



Research Article

Target post-evaluation of China's "12th Five-Year" oil and gas exploration and development planning and its "13th Five-Year" target prediction

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Received 4 January 2016; accepted 16 March 2016

Abstract

In the turn of 12th and 13th "Five-Year Plan" of China, the global oil and gas market changes greatly. In this regard, the target post-evaluation of the "12th Five-Year" oil and gas exploration and development planning was conducted, which is of significant importance to scientifically and reasonably making the specific "13th Five-Year" oil and gas exploration and development target planning. The post-evaluation results indicate that, in the period of "12th Five-Year Plan", the oil and gas exploration and development targets of China were satisfactorily completed, but some deficiencies still existed. For example, the target of oil production (2×10^8 t) was overfulfilled, while the target of oil reserves (65×10^8 t) remained 6.4% outstanding. The target of gas reserves (3.5×10^{12} m³) was overfulfilled, while the target of gas production (1385×10^8 m³) remained 6.2% outstanding. Moreover, the targets of unconventional gases were not satisfactorily completed—shale gas being better than coalbed methane (CBM). Failures to fulfill some targets in "12th Five-Year Plan" were primarily attributed to the slowdown of oil and gas consumption growth, sharp drop of oil price, downgrading of resources, and changes of statistic basis under the new normal. The forecast results suggest that, in the period of "13th Five-Year Plan", given USD50–70/bbl of world oil price, China's annual average incremental conventional oil and gas in place will be 10.0×10^8 – 12.0×10^8 t and 6000×10^8 – 8000×10^8 m³ respectively, annual average incremental shale gas and CBM in place will be 1000×10^8 – 2000×10^8 m³ and 500×10^8 – 1000×10^8 m³ respectively, and annual oil production will be about 2.0×10^8 t. By 2020, China's annual gas production will approach 1800×10^8 – 2000×10^8 m³ (shale gas: 200×10^8 m³, and CBM: 150×10^8 m³).

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Keywords: China; Oil and gas; Exploration and development; Production; Reserves; Unconventional oil and gas; Target evaluation; Forecast

The global oil and gas market has changed greatly over recent years. Within China, in the turn of 12th and 13th "Five-Year Plan", it is of great significance to make the specific "13th Five-Year" oil and gas exploration and development plan by making a target post-evaluation of "12th Five-Year" oil and gas exploration and development planning and prediction on the development trend and the target of the "13th Five-Year" planning.

1. New situation and background confronted by the oil and gas industry

1.1. The growth of oil and gas demand in the world has slowed down, the supply is surplus, and the price has plummeted

The global economic recovery has been feeble and in a "weak growth" state over recent years. Specifically, the economy of developed countries has a slow growth, whereas that of emerging economies has a downturn or even negative growth. Under this background, the international oil and gas market falls into a downturn trend, the growth rate of demand

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Peer review under responsibility of Sichuan Petroleum Administration.

<http://dx.doi.org/10.1016/j.ngib.2016.03.005>

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Please cite this article in press as: Pan JP, et al., Target post-evaluation of China's "12th Five-Year" oil and gas exploration and development planning and its "13th Five-Year" target prediction, Natural Gas Industry B (2016), <http://dx.doi.org/10.1016/j.ngib.2016.03.005>

drops obviously, and the oil and gas supply keeps surplus. According to statistics, since 2010, the annual average growth rate of global oil consumption has dropped from 3.4% to 0.8%, 1.0% averagely, and that of gas consumption has dropped from 7.5% to 0.4%, 1.4% averagely (Table 1). In the same period, the average growth rates of annual oil and gas outputs were 1.6% and 2.0%, respectively. In 2014, the oil consumption of the United States – the first large oil consumption country in the world only grew by 0.5%, whereas that of OECD member countries grew by –1.2% [1]. It is predicted that the growth rate of global oil and gas consumption would continue to slacken in 2015. The OPEC data show that the global oil output is 9558×10^4 bbl/d in 2015, whereas the consumption is 9288×10^4 bbl/d, so there is 270×10^4 bbl/d output surplus [2].

Table 1
Global oil and gas consumption and growth rate since 2010.

