



Future Oil & Gas Resources in China

CNPC Economy and Technology Research Institute
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- I. Oil and Gas Resources in China
- II. Oil & Gas Reserves Growth in China
- III. Main Areas for Future Oil & Gas Reserves Addition
- IV. Conclusion

I. Oil and Gas Resources in China

- National Oil & Gas Resources Evaluation
- Oil resources
- Gas resources
- The Estimates of Resources May Increase in Future
- Unconventional oil and gas

1. National Oil & Gas Resources Evaluation

The 3rd round evaluation started in 2003 and will be completed soon. Nearly 130 basins evaluated and some preliminary results achieved.

Ultimate resources in place:

Oil: **106.8 bln ton**

Gas: **52.65 tcm**

2. Oil resources

Onshore : 82.2 bln ton

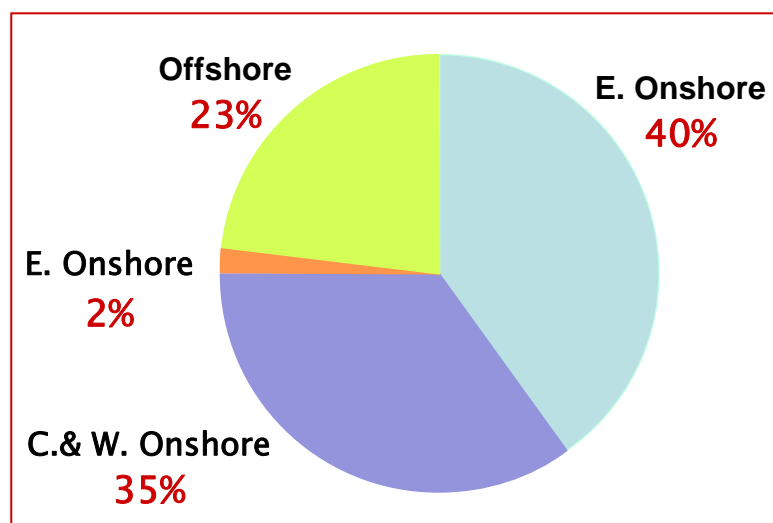
East China : 41.97

C. & W. China : 37.24

South China : 2.50

Offshore : 24.6 bln ton

Chinese oil resources distribution

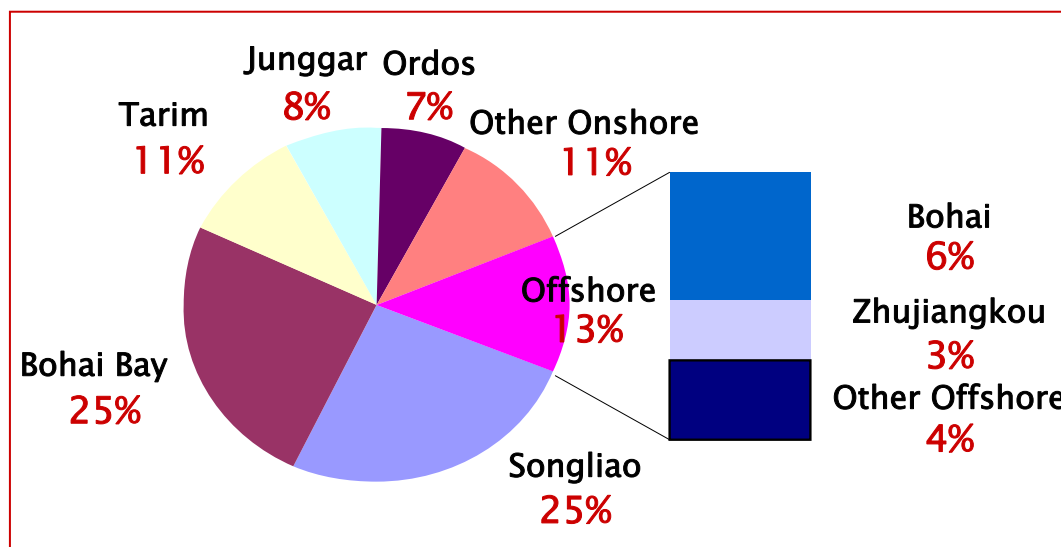


Remaining oil recoverable resources: 15 bln ton

Onshore: 13.1 bln ton, mainly in Songliao, Bohai Bay, Ordos, Junggar, and Tarim Basins, etc. ;

