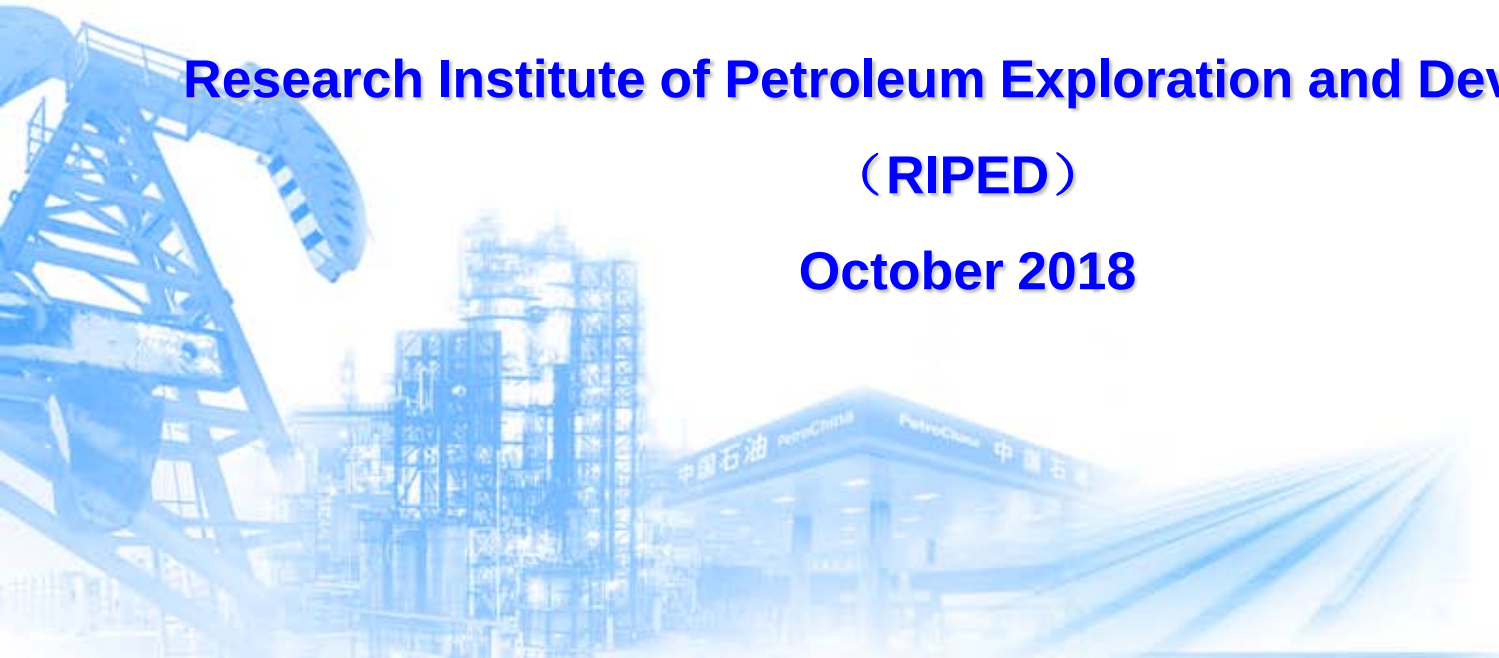




Analysis of CNPC's Overseas Natural Gas Cooperation Examples

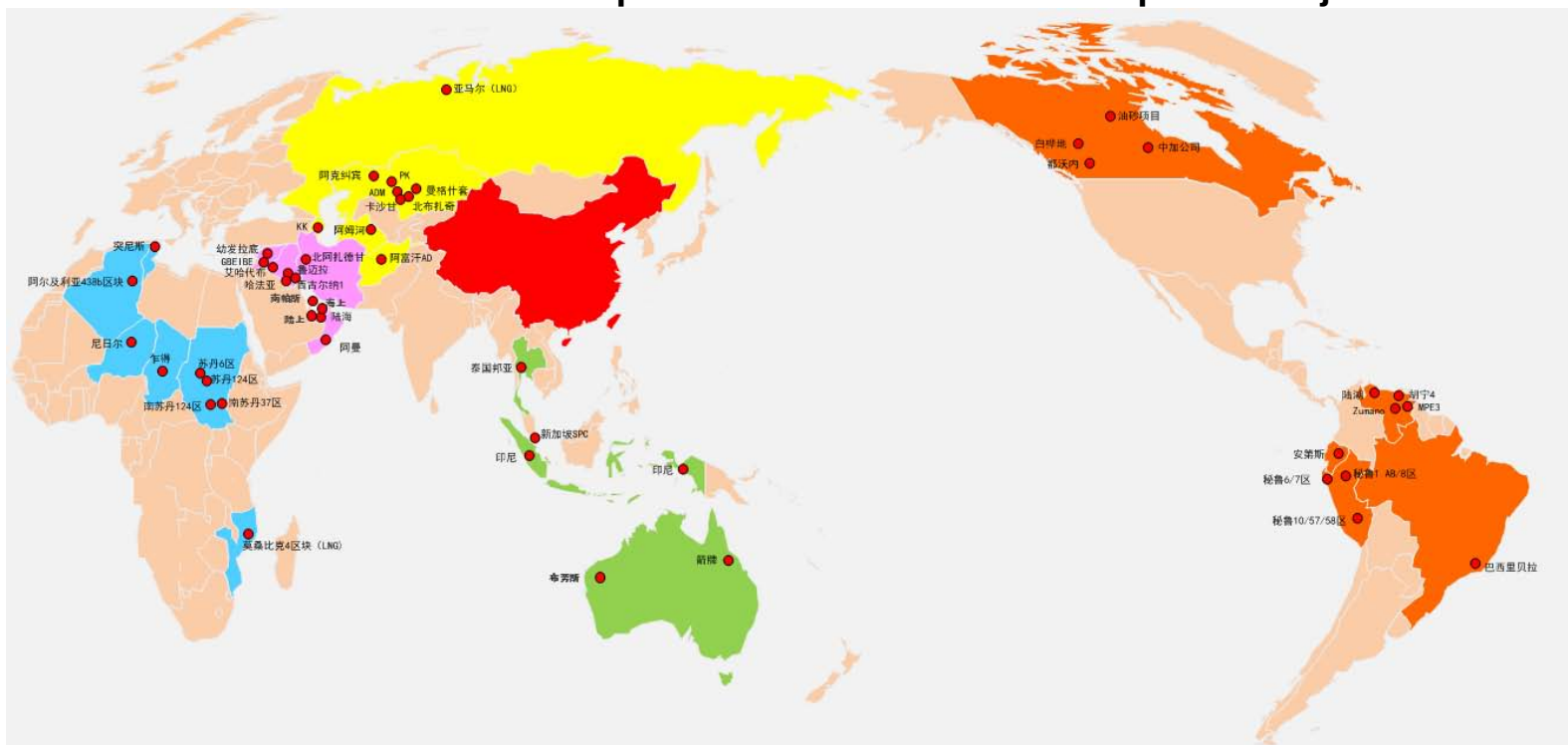
**Research Institute of Petroleum Exploration and Development
(RIPED)**

October 2018





- ## Global Distribution Map of CNPC's Overseas Development Projects





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I. Block Location

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2. Indonesian natural gas project