Year	Oil consumption /10 ⁸ t	Year-on-year growth rate	Gas consumption /10 ⁸ m ³	Year-on-year growth rate
2010	40.42	3.4%	31937	7.5%
2011	40.85	1.2%	32653	2.4%
2012	41.33	1.2%	33458	2.5%
2013	41.79	1.1%	33810	1.1%
2014	42.11	0.8%	33930	0.4%

Note: Data were rearranged from the Statistical Yearbook of World Energy, BP (2011–2015).

As the growth rate of oil and gas consumption slackens, the global oil price ceaselessly declines. Since the first half of 2014, the global oil price has plummeted all the way, i.e., it has dropped by 66%, and wandered at USD40–60/bbl. From November to December in 2015, the global oil price further dropped largely to break USD40/bbl and came to USD34.95/bbl (WTI) on December 17, approaching USD30/bbl. The growth rate of oil and gas demand has slowed down, the oil price collapse has largely impacted the oil and gas exploration and development in the world, so the industry situation becomes severe, and the sustainable development of oil and gas is worrisome. According to Goldman Sachs' estimation, when the global oil price is lower than USD60/bbl, the oil development projects worth about $USD1 \times 10^{12}$ in the world would be forced into suspension or delay, involving a productivity of $(700–800) \times 10^4$ bbl/d [3]. According to statistics, the investment of top five transnational oil companies in the world dropped by more than 15% in the first half of 2015, and continued to drop in the 3rd quarter by 20.6% [4]. The semiannual report of Exxon–Mobil shows that the substantial negative income of upstream resulted from weak oil price has swallowed up the profits created by its downstream and chemical business.

1.2. Domestic economic development has entered a new normal, and the growth rate of energy consumption has remarkably slowed down

According to the calculation with the energy consumption statistic data issued by National Bureau of Statistics of the

People's Republic of China and the data from the notification of energy situation of National Energy Administration [5], the annual average growth rate of primary energy consumption in China was 8.4%, 4.4% and 2.2% in the periods of 2001–2012, 2012–2013 and 2013–2014 respectively, while the figure was 0.7% in the first half of 2015 and about 1.0% in the whole year of 2015. The annual average growth rate of oil consumption in China was 7.8% during 2001–2012, dropped to 3.8% in recent two years; it was 3.2% in the first half of 2015, and about 3.0% in the whole year of 2015. The annual average growth rate of gas consumption in China was up to 16.3% during 2001–2012, dropped to 12.5% and 7.6% during 2012–2013 and 2013–2014 respectively; it was 1.4% in the first half of 2015, and about 2.7% in the whole year of 2015.

1.3. The investment on oil and gas exploration and development in China has largely dropped, and the growth rate of oil and gas outputs has apparently slackened

Statistics show that the investment on oil and gas exploration continued to increase during 2006–2013 in China, from $RMB447.02 \times 10^8$ to $RMB785.56 \times 10^8$ yuan [6], with an annual average growth rate of 8.4%. Impacted by low oil price, the investment on oil and gas exploration and development dropped obviously in the later period of the “12th Five-Year Plan”. According to statistics, the investment on oil and gas exploration and development dropped by $RMB227 \times 10^8$ yuan in 2014 from the amount in 2013, and the upstream investment was expected to drop by about 30% in 2015 [7].

According to the statistics of Ministry of Land and Resources of the People's Republic of China (hereinafter referred to as MLR) [8] and National Energy Administration (hereinafter referred to as NEA) [5], oil output grew by 1.1% in 2014, reaching 2.11×10^8 t, 2.1% in the first half of 2015, reaching 1.1×10^8 t, and grew by about 2.0% in the whole year of 2015. In the depressed market, gas development and production are obviously inhibited, and the growth rate of output has dropped apparently. Statistics show that since the beginning of the 21st century, gas output grew by 11.4% each year averagely; however, in 2014, the growth rate dropped to 7.2%, and the year-on-year growth of gas output was only 4.3% in the first half of 2015 [5]. The gas output increased by 3.7% in the first three quarters of 2015 and was predicted to increase by about 4.0% in the whole year of 2015. If there are void of effective systems and mechanisms for ensuring relatively stable investment on upstream, especially for ensuring stable investment on risk exploration, in the later period of the “13th Five-Year Plan” and after, oil and gas reserves and outputs would be much