KUALA LUMPUR 2012 WORLD GAS CONFERENCE

IGU

25th world gas conference

"Gas: Sustaining Future Global Growth"

Demands and Challenges of UGS Construction in China for the Next Two Decades

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Back ground

China's natural gas consumption is irreversibly in rapid growth, but as an emerging natural gas market, China's natural gas consumption will rely on gas development in west area and international natural gas resources such as Central Asia, Russia and overseas LNG market for a very long time. So ,to establish peak shaving capability and emergency reserve to match this situation is urgently.

CONTENT

Current status of UGS in China

Storage in operation

1999, Start construction
2006, Completed in operation

2007, Preparation
2010, finished construction

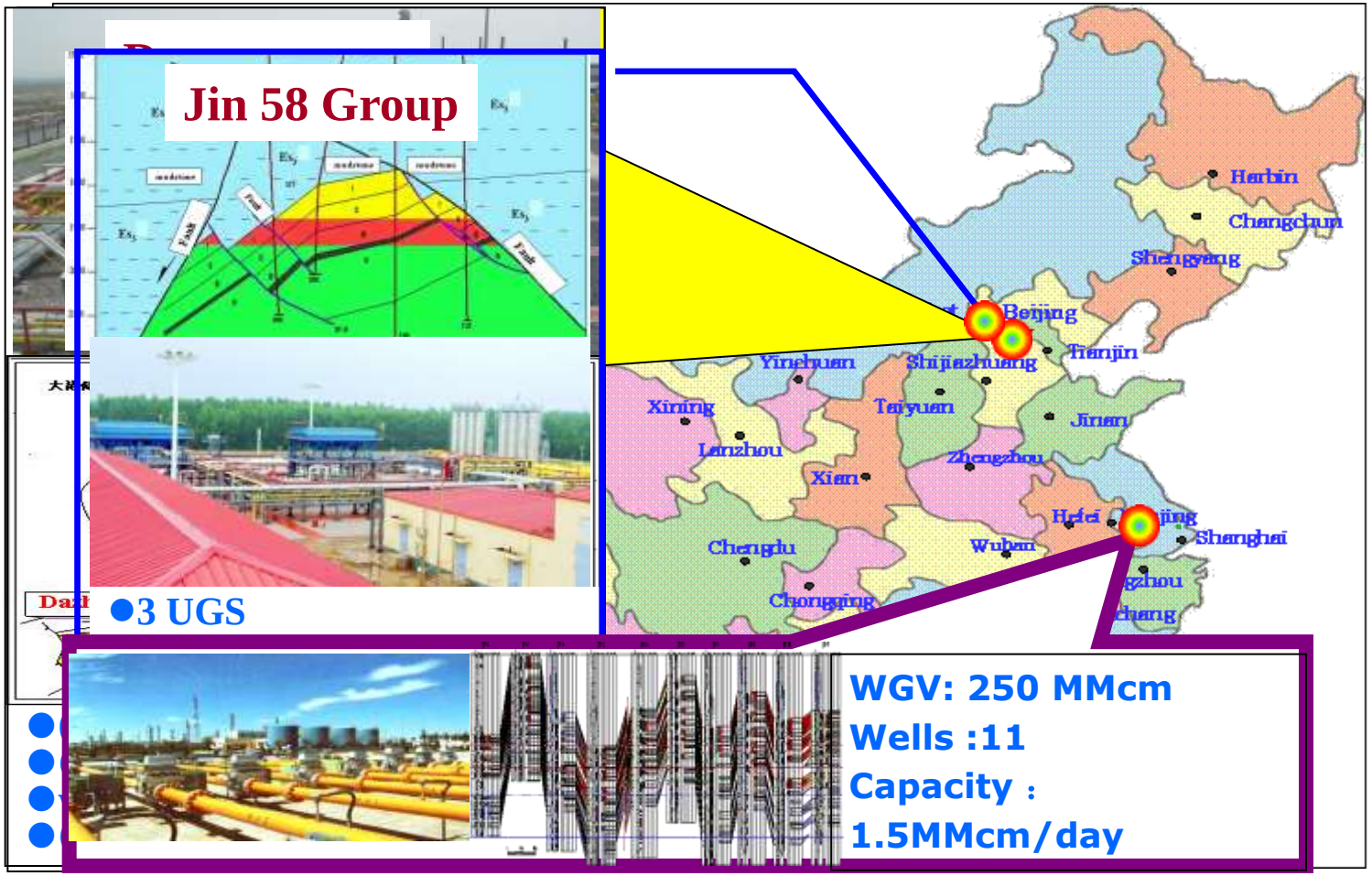
2009, Start construction
2011, Put into operation