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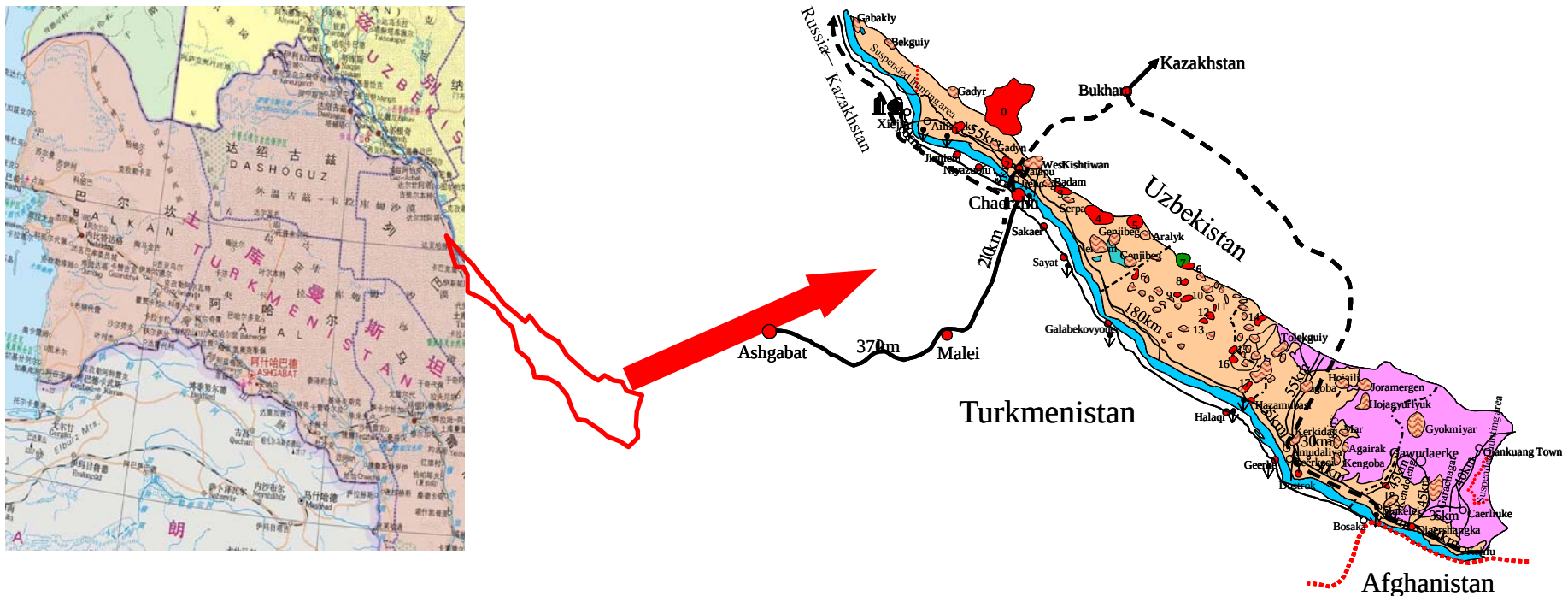


1. Amu Darya Right Bank natural gas project

■ Block Location

Located in the northeast of Turkmenistan, the Amu Darya Right Bank natural gas project borders on the Amu Darya in the southwest and the national boundary of Turkmenistan with Uzbekistan in the northeast.

Location schematic of the Amu Darya Right Bank natural gas project





1. Amu Darya Right Bank natural gas project

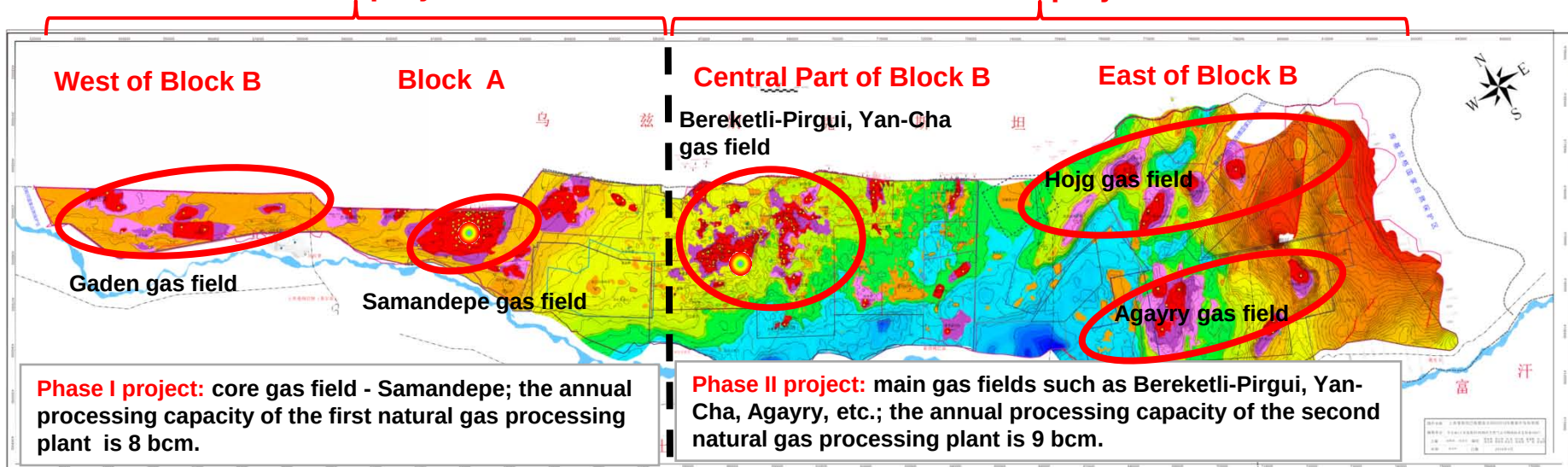
■ Contract Description

- **Contract model:** Product Sharing Contract (PSC) that integrates exploration, development, engineering construction, production operation and product sales, where CNPC has 100% equity.
- **Contract period:** 35 years; to 2041.
- **Contract area:** 8900km², including two blocks such as block A and block B.
- **Development deployment:** phase I project: block A and the west of block B, productivity objective 8 bcm/a; phase II project: the central east of block B, productivity objective 9 bcm/a.

Productivity construction and gas production area distribution map

Phase I project

Phase II project

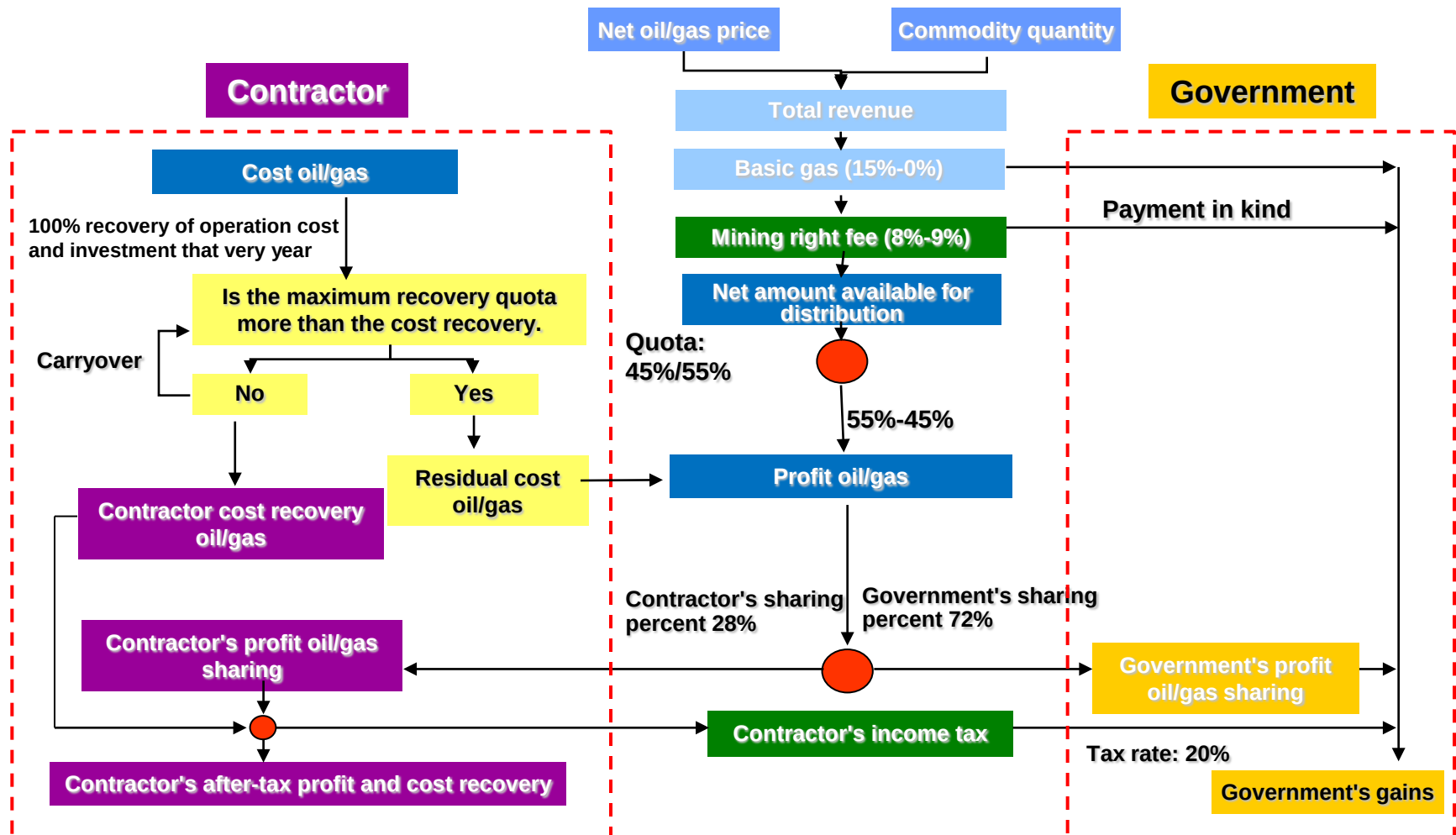




1. Amu Darya Right Bank natural gas project

■ Contract Description

PSC diagram of for the Amu Darya Right Bank natural gas project





1. Amu Darya Right Bank natural gas project

■ **Project construction history:** phase I project was put into operation in 2009, and phase II project was put into operation in 2014.