Offshore: 1.9 bln ton, mainly in Bohai and Zhujiangkou areas

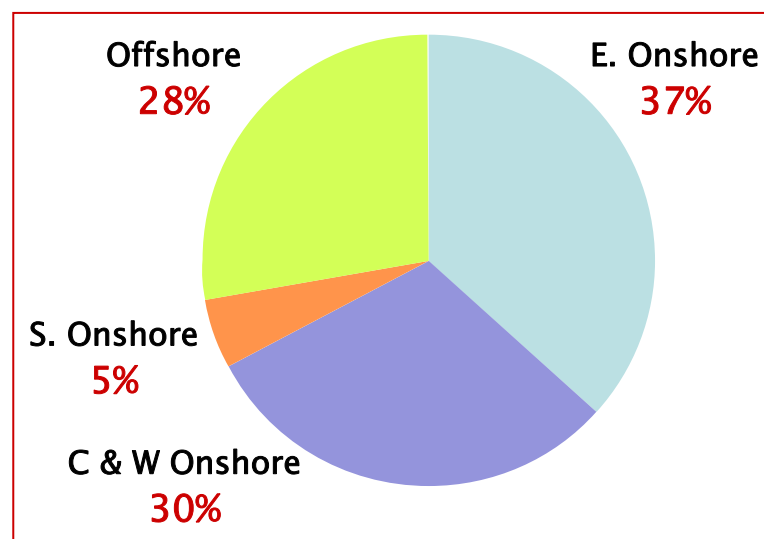
Remaining recoverable oil resource distribution



Undiscovered oil recoverable resources: **6.8 bln ton**

East Onshore: **2.5 bln ton**
West Onshore: **2.1 bln ton**
Central Onshore: **0.3 bln ton**
Offshore: **1.9 bln ton**

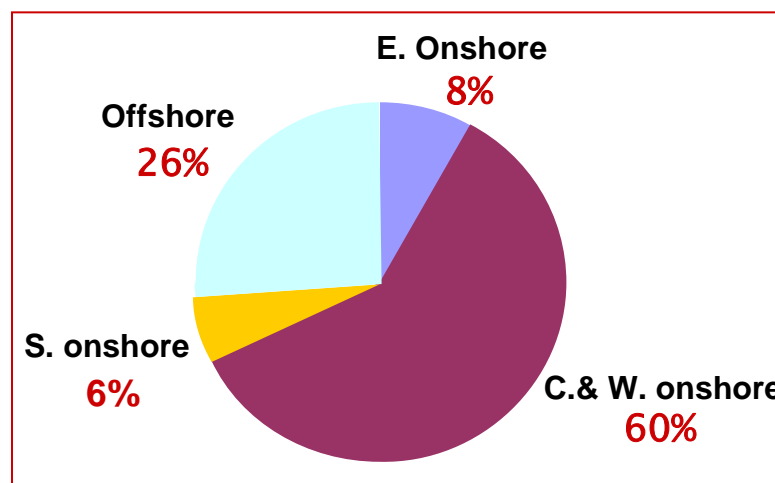
Undiscovered oil recoverable resources distribution



3. Gas resources mainly in Central & West onshore and offshore

Onshore : 38.82 tcm
East : 4.36 tcm
C. & West : 31.26 tcm
South : 3.2 tcm
Offshore : 13.83 tcm

Gas resource distribution in China

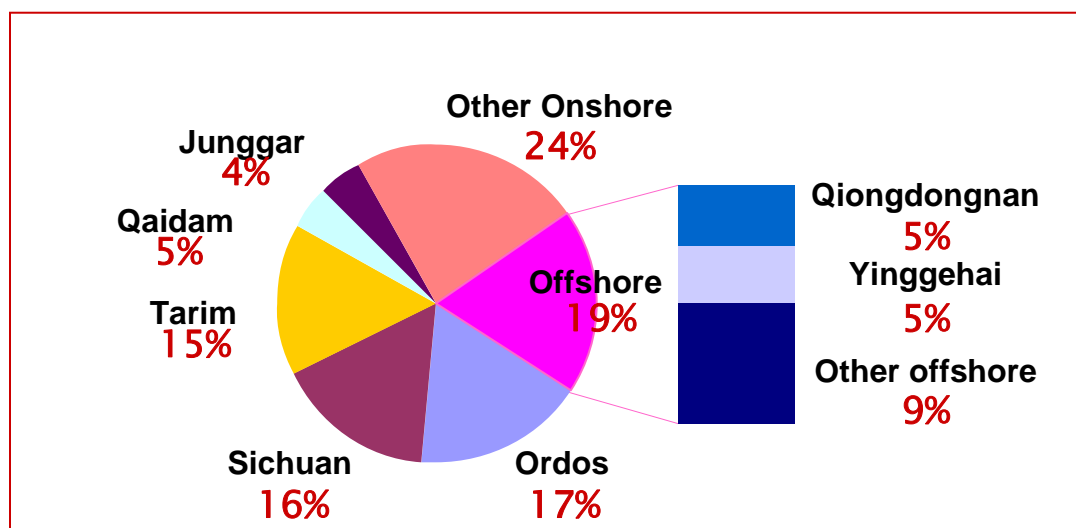


Remaining gas recoverable resources : 14 tcm

Onshore: 11.4 tcm, mainly in Ordos, Sichuan, Tarim, Qaidam, etc.

Offshore: 2.6 tcm, Qiongdongnan, Yinggerhai, E. China Sea, etc.

Remaining recoverable gas resources in China



Undiscovered gas resources: **17.4 tcm**, also mainly in Central and West onshore and Offshore areas.