Storage in operation in China

STORAGES		TYPE	WGV (Bcm)
Da Gang Group	6	Oil/Gas field	4
Jin58 Group	3		
Liu Zhuang	1		

Current status of UGS in China

Storage in operation

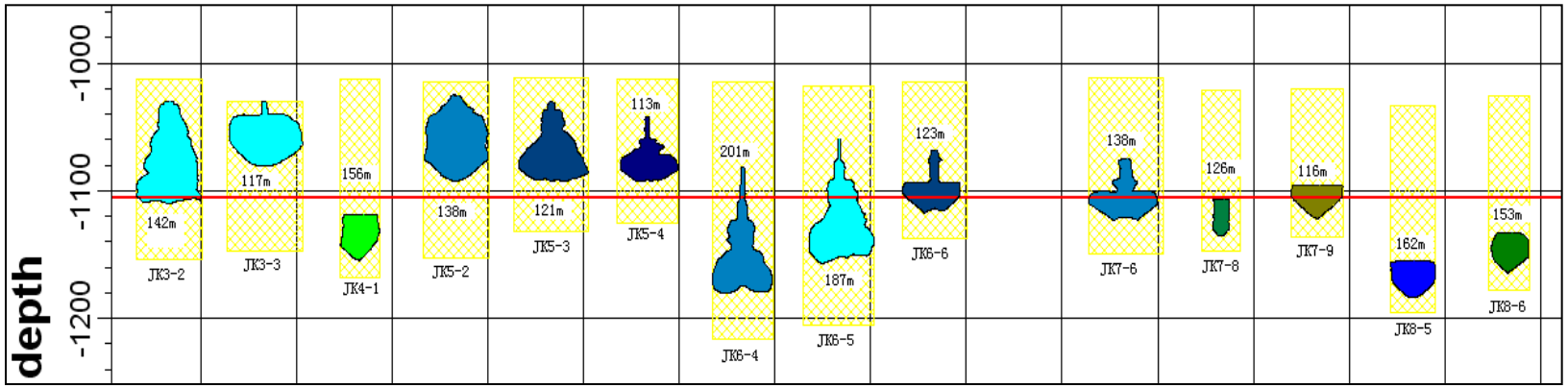


Current status of UGS in China

Storage in expanding

Jintan

- The first salt cavern gas storage in China
- Designed working gas volume is 2 Bcm
- Started to construct in 2005
- Completed time is 2020