2007.8.29

The President of Turkmenistan issued exploration and development license and work permit.

2007.7.17

Signed the PSC for Bagtyyarlyk Contract Area in the Amu Darya Right Bank Area in Turkmenistan and the Natural Gas Purchase and Sale Agreement.

2009.12.14

The heads of the four countries gathered at the first processing plant and witnessed the gas supply moment.



2011.12.13

Construction of the second processing plant was started.

2014.05.07

The 9 bcm/a processing capacity of the second processing plant was completely built up and put into operation.

2015.12.31

The daily gas Rate of Amu Darya Company 50.41 million cubic meters (annual production scale 16.5 bcm)

Supplied 65.0 bcm natural gas to China steadily.

2016-2021

Old well rehabilitation and acidizing for plugging removal

1. Project feasibility study report
2. Workover scheme for Samandepo gas field
3. Yashyldepe gas field development plan



Quick production recovery of Samandepo gas field - core of phase I project

Technologies:

1. Intraplatform shoal thin reservoir prediction and hydrocarbon detection technology
2. Identification and evaluation technology for gentle slope reef beaches
3. Multi-azimuth non-offset VSP fracture prediction technology etc.
4. Multi-parameter optimization technology for high-inclination wells
5. Collaborative development technology for scattered gas field groups
6. Carbonate fracture prediction technology
7. Static and dynamic multi-information reservoir identification technology
8. Multi-parameter reasonable proration production technology for high-inclination wells
9. High-efficiency development strategy for fractured gas reservoirs
10. Differentiated water control countermeasures for surpressure gas reservoirs with edge and bottom water



Promotion of 9 bcm productivity construction of phase II project

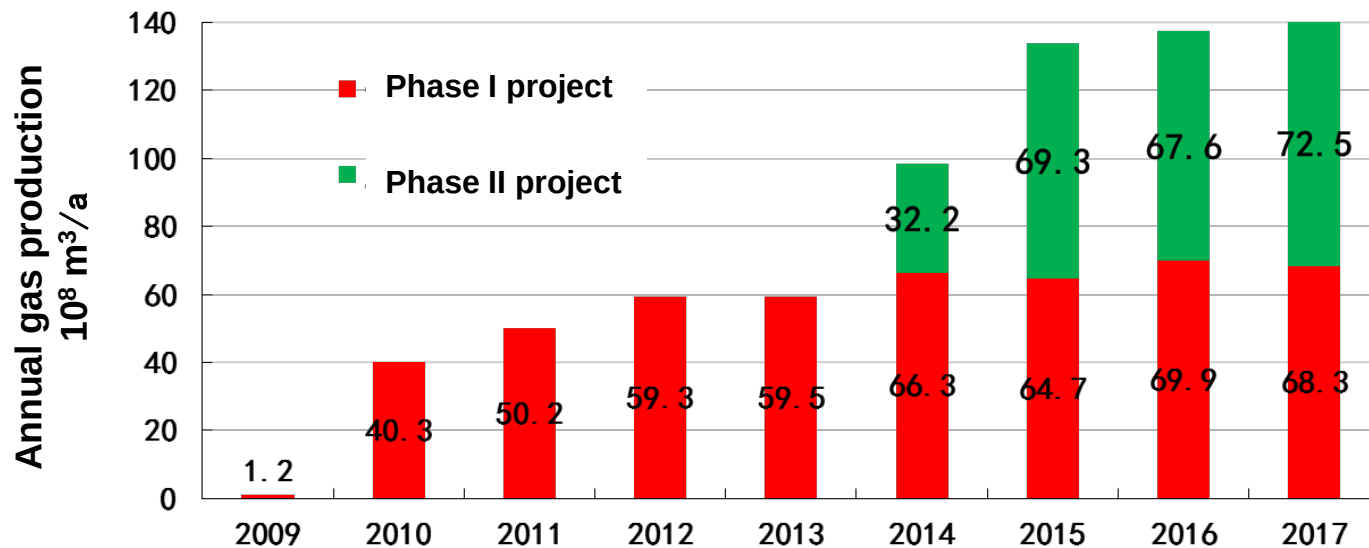


II. Project development history

■ **Project construction history:** 22 gas fields have been put into production, and the natural gas production was 14.0 bcm in 2017.

- Phase I project: 47 wells have been put into production; the peak daily gas production is 25.35 million cubic meters, and the cumulative gas production is 52.39 bcm. The annual natural gas production of phase I project is about 7.0 bcm at present.
- Phase II project: 62 wells have been put into production; the peak daily gas production is 27.30 million cubic meters, and the cumulative gas production is 27.24 bcm. The annual natural gas production of phase II project is over 7.0 bcm at present.

Annual gas production of the Amu Darya Right Bank natural gas project





1. Amu Darya Right Bank natural gas project

- **Project construction history:** 2 natural gas processing plants, completion of 17.0 bcm/a raw gas processing capacity
 - **5 rows** of natural gas processing units (involving desulfurization and decarbonization, dehydration, dealkylation, and sulfur recovery) of the processing plant of phase I project have been built up, with the total processing capacity of $80 \times 10^8 \text{m}^3/\text{a}$.
 - The processing plant of phase II project is provided with **4 rows** of natural gas processing units with the total processing capacity of $90 \times 10^8 \text{m}^3/\text{a}$. After processing, the purified gas is transported to the external booster station via a transportation pipeline and finally to China via the Central Asian Gas Pipeline.

The second natural gas processing plant of the Amu Darya Right Bank natural gas project





1. Amu Darya Right Bank natural gas project

■ **Project construction history:** Lines A, B and C of the Central Asian Gas Pipeline have been built up.

- The Amu Darya Right Bank natural gas project is CNPC's largest overseas natural gas project in production at present. The project is one of the main gas supply sources via China-Central Asian Gas Pipeline. Lines A, B and C of the Central Asian Gas Pipeline have been built up.

Schematic of China-Central Asian Gas Pipeline





1. Amu Darya Right Bank natural gas project

■ Social Contribution

- Since 2017, China has become the largest and only natural gas importer of Turkmenistan, with a total of 38.5 billion US dollars in natural gas trade between the two countries.
- CNPC employs **very many employees of Turkmenistan** (peak employees accounting for 1% of its employed population), has obtained **great social benefits** (more than 13.60 million US dollars in total, including 3.59 million US dollars invested to build up the largest public welfare project - **Migan Village Water Plant** in Central Asia), and has **paid tremendous taxes** (over 2.4 billion US dollars of various taxes).
- CNPC provided support involving personnel, machines, tools and spares to natural gas Konzern in the supply guarantee period in winter and spring of the six years 2011-2017.
- CNPC provided dozens of large vehicles, machines and tools to the local government free of charge and assisted in **flood fighting and rush repair of bridges** in the autumn harvest season and the flood season, with the cumulative cost up to 650000 US dollars in 2011-2017. CNPC received **5 written letters of thanks** from the local government.





1. Amu Darya Right Bank natural gas project

■ Social Contribution

- In 2016, the President of Turkmenistan instructed to promote Chinese language teaching in primary schools nationwide; since 2009, the company has selected a total of 107 local students to study in China for 9 consecutive years.
- The company's multiple means such as special training, on-the-job training, cross-post training, etc. have been fully utilized to improve the overall quality of local employees. Since 2008, 716,500 personnel-hours have been trained, 129 local employees have been promoted as middle-level cadres.
- The standards formulated by the company for sulfur granulation, waste liquid discharge, etc. have been upgraded from industrial regulations into the industrial standards of Turkmenistan.
- Totally 201 million safe manpower hours

President Hu Jintao attended the commissioning ceremony of phase I project on Dec. 14, 2009.



President Xi Jinping inspects the Amu Darya Right Bank natural gas project on Sept. 4, 2013.