Central Onshore:	6.78 tcm , 39% of total
West onshore:	5.14 tcm , 29.5% of total
Offshore:	2.92 tcm , 18.5% of total
East onshore:	1.8 tcm , 10.3% of total

Undiscovered Oil Resources by Regions in China

Area	Undiscovered oil (10 ⁸ t)			Undiscovered Gas (10 ¹² m ³)	
	Resources	Recovery	Recoverable Resources	Resources	Of total
East	122.13	20.0%	24.82	1.80	10.3%
Central	18.90	18.0%	3.40	6.78	39.0%
West	95.33	22.0%	20.97	5.14	29.5%
Others	0.08	15.0%	0.01	0.76	4.4%
Onshore	236.44	20.8%	49.21	14.48	83.2%
Offshore	86.31	22.0%	18.99	2.92	16.8%
China Total	322.75	21.1%	68.2	17.4	100.0%

Undiscovered Oil Resources in Some Basins

Area	Undiscovered oil (10 ⁸ t)			Undiscovered Gas (10 ¹² m ³)	
	Resources	Recovery	Recoverable Resources	Resources	Of total
Songliao	47.78	20.0%	9.56	0.19	1.1%
Bohai Bay	49.60	20.0%	9.92	0.60	3.4%
Ordos	13.08	19.0%	2.49	4.12	23.7%
Sichuan	-	-	-	2.67	15.3%
Junggar	20.43	20.0%	4.09	0.83	4.8%
Tarim	44.44	20.0%	8.89	3.49	20.0%
Qaidam	14.11	22.0%	3.11	0.61	3.5%

4. With technologic advances and geologic knowledge improvement, oil & gas resource estimation could change

Comparison of the resource evaluation

1987 : oil, 78.7 bil ton; gas, 33.6 tcm

1994 : oil, 94.0 bil ton; gas, 38.04 tcm

2006 (est.) : oil, 106.8 bil ton; gas 52.65 tcm

2006: Ultimate oil and gas resources increased by 14% and 38%

2006: Ultimate Recoverable oil and gas resources increased by 40%+ and 57%.

- So far, only about 150 of 429 basins been evaluated. Some petroliferous areas remain un-evaluated, such as Tibet Plateau and parts of South China Sea.
- With the technologic advances and geologic knowledge improvement, resource estimation could increase.

5. Unconventional oil and gas resources

- Among oil and gas resources, conventional resources only count for 56.45%. Great unconventional resources will be important substitute.
- In the recent round national resource evaluation, unconventional oil and gas resources (Coalbed methane, oil shale and oil sand) been included for the 1st time.

5. Unconventional oil and gas resources

- CBM occur mainly in Ordos, Qinshui, Junggar, Diandongqianxi, Erlian, Tuha, Tarim, Tianshan and Hailaer basins
- Oil shale mainly in Jilin, Helongjiang, Shaanxi, Xinjiang, etc.
- Oil sand mainly in West Xinjiang, Qinghai, Inner Mongolia, etc.

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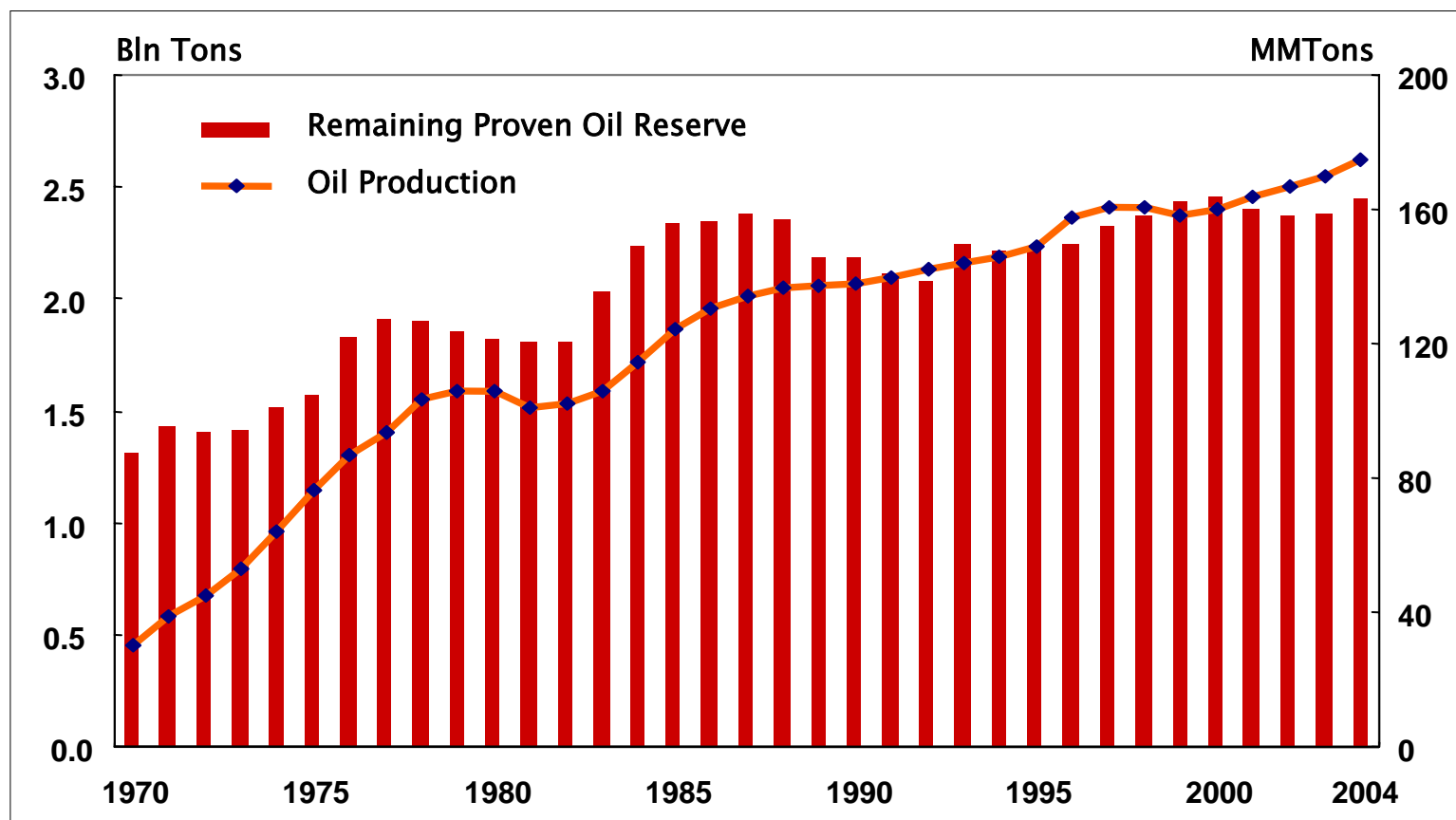
II. Oil & Gas Resources Growth in China