Section of Jintan salt cavern storage

Current status of UGS in China

Storage in expanding

Current status of UGS in China

Storages under construction

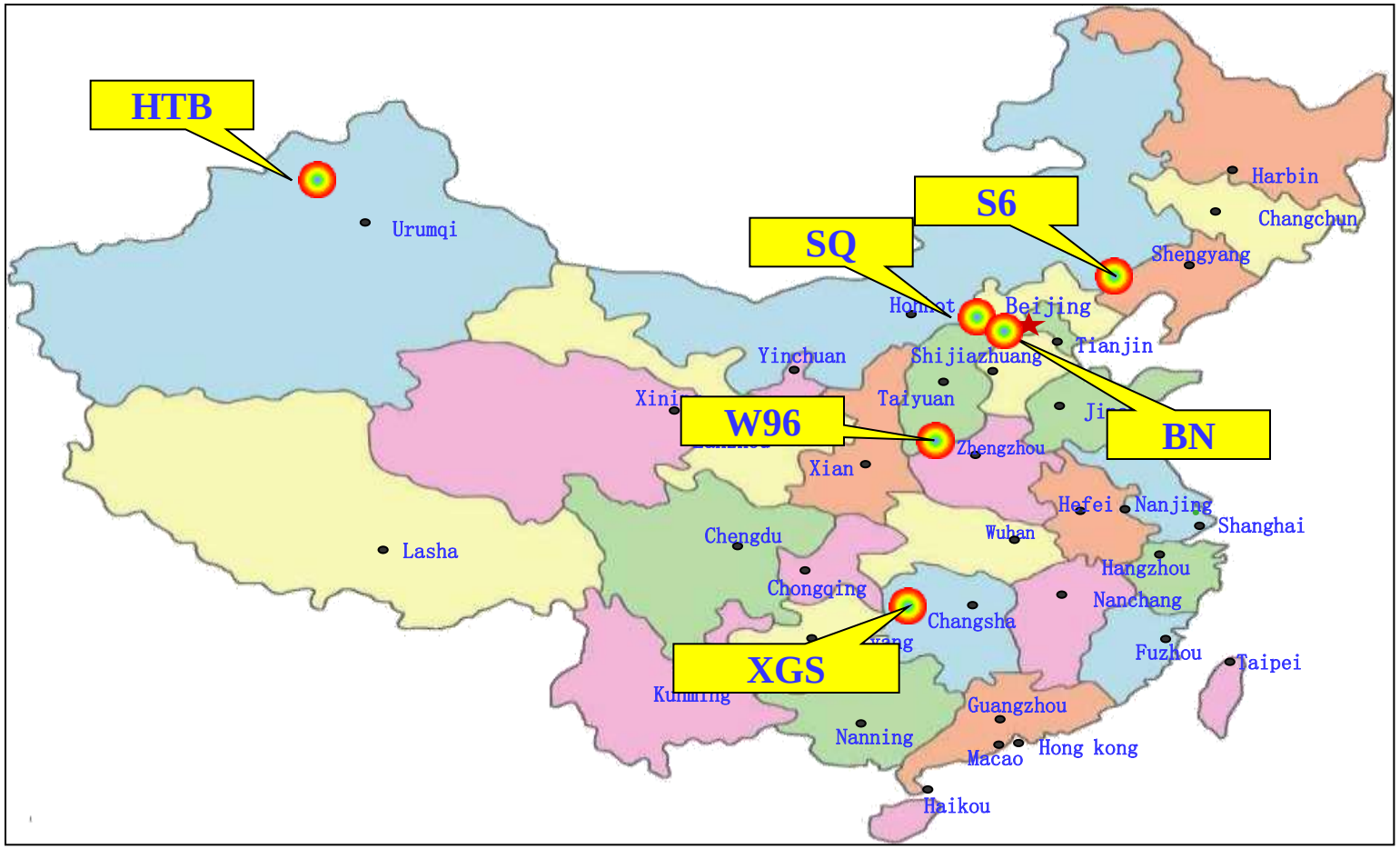
China is actively promoting the construction of gas storages, and 10 gas storages are under construction. The total working gas volume under construction is more than 10 Bcm

Under construction gas storage in China

STORAGES		TYPE	WGV (109m3)
Sh 6	1	Oil/Gas field	>10
BN	1		
SQ	5		
XGS	1		
HTB	1		
W 96	1		