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2. Indonesian natural gas project

■ Block Location

- **Jabung Block is located in Jambi Province, Sumatra Island, Indonesia**
- **Contract area: 1642.8 km²**

Location Map of Jabung Block in Indonesia

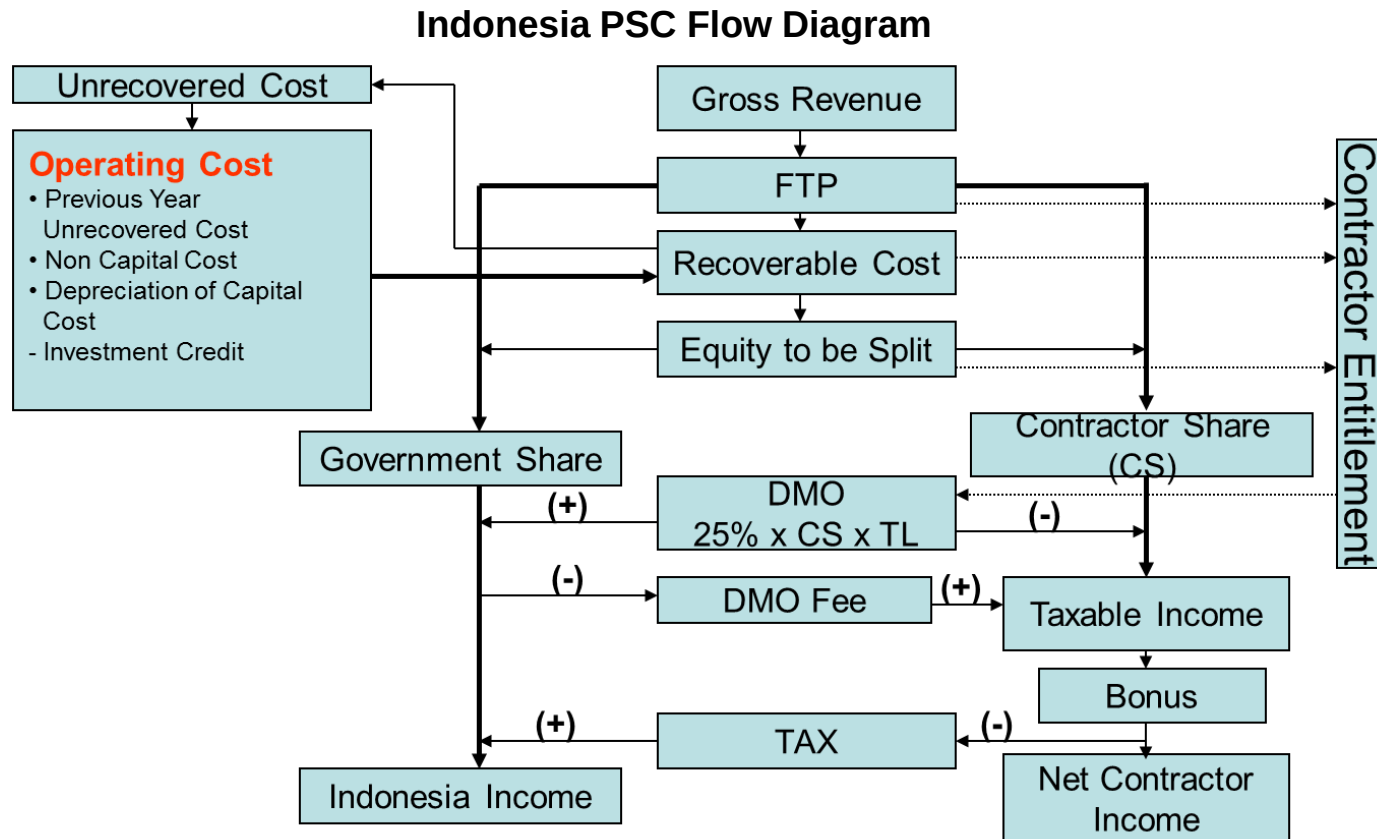




2. Indonesian natural gas project

■ Contract Description

- **Contract Type:** PSC
- **Block contract period :** 30 Years PSC, 27 Feb 1993 – 26 Feb 2023
- **Participant:** PetroChina (Operator, from 2002) ,Petronas and Pertamina



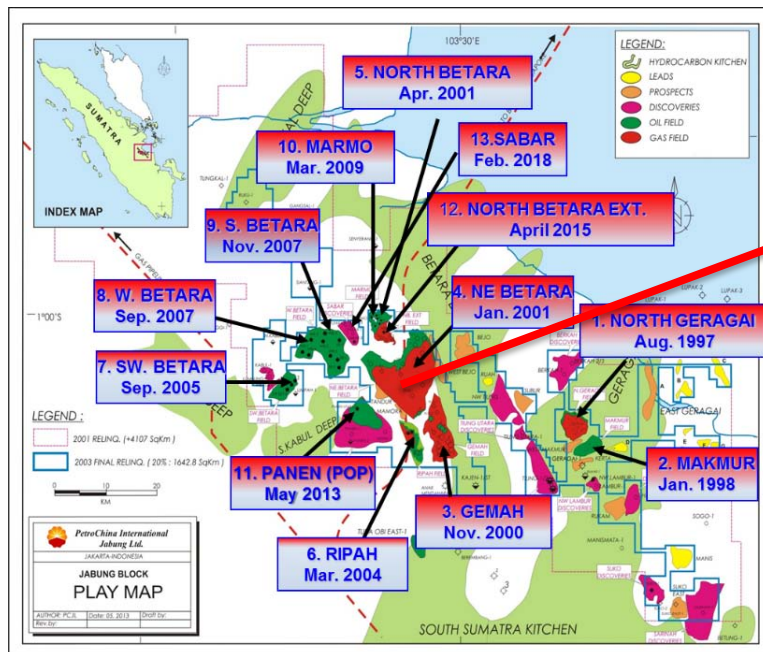


2. Indonesian natural gas project

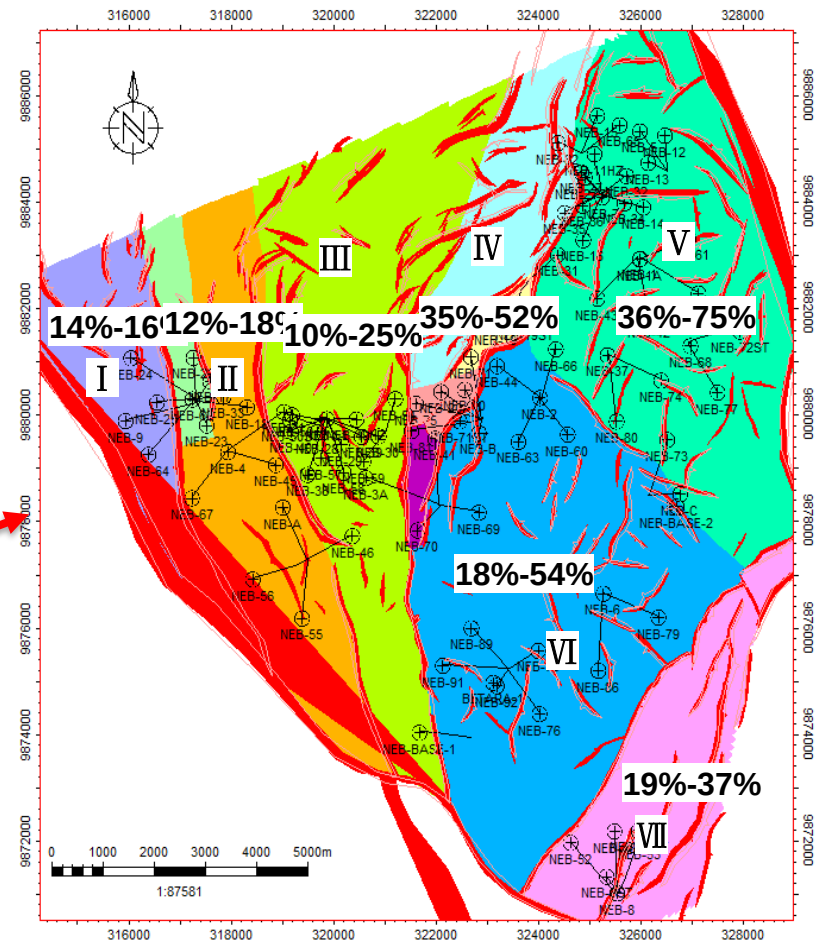
■ Fields in Jabung Block

- 13 producing fields, most of the fields are condensate gas fields.
- NE BETARA is the largest gas field with thin oil rim. 7 fault blocks are divided based on fault scale
- CO₂ content reduces from 75% to 10%

