**

## **5. High requirement for integrated development**

- Resource as base, pipeline as bridge;**
- Market-based system, price is the key;**
- Domestic as main, import is supplement;**
- Policy guidance and planning are needed.**



### **III Four strategic topics in natural gas development**

# 1. Estimation and development for the low quality resources

- **Relativity of “low”, and dynamic ——initiative exploration**
- **Extremely anisotropy——can not adopt the general approach for the conventional natural gas**
- **Development difficulty: low individual-well output, and rapidly decrease of the output**
- **The output can not be simply determined as total reserves multiplying the mining speed**

## **2. Integrated planning for pipe networks**

- Divided scheme of pipe network construction: upstream and downstream**
- Domestic production and import division among different companies**
- Without considering gas field groups and supply break in pipeline construction**
- Pipeline company must be open.**

### **3. Properly westward moving of the middle and terminal users**

#### **○ Lessons learned**

- Moving Guangzhou fertilizer plant to Talimu; the LNG management of Guanghai Co.**
- developing LNG、GTC、CNC and other medium and small sized electricity generation in central and west**
- properly westward moving of the natural gas chemical industry and fertilizers**



## 4. **Attaching importance to LNG**

- **The cost of the LNG system tend to decrease rapidly**
- **Oversupply trend in the international market, buyer's market and actual market formed**
- **Estimating the difficulty about the pipeline gas in neighbor objectively (Russia middle-Asia)**
- **The experience in east Asia, increasing the LNG import possibility**

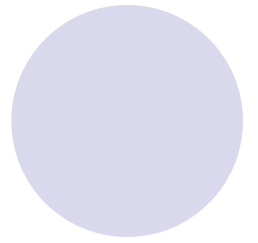
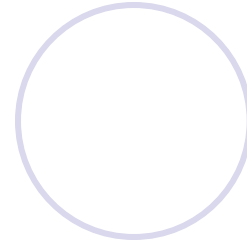
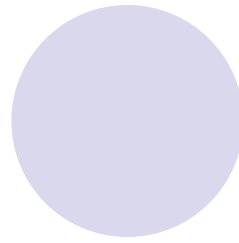
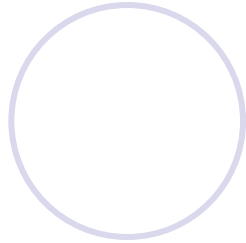
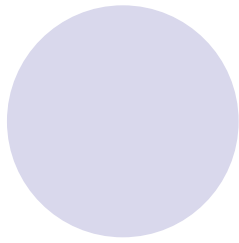


- **A high scenario:**

	<b>Import volume</b>	
<b>2010</b>	<b>19~20 million ton</b> <b>25.6~27 Billion m<sup>3</sup></b>	
<b>2020</b>	<b>50 million ton</b> <b>67.5 Billion m<sup>3</sup></b>	<b>Total consumption</b> <b>200~240 Billion m<sup>3</sup></b>

**Less than Japan (79.77 Billion m<sup>3</sup>), about 40% of the world  
LNG trade volume in 2003**

**Sources: Asia, Australia, Middle East, Sakhalin**



The End

Thanks