Current status of UGS in China

Storages under construction

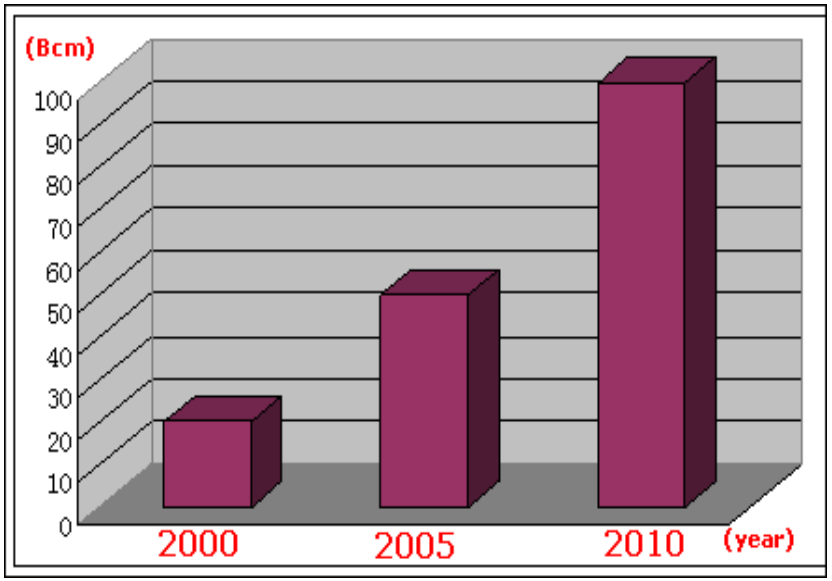


CONTENT

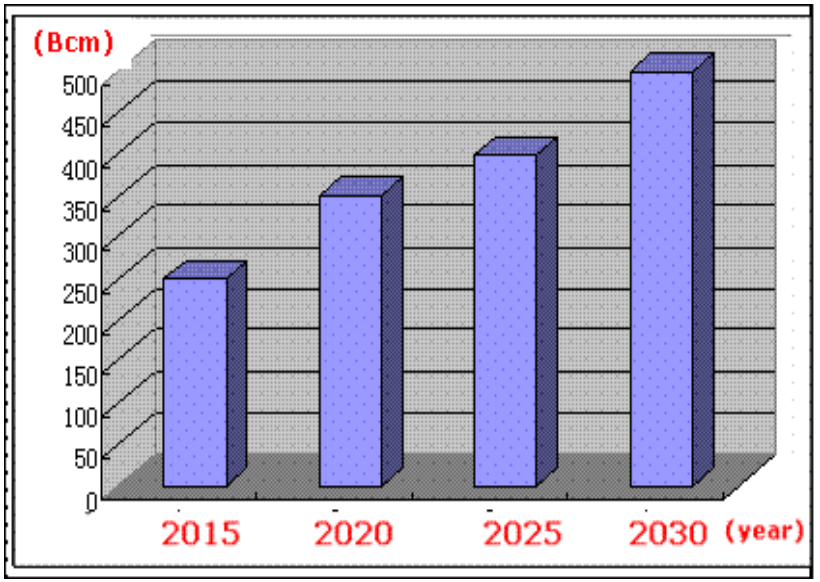
Demands for UGS Construction

Driving force

1. Rapidly growth of gas consumption



Gas consumption last 10 years

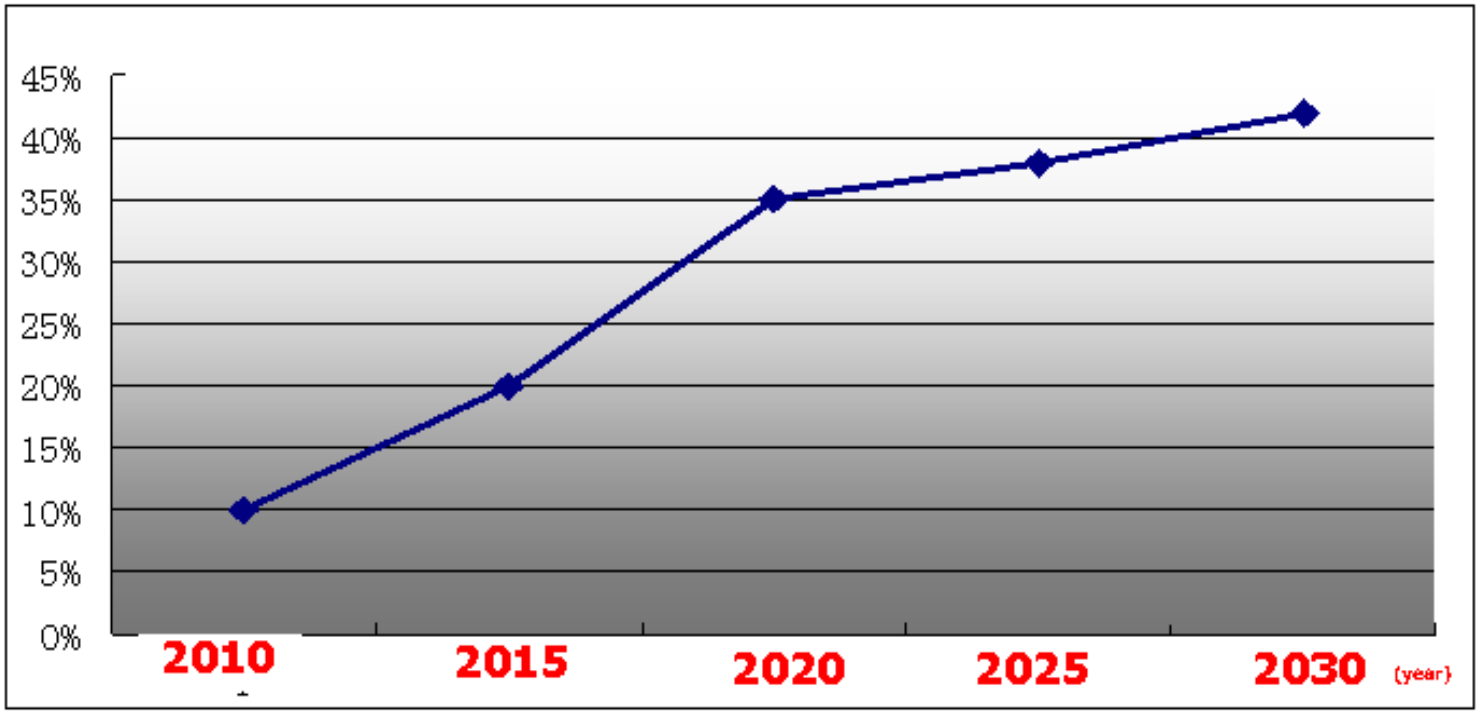


Gas consumption prediction for next 20 years

Demands for UGS Construction

Driving force