Existing 13 producing fields



Fault blocks in NEB field



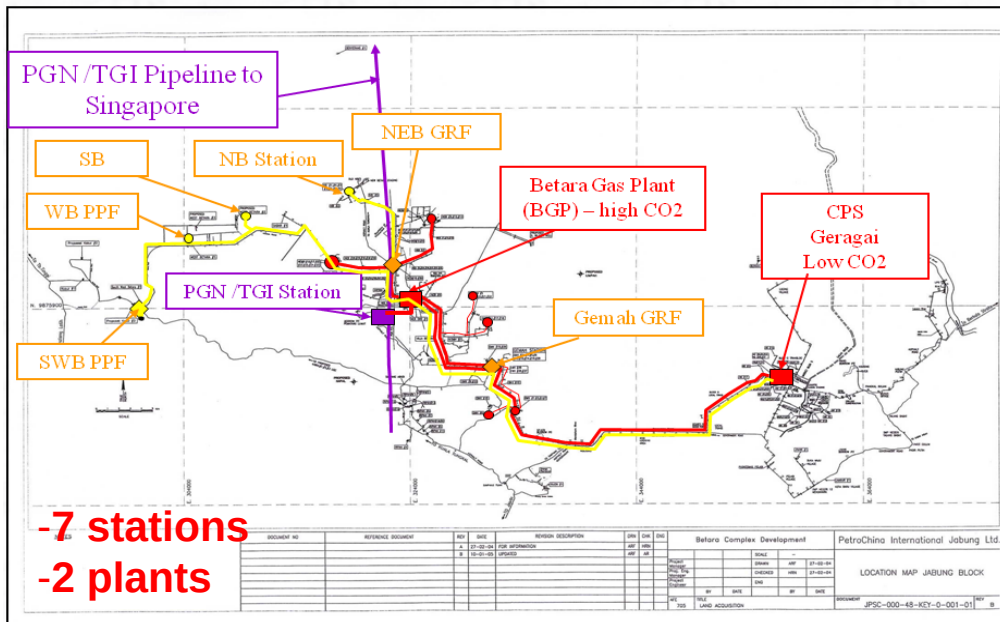


2. Indonesian natural gas project

■ Project construction history

- **2 Plants: Betara Gas Plant (BGP, high CO₂, 2005) & Central Processing Station (CPS, Low CO₂, 1997)**
- **BGP built by Petrochina in 2005 is located in NEB field.**
Inlet Raw Gas: capacity 230 -250 MMSCFD, CO₂ content less than 40%.
Sales Gas production 100-110 MMSCFD

Main Surface Production Facilities of Jabung



Betara Gas Plant (BGP)



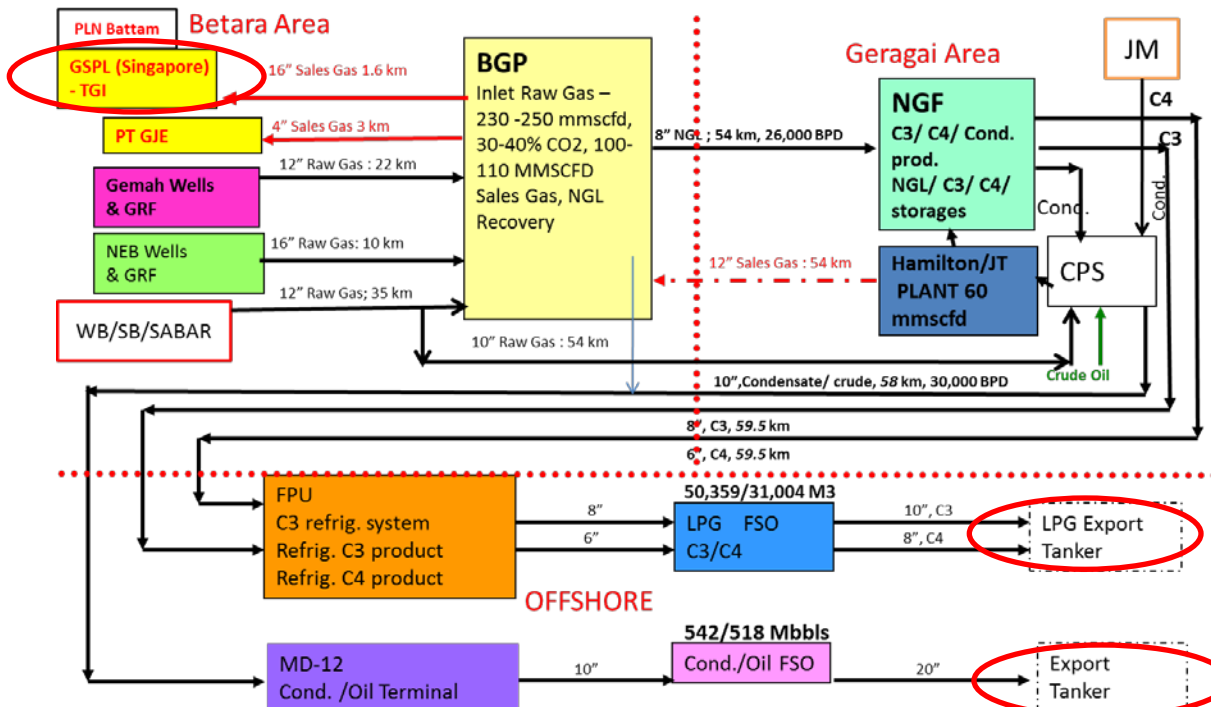


2. Indonesian natural gas project

■ Project construction history

- Gas products include sales gas, condensate oil and LPG (C3 & C4).
- Sales gas is exported to Singapore by pipeline.
- Condensate oil and LPG (C3 & C4) is exported by tanker.

Simplified Flow Diagram Gas Facilities



Fixed Processing Unit (FPU)



Floating Storage & Offloading (FSO)