- Oil reserves
- Gas reserves
- Potential for future oil and gas reserves growth
- Oil and gas production

1. Oil reserves

- The proven oil reserves in China have been increased since 1949. Especially during 1959–88, several giant oilfields were found in Songliao and Bohai Bay Basins, resulting in a rapid growth of oil reserves, peaked in 1977 and 1987. Since 1992, the proven oil reserves remain in a relative high reserve level and keep increasing as a whole.
- During 1985–2004, proven OIP of 767 Mmt added per year. By 2004, 24.68 bln ton of OIP being proven, 6.73 bln ton recoverable; about 4.3 bln ton of oil produced, with a remaining proven recoverable reserve of 2.445 bln ton.

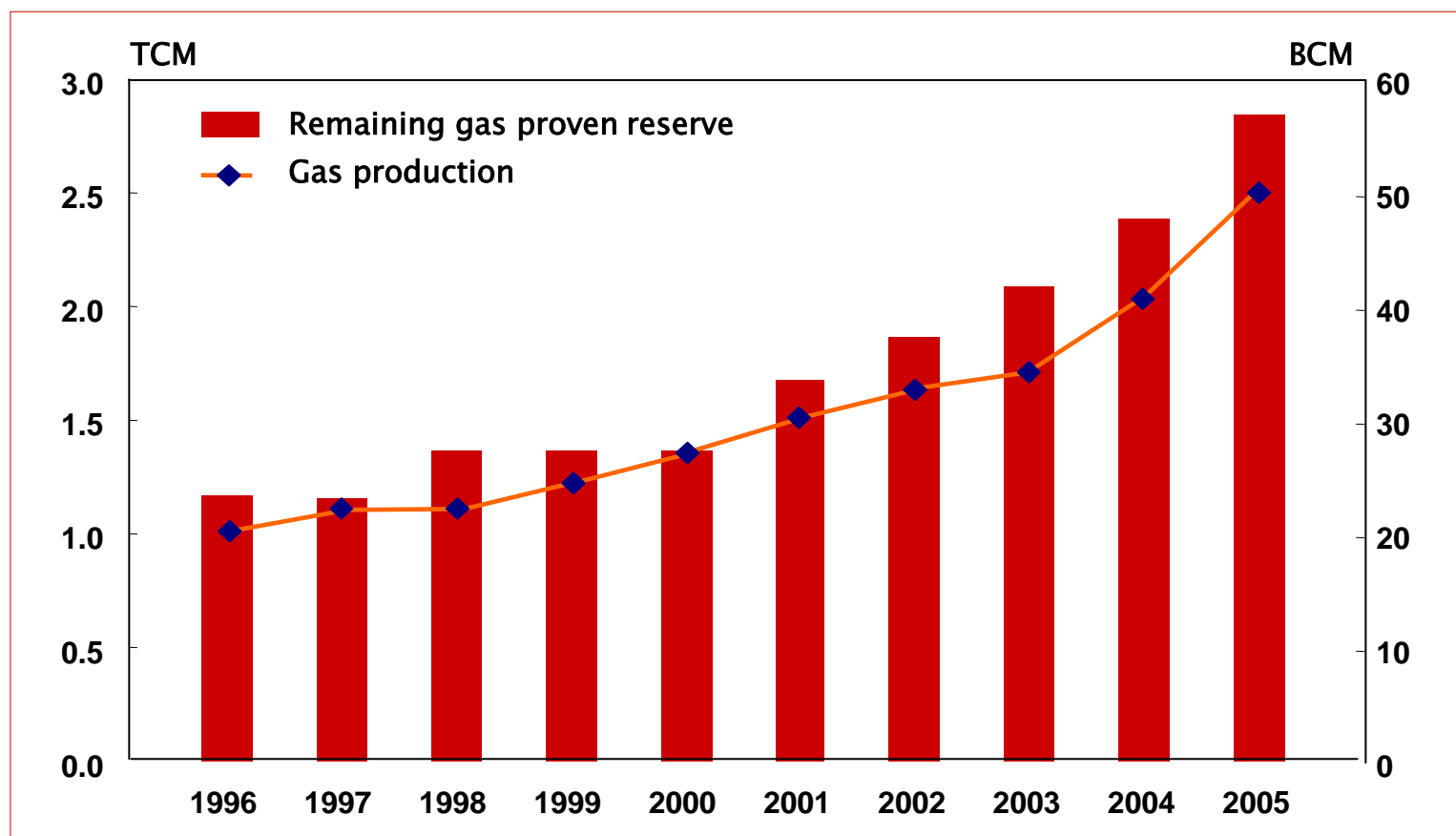
Oil reserve and production in China, 1970–2004