2. High Import dependency of Gas consumption



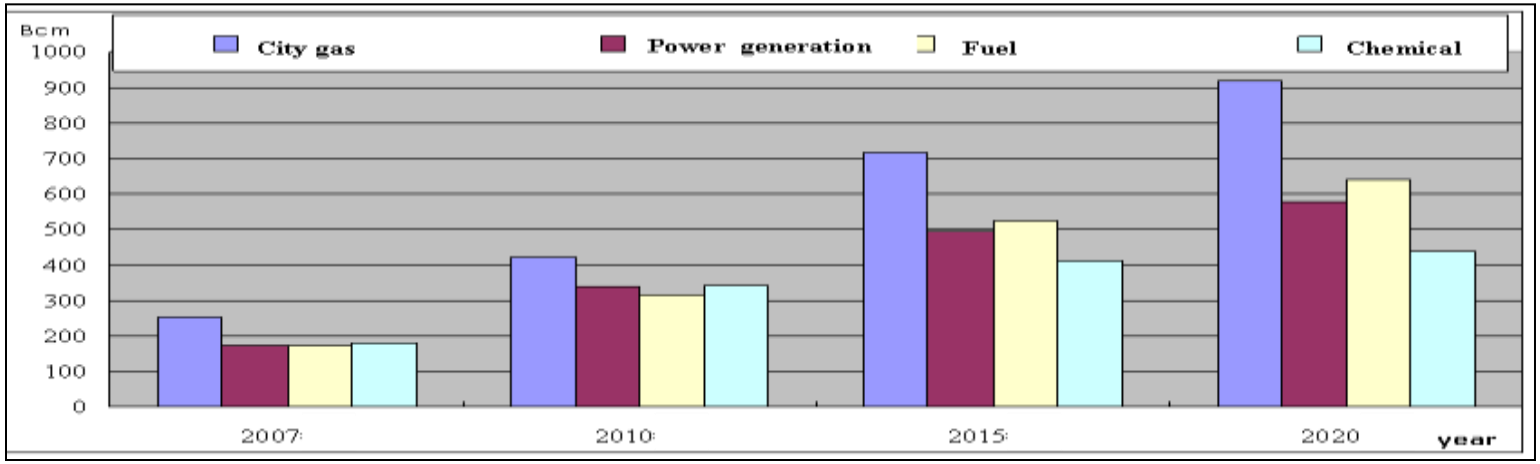
Gas import dependency of China in next 20 years

Demands for UGS Construction

Driving force

3. More and more important consumer of city gas

- Before 2000 ,Chemicals and industrial fuels accounts for 82% of total gas consumption
- 2000-2010, City gas consumption equals to other consumption
- Next 10 years, City gas will be the biggest consumer