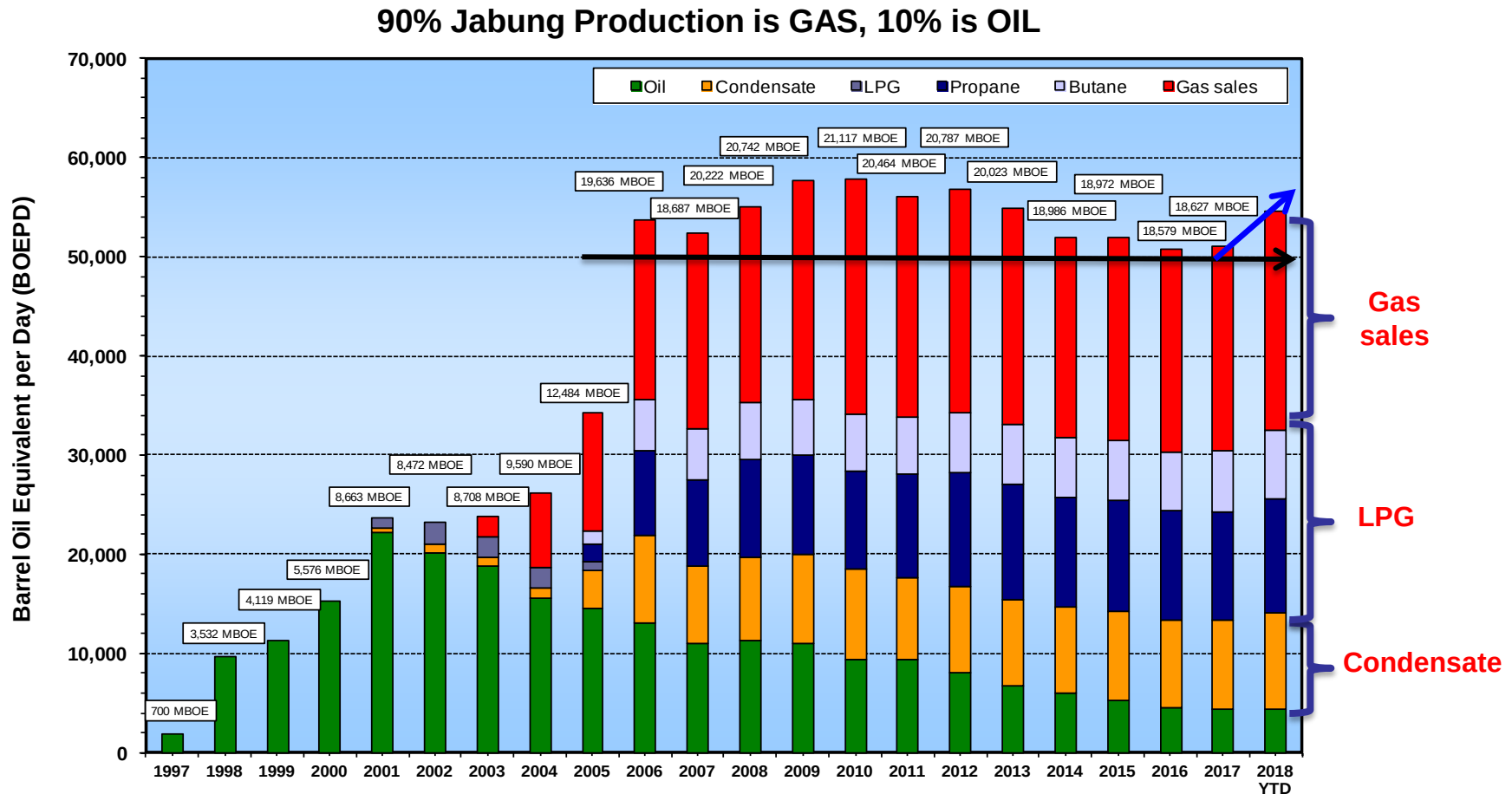




2. Indonesian natural gas project

■ Project construction history

- Maintain 12 years stable production from 2006 (BGP was built) till now, above 50 MBOEPD





2. Indonesian natural gas project

■ Society contribution

- Won the Major Tax Payer Award
- PetroChina received the Zero Accident Award for four times from the Energy and Mineral Resources Ministry. PetroChina had recorded zero accident operation since 2007. The health and safety award is the appreciation for PetroChina's success in recording more than 20 million working hours without accident.

PetroChina won the Zero Accident Awards in 2017





2. Indonesian natural gas project

■ Society contribution

- 99% of the employee are local workers.
- Won the silver prize of **Localization Share Award** from the Energy and Mineral Resources Ministry.
- PetroChina has provided mobile libraries, trainings for teachers, the construction of school buildings, scholarships for students

Employees' Families Enjoy Ramadan Event at Office



PetroChina provides Early-Education Facilities to Tanjung Jabung Timur People





2. Indonesian natural gas project

■ Society contribution

- Help the local residents
- Won enterprise social responsibility award issued by the Indonesian government.

Establish hospital

Tribun Jambi

Selasa, 22 Agustus 2017

Cari



Mobil Pintar dilengkapi Fasilitas Internet dari PetroChina Untuk Anak-Anak Tanjab Timur

Kamis, 17 Agustus 2017 22:25



IFB...

Donate items to the community





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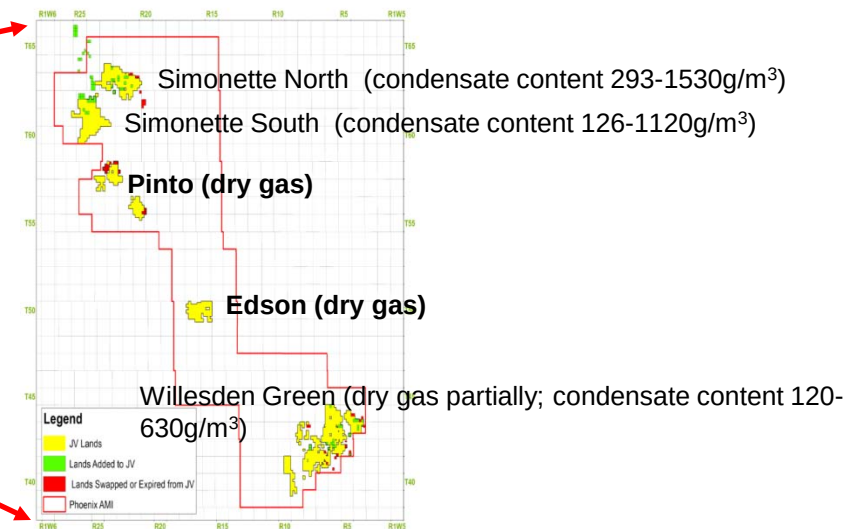
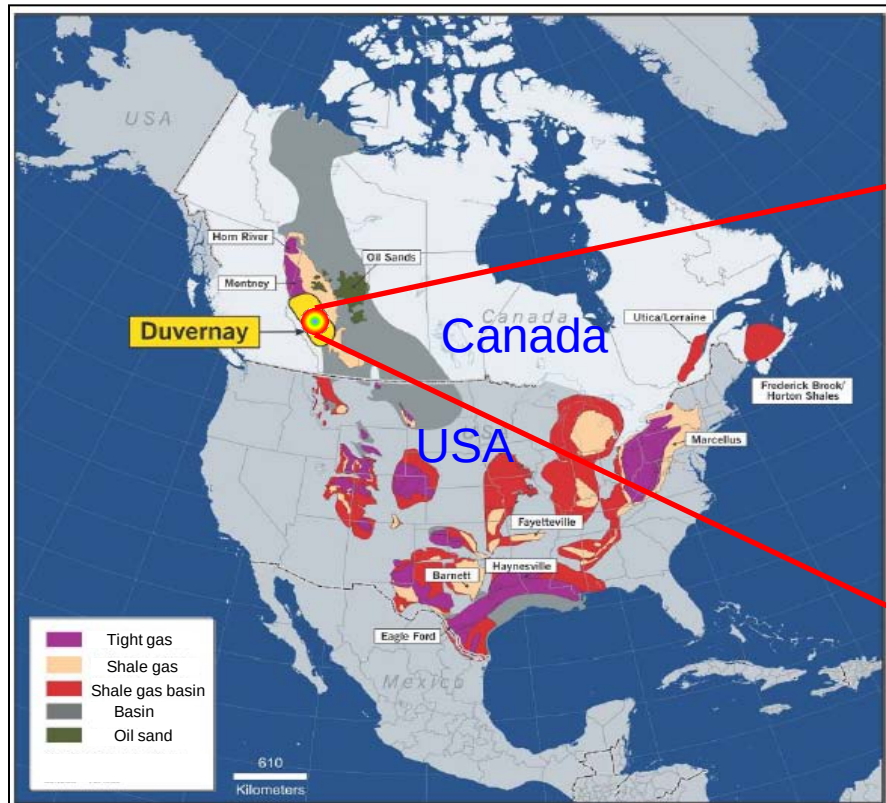


3. Canadian natural gas project

■ Block Location

- Duvernay project is located in the western part of the Western Canadian Sedimentary Basin and the central west of Alberta, and is about 350 km northwest of Calgary.
- Shale gas reservoir rich in condensate.