2. Gas reserves

- **1949–1976**, gasfield discovered mainly in Sichuan Basin. Of the proven GIP growth of 209.1 Bcf, 154.3 bcf from Sichuan, accounting for 73.8%
- **1977–1988**, 6 gas production bases established: Sichuan, Tarim, Ordos, Qaidam, Qiongdongnan and East China Sea
- **1989–**, several big gas discoveries made, leading to rapid gas reserve growth
- **Up to end 2005**, accumulative proven gas recoverable reserves: 3.5 tcm, increased 25%
- Remaining proven gas recoverable reserve: 2.85 tcm, increased 16%

Gas reserve and production, 1996–2005



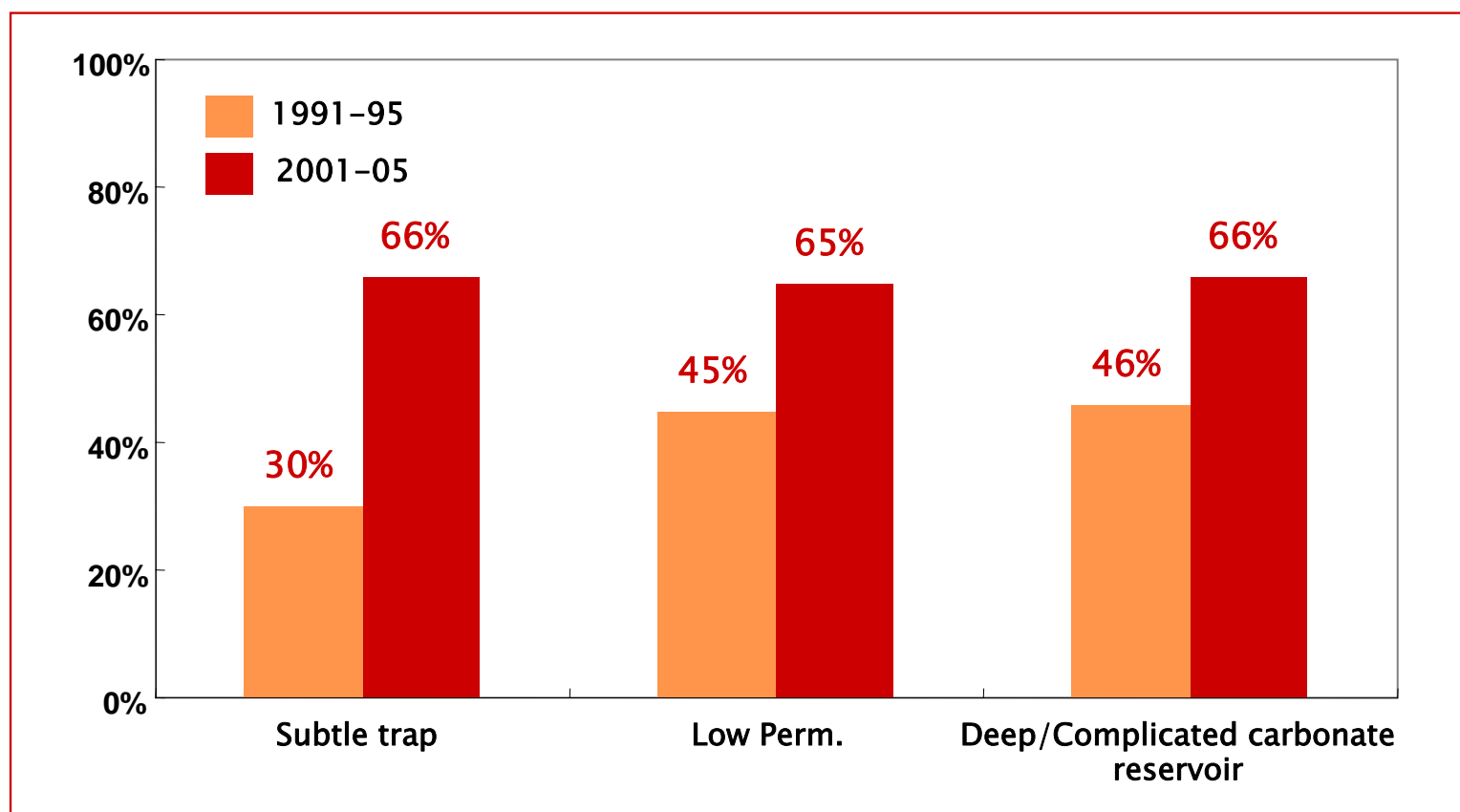
3. Potential for future oil reserve growth