Gas consume structure of China in next 20 years

Demands for UGS Construction

Driving force

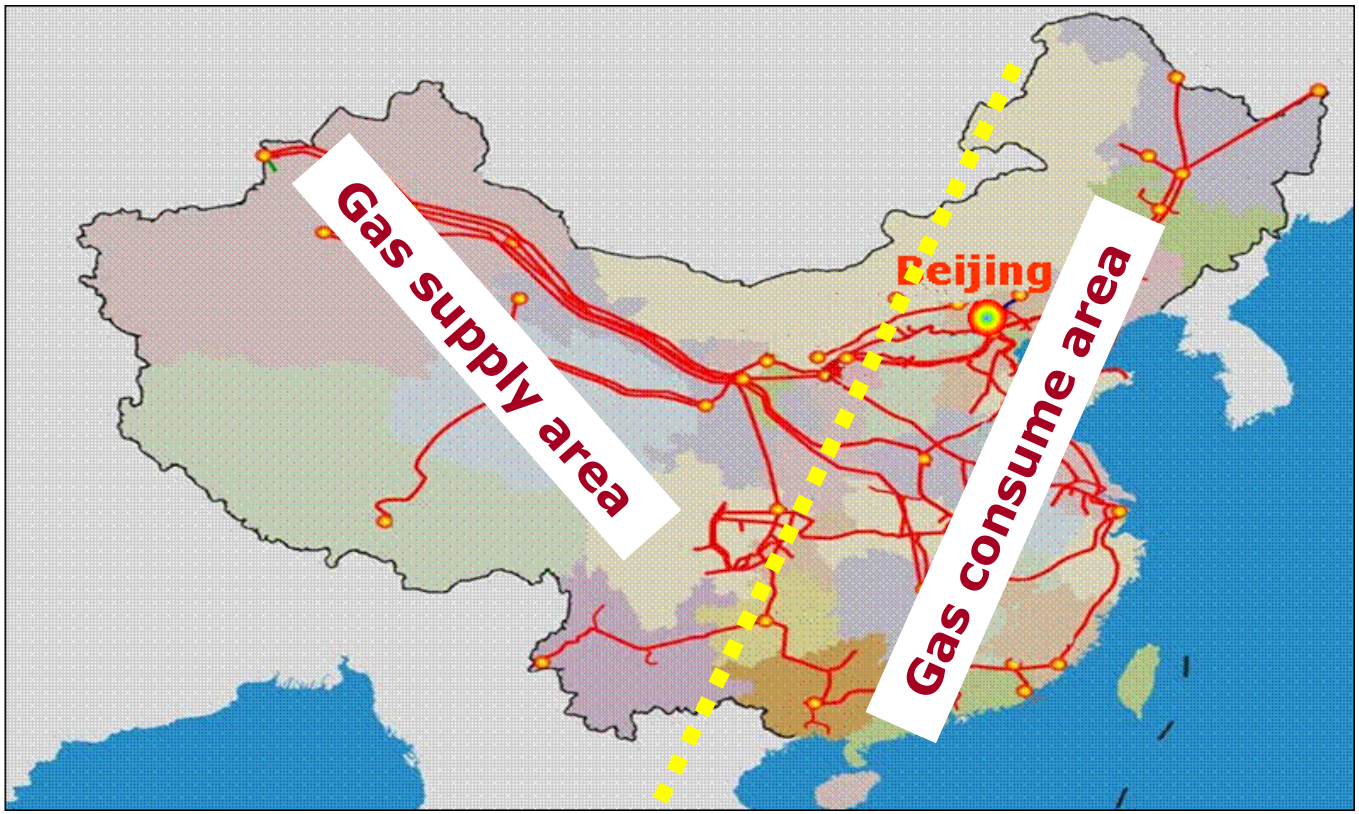
4. Increasing Unconventional gas production

- **Coal-bed gas production: 50 BCM**
- **Shale gas production: 80 BCM**
- **Coal gas production: 10 BCM**

Demands for UGS Construction

Driving force

5. Far location of gas market from Gas supply



Demands for UGS Construction

UGS Demand Prediction

1. Peak shaving demand

- The working gas volume account for about 15% of gas consumption
- Total gas consumption would reach 350 Bcm in 2020 and 500Bcm in 2030
- Working gas of peak shaving will reach 52 Bcm in 2030.

UGS demand for peak shaving in next 20 years

Year	2015	2020	2025	2030
Gas Consumption (Bcm)	250	350	400	500
Working Gas (Bcm)	37	52	60	75

Demands for UGS Construction

UGS Demand Prediction

2. Emergency reserve demand

- Emergency reserve account for 10% imports
- Emergency reserve would reach 11 Bcm in 2020 and 35 Bcm in 2030

UGS demand for Strategic reserves in next 20 years

Year	2020	2030
Import Gas volume (Bcm)	140	210
Emergency reserve (Bcm)	14	21

Demands for UGS Construction

UGS Demand Prediction

3. Total demand

Total UGS demand of China in next 20 years

Year	2020	2030
Peak shaving (Bcm)	52	75
Emergency reserve (Bcm)	14	21
Total (Bcm)	66	96

CONTENT

Challenges and solutions

Challenges

1. Huge workload

- 100 Bcm working gas volume
- 2Bcm per storage
- 50 targets must be found
- 300 targets could be evaluated

Challenges and solutions

Challenges

2. Complex geological condition

- **Depleted field**

- Deep to 5000m
- Low permeability
- Low porosity
- low pressure coefficients
- Many exist wells
- H_2S