Location schematic of Canadian Duvernay shale gas project



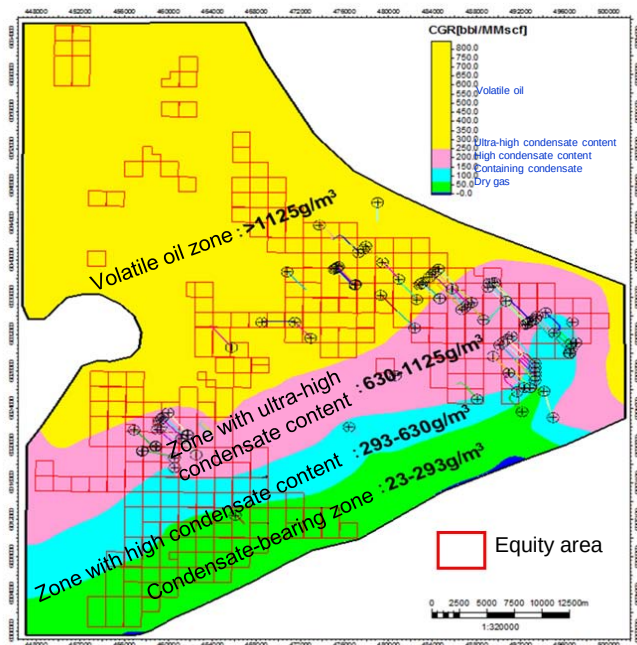


3. Canadian natural gas project

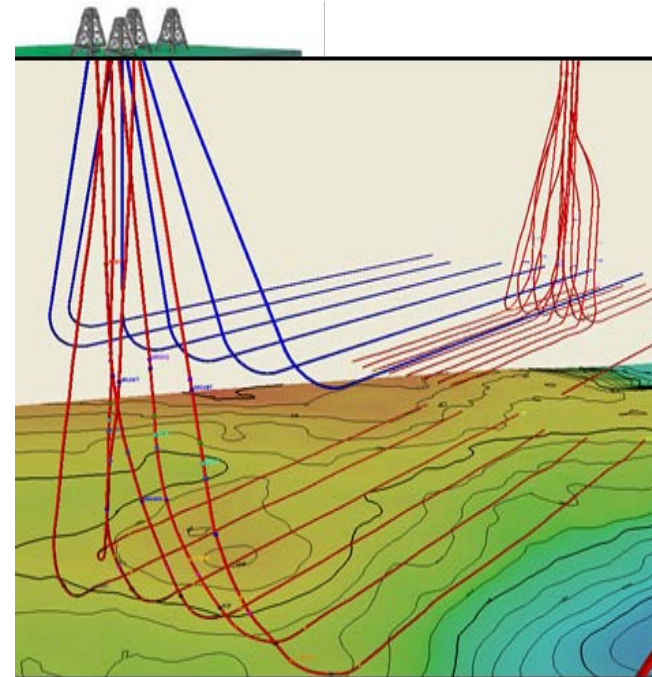
■ Contract description

- **Contract model:** royalty and tax regime contract, where CNPC has 49.9% equity and Encana Company has 50.1% equity and is the operator.
- **Contract period:** the long-term right to use can be owned after reaching a certain production.
- **Contract block:** area 1850.1km²; the main block Simonette covers an area of 751km².
- **Development deployment:** the progressive development mode is adopted, focusing on the development of the main block; it is predicted to build up 5.0Mt/a oil equivalent scale.

Distribution map of the condensate content in the main development block Simonette



Layout schematic of development wells platform

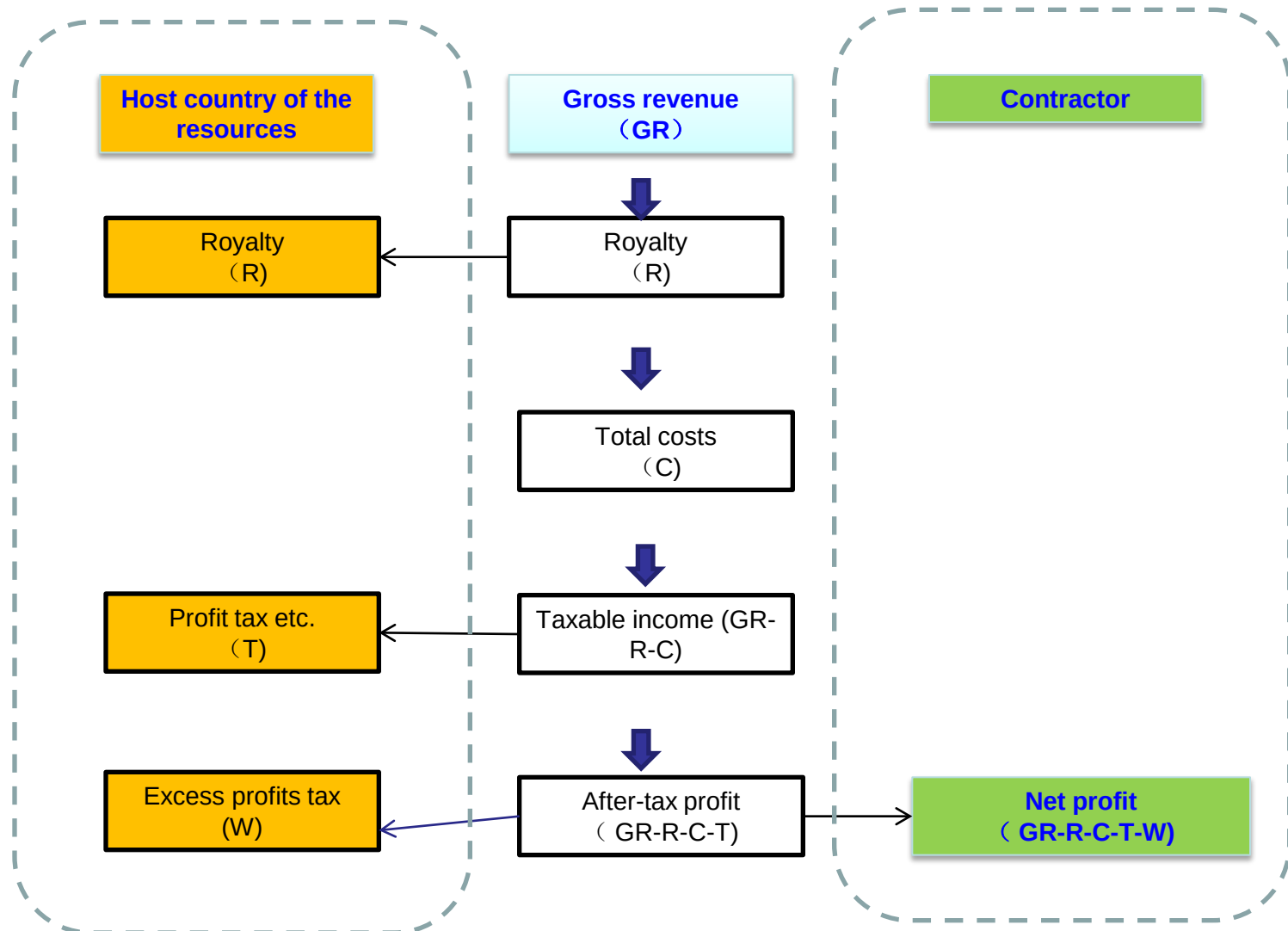




3. Canadian natural gas project

■ Contract description

Revenue distribution process under the royalty and tax regime contract

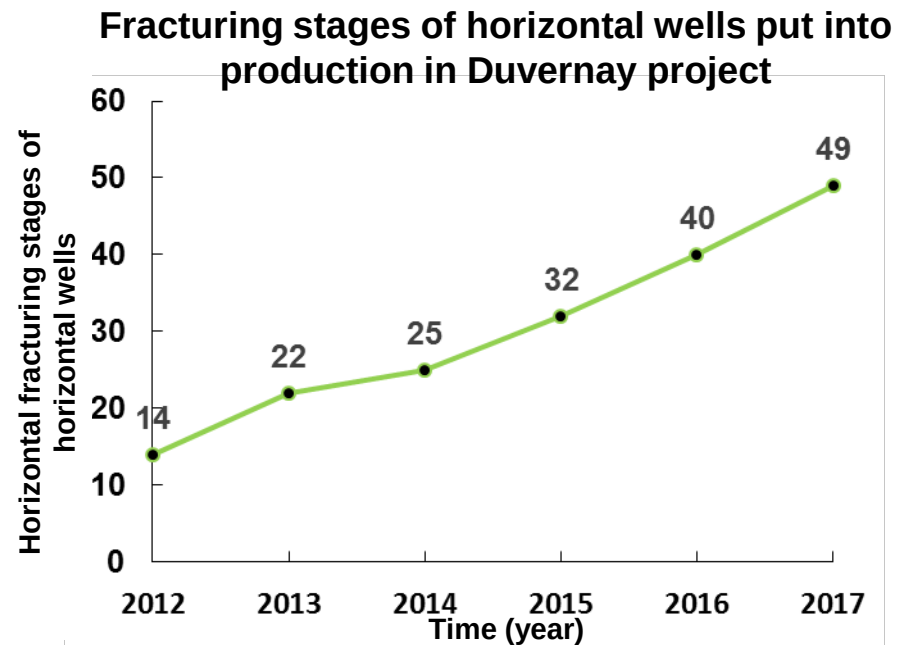
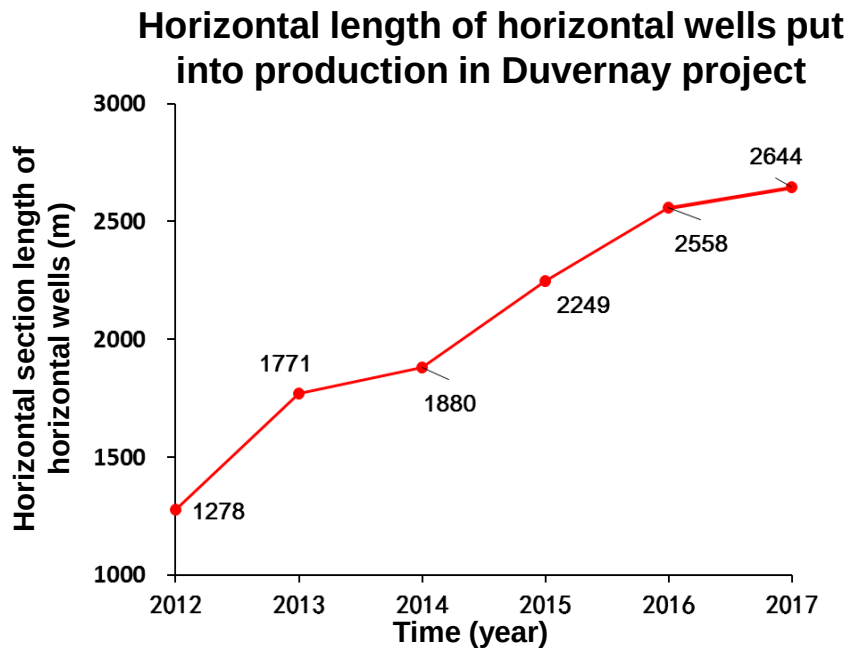