- Remaining oil recoverable resources: 15 bil ton, of which 6.51 bln ton recoverable, proven ratio 43%, leaving 8.49 bln ton to be proven
- According to the reserve growth trend, During 1991–95, annual growth by 123 Mmton; 1996–2000, annual growth by 158 Mmton; 2001–05, annual growth by 186 Mmton. It is predicted that annual growth of about 180 Mmton would be achieved for 2006–2010.

3. Potential for future oil reserve growth

- Geographically, remaining resources mainly lie in remote areas, such as desert, mountain, offshore and deep sea.
- Geologically, reserve quality of the remaining resources getting poorer. Among the oil reserve addition in 2001–05,
 - 66% from subtle pools (versus 30 % in 1991–95)
 - 65% from low permeability reservoirs (versus 45% in 1991–95)
 - 66% from deep Fm (over 3500m) and complicated carbonate reservoirs (versus 46% in 1991–95).

Comparison of oil reserve addition by reservoir type: 1991-05 vs. 2001-05



3. Potential for future gas reserve growth

- Gas exploration in China is now in a period of big discovery. The 10th 5-year period was the most successful for gas exploration,
 - 8 giant gas fields with reserve over 100 bcm discovered
 - Gas reserve increasing rapidly
 - Gas exploration in China is regarded in an early stage, indicating a relatively high success ratio of significant gas discovery.

3. Great potential remained for future gas reserve growth

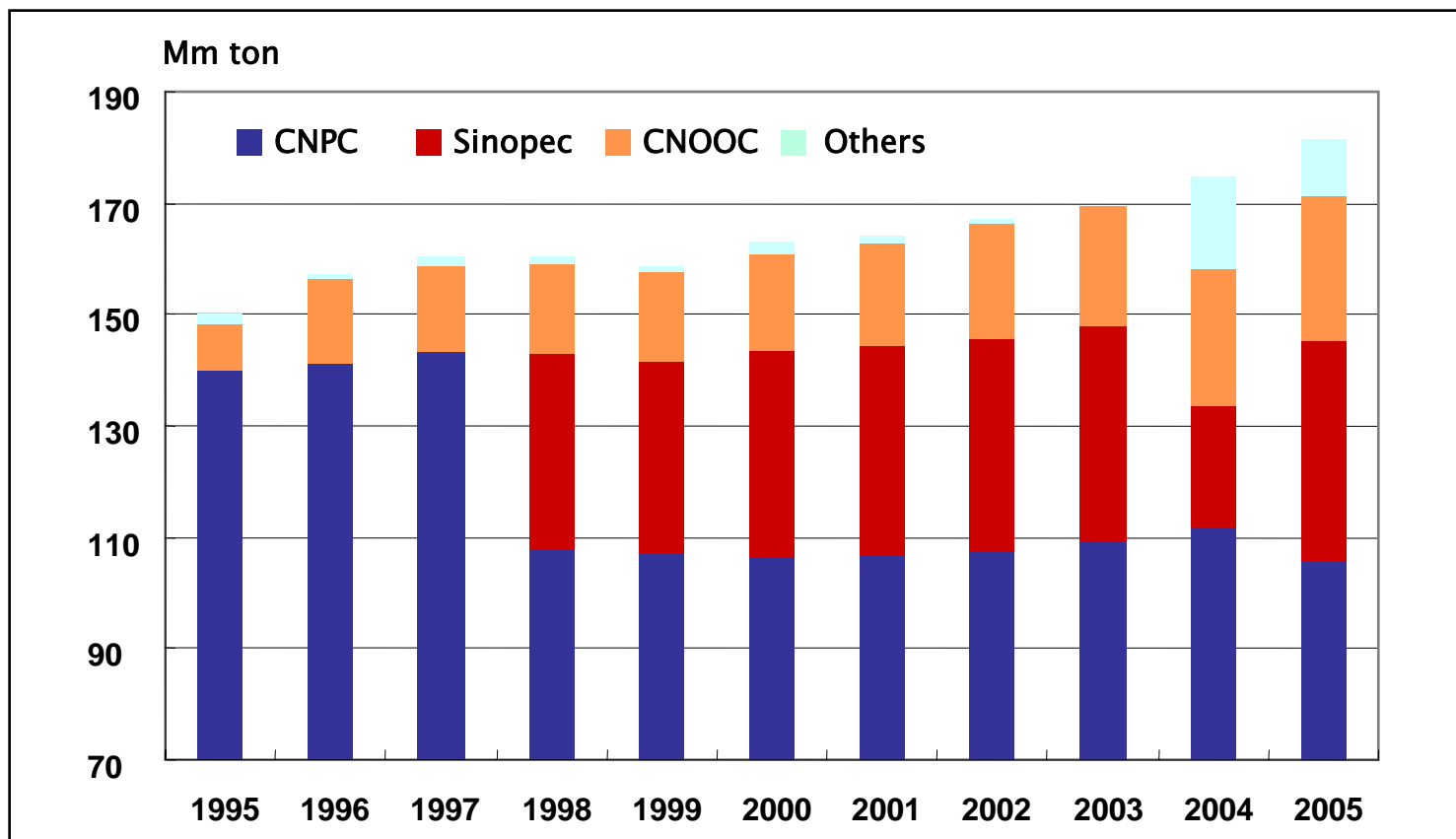
- According to gas reserve growth trend,
 - 1991–2003, reserve growth by 2.06 tcm, annually 158.5 bcm; in which 1996–2003, reserve growth by 1.62 tcm, annually 201.9 bcm
 - It is predicted that reserve growth by 3.13 tcm for 2004–20, annually 183.9 bcm; In 2020, gas recoverable reserve would be 5.59 tcm.