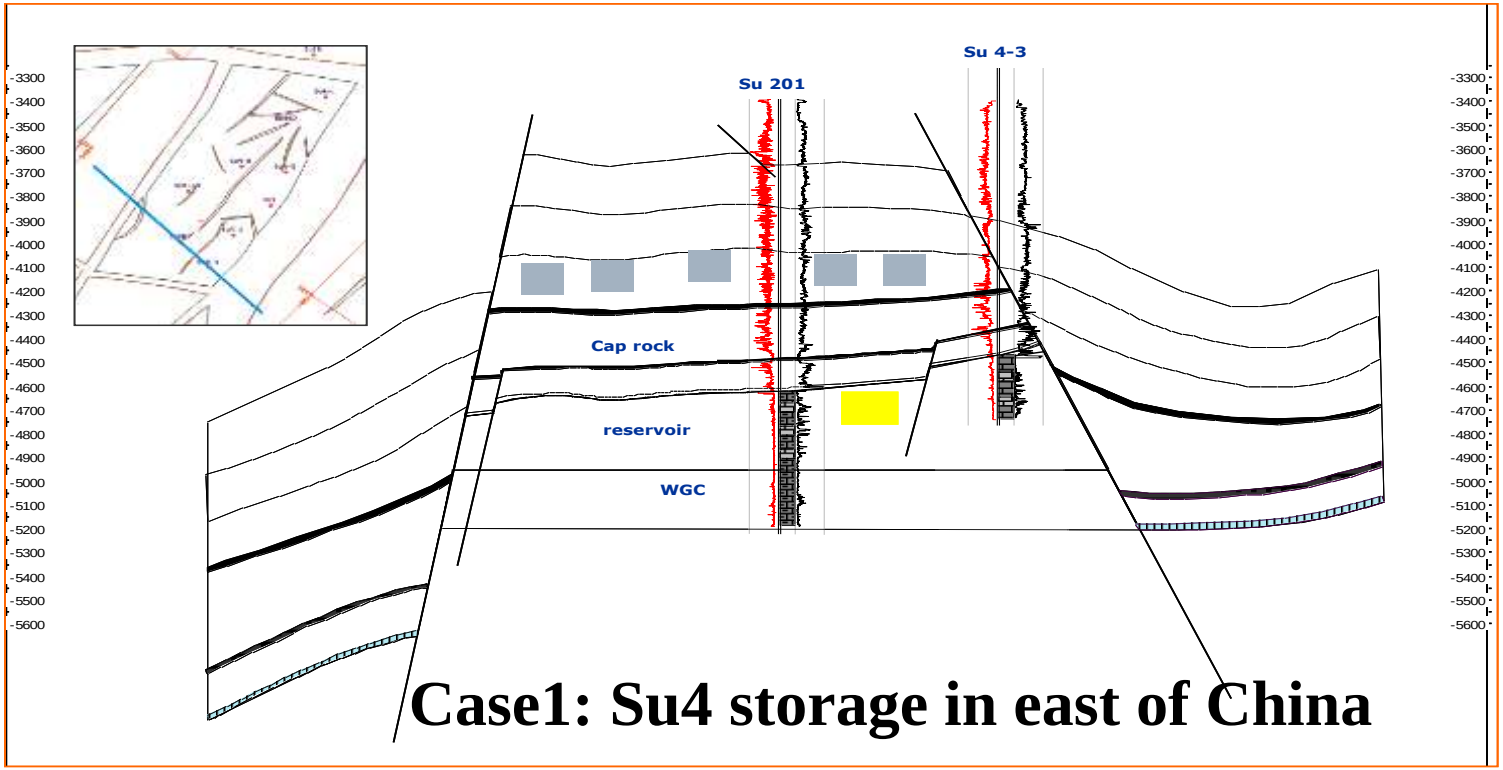
Typical storage parameters

Storage	Depth (m)	K (mD)	Present pressure（Mpa）	pressure coefficients
S4	4400	/	29.5	0.68
S1	3800	1	9.8	0.26
S20	3300	4	5.8	0.18
HTb	3585	65	16.5	0.53