3. Canadian natural gas project

■ Project construction history

- With the deepening of development, the horizontal section length and fracturing stages of multi-stage fractured horizontal wells for Duvernay project increase year by year.



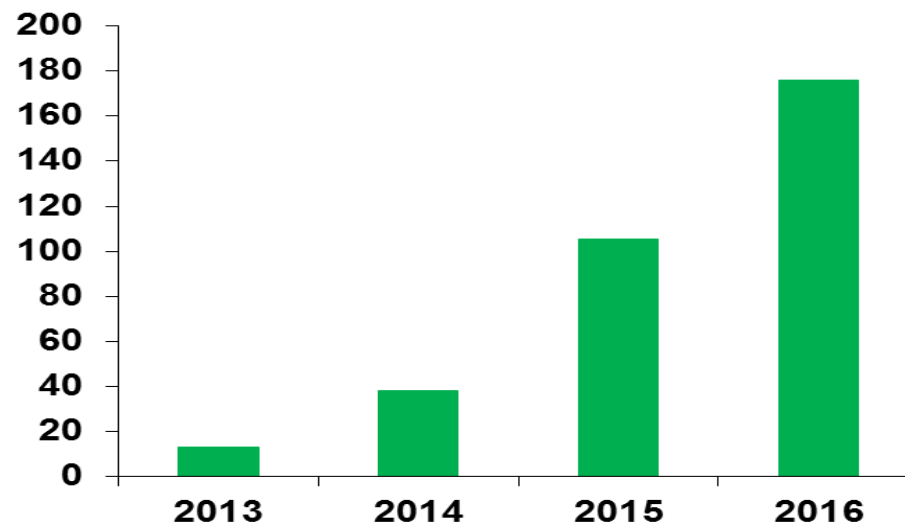


3. Canadian natural gas project

■ Project construction history

- A series of characteristic technologies have been formed, including favorable reservoir prediction technology for shale gas reservoirs rich in condensate, productivity prediction technology for multi-stage fractured horizontal wells, well spacing, well pattern and fracturing process optimization technology for multi-stage fractured horizontal wells, etc. Production has increased quickly and reserves have increased greatly.

The production has increased quickly



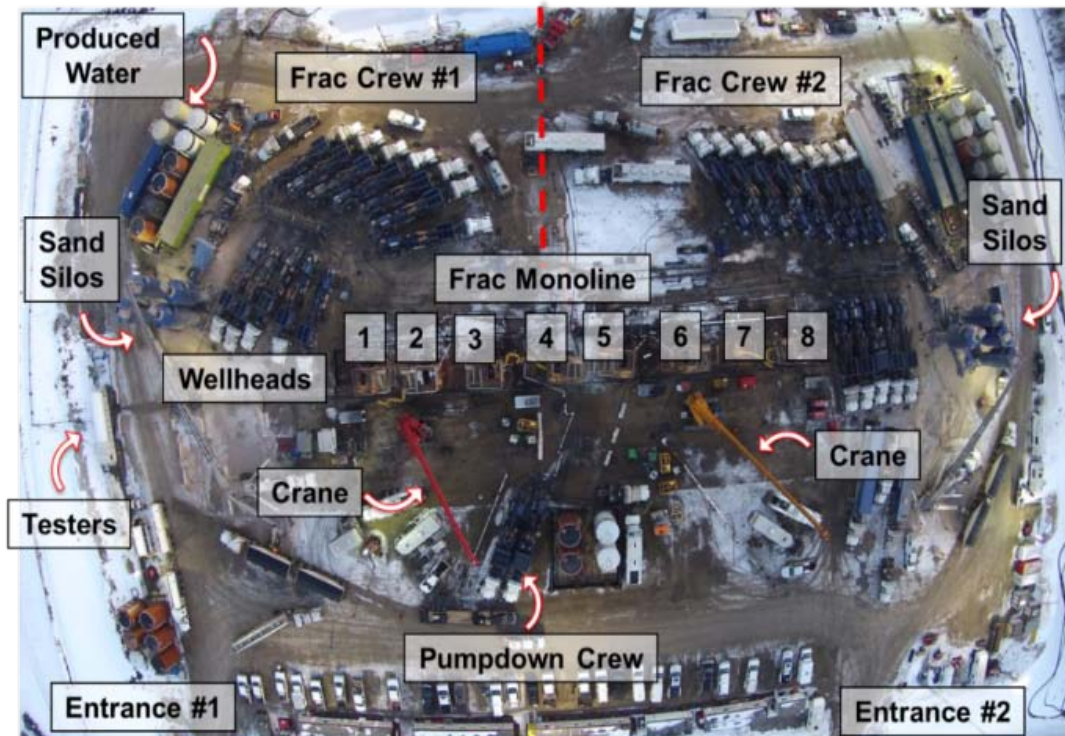


3. Canadian natural gas project

■ Project construction history

- The dual-unit “factory operation mode” has been achieved gradually; the efficiency has been increased by more than 100% through high-efficiency implementation of integrated well bore operation, integrated material supply and integrated equipment maintenance; the cost of fracturing and completion has been reduced by over 30%.

“Double Down” double-unit, double-snubbing operation, double-coiled tubing





3. Canadian natural gas project

■ Project construction history

- Since CNPC entered the project, CNPC has closely cooperate with the operator Encana: carry out technical communication and decide the project development strategy through consultation at the site. CNPC has maintained friendly and close cooperation relationship with Encana.

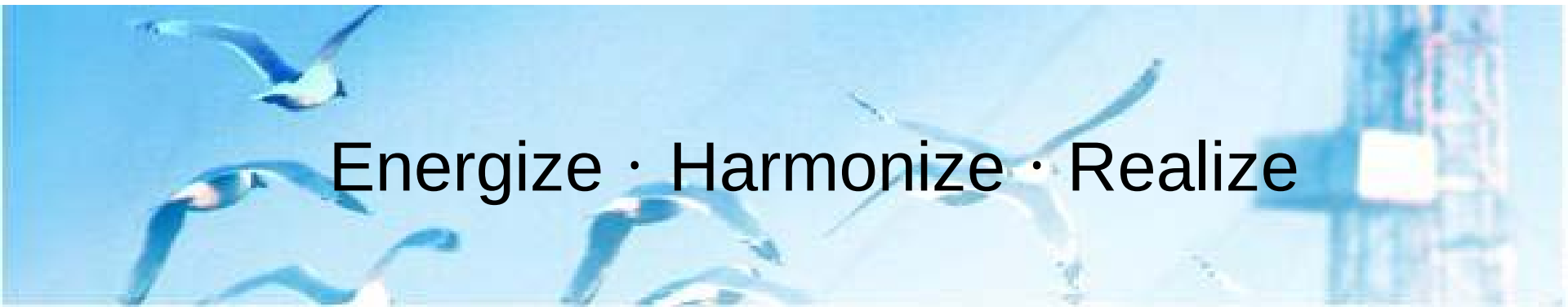




Conclusion

■ In cooperative development of overseas oil and gas projects, CNPC:

- Strictly abides by the laws of the host country of the resources;
- Respects the interests of the host country of the resources while giving back to local communities;
- Respects the interests of partners and seeks win-win development;
- Is committed to the research on high-efficiency natural gas development technologies and makes contributions to energy.



Energize · Harmonize · Realize



Thanks !
СПАСИБО!