4. Rich resources ensure the production growth

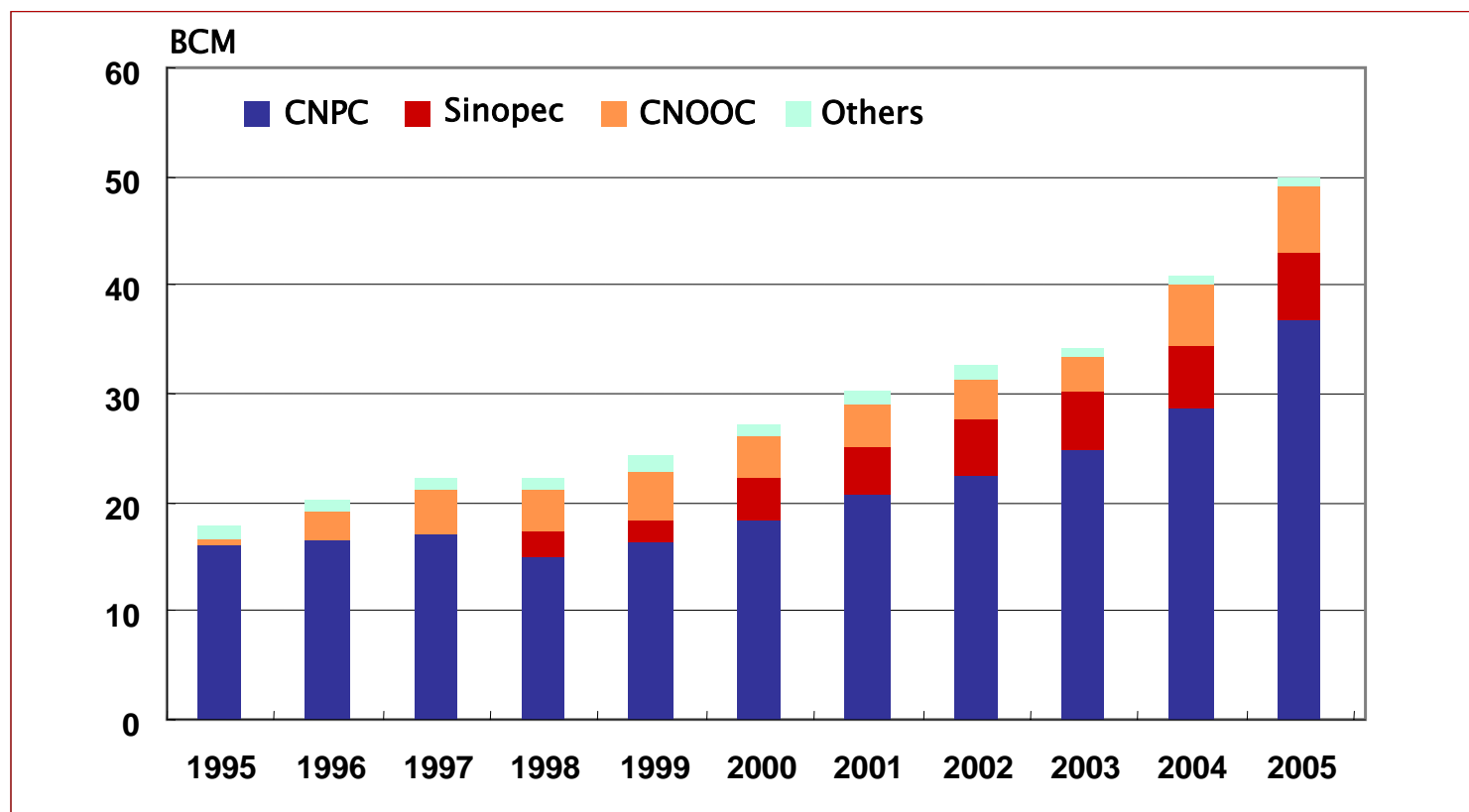
Oil & gas production in China, 1995–2005 (oil: bt; gas: bcm)

	1995	2000	2001	2002	2003	2004	2005
Oil	1,500	1,630	1,640	1,670	1,696	1,750	1,820
Gas	17.95	27.20	30.33	32.66	34.13	40.77	49.95

Oil Production in China, 1995–2005



Gas Production in China, 1995–2005



- Oil production in 2005 rose to 182 Mmton from 150 Mmton in 2000. Of which 59% coming from East onshore (versus 72% in 2000), 24.6% and 16.4% from West onshore and Offshore (versus 16.6% and 11% in 2000).
- Gas production rose to 50 bcm, versus 41.5 bcm in 2004 and 27.7 bcm in 2000.

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III. Main Areas for Future Reserve Addition

- East rift basins: favorable for recent reserve growth
- Large uplifts and slopes in West basins: favorable for rapid reserve growth
- Offshore: replacement area for Chinese exploration
- South onshore basins: Marine formations

1. Eastern rift basins

- 55 basins, covering 1.02 Mm km². It is most petroliferous and explored area, with 12.2 bln ton of oil and 1.8 tcm of gas undiscovered.
- Main Prospects: pinch outs, stratigraphic and lithologic traps, surrounding frontier basins, beach area of Bohai Bay
- Recent achievements
 - Songliao: big discoveries made in Xujiaweizi in the north and Changling in the south, such Qingshen gas field, proven reserve over 100 bcm
 - Beach area in Bohai Bay: Nanpu 1 & 2 discoveries made, with OIP predicted more than 250 Mmton

2. Central and Western Basins

- 25 basins, covering 1.59 Mm km²; 10 basins proved containing oil or gas, 13 basins with oil or gas show; unproven oil and gas resources being 11.4 bil ton and 11.92 tcm
- Favorable prospects: thrust belts in foreland basins, large uplifts, large stratigraphic traps

2. Central and Western Basins

■ Recent achievements

- Ordos: big oil fields discovered, such as Zhijing, Ansai, Xifeng, etc., leading to oil production in Ordos rose from 5.5 Mmton in 2000 to 15 Mmton in 2005
- Tarim: since Kela 2 gas field discovery in 1998, several other big gas fields been found, including Dina and Jilake, providing sufficient gas source for Xinjiang–Shanghai gas pipeline
- Breakthrough in marine carbonates exploration: Puguang giant gas discovery in Sichuan; great reserve growth of Ordovician marine reservoirs

3. Offshore

- Offshore unproven oil and gas resources: 8.631 bil ton and 2.92 tcm.
- With an oil proven ratio of only 29%, Offshore remains in stage of peak oil discovery and will be an important replacement area for Chinese exploration.
- Achievements in 2005
 - 14 discoveries made in 2005, such as Weizhou 6-10-1, Huizhou 25-4 and Luda 27-1, proven reserve addition of 288 Mm TOE
 - 7 new oilfields on stream, the total number of producing fields adding up to 45.

4. Southern basins

- Oil resources in South China (1994 est): 2.5 bil ton
- Oil fields only discovered in Baise, Jinggu, Shanshui and Fushan Basins, total proven OIP adding to 22.6 Mmton. Large amount of resources remained to be discovered.

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2006 is the starting year of the 11th 5-Year Planning Period for China. The 3 national oil companies are making great efforts on increasing oil and gas production. Under the high prices of oil and gas, they are focusing on the development of the remaining reserves of poor qualities and the newly found reserves, and on the field construction as well, ensuring the steady increase of oil production and rapid improvement of gas production.

The strategies for the sustainable development of Chinese oil and gas resources:

- Focusing on oil E&P to ensure the steady increase of oil production.
 - Fine E&P in the East
 - Speeding up E&P in the West
 - Extending the offshore area
 - Searching for breakthrough in the frontier areas
- Specially stressing the holistic gas exploration and development and ensuring the rapid development of the upstream, midstream and downstream of gas industry
- Focusing on favorable trends in large basins to search for big and significant discoveries, so as to obtain great reserve growth.
- Focusing on R&D, ensuring the sustainable development oil Chinese oil and gas resources.



Thank You!