Challenges and solutions

Challenges

2. Complex geological condition



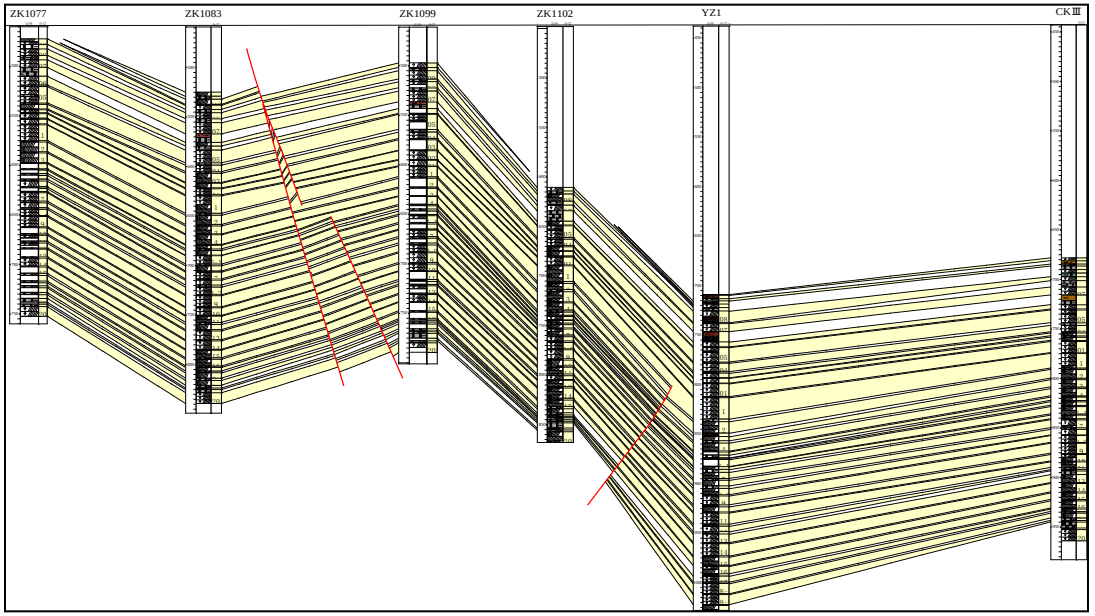
Case1: Su4 storage in east of China

Challenges and solutions

Challenges

2. Complex geological condition

- **Salt cavern**
  - Thin layer bedded salt
  - High insoluble contents



Case2: Yunyin storage in south of China

Challenges and solutions

Challenges

2. Complex geological condition

- **Aquifer**
  - Bad quality of cap rock
  - Flat trap reservoir
  - Small fault block

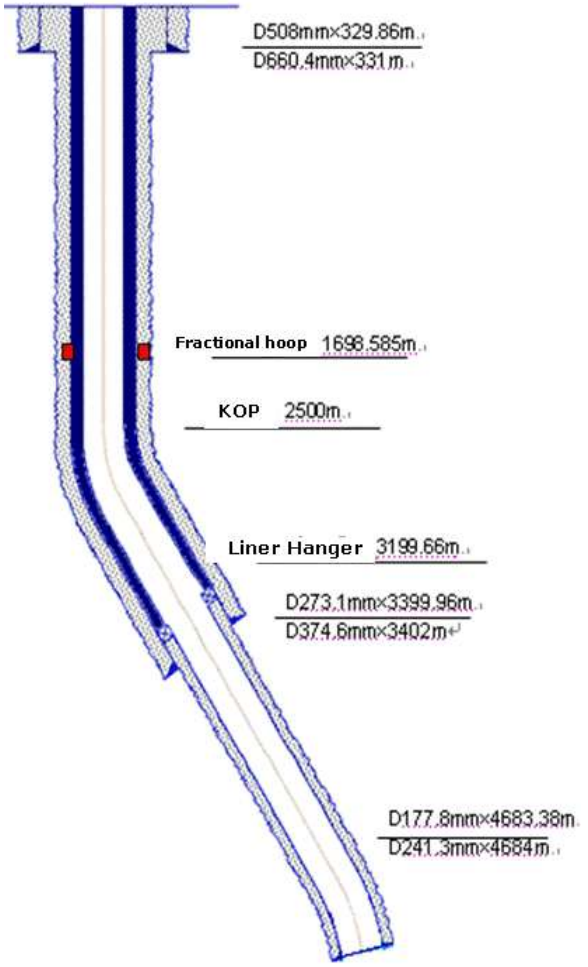
Case3: Sedimentary Basins in Jiangxi

Challenges and solutions

Challenges

3. Technology Application

- Safety drilling
- Well completion
- Deep well cementation
- Very high injection pressure
- Salt cavern leaching control
- Anti corrosion



Example: well casing program of SU4

Challenges and solutions

Challenges

4. Management optimization

- Integrity management
- Speed up expanding
- Storage group optimization
- Monitoring

Challenges and solutions

Challenges

5. Investment

- 100 Bcm WGV
- 500 billion RMB (80 billion US dollar)
- Have not established shaving gas price mechanism

Potential area of storage construction in China

Challenges and solutions

Solutions

- Construct UGS closing to main import channel
- Accelerate the construction of scheduled gas storages
- Strengthen exploration to look for new storage in south China
- Set up LNG facility to replace of UGS
- Government invest in storage construction
- Encouragement Policy including peak shaving gas price

Summary

- China has strong UGS demand in the future
- There are many challenges of UGS construction focus on complex geological condition and relating problems
- Both government and local gas companies are making effort to accelerate UGS construction
- UGS will support natural industry sustainable development in China

Thank you for your attention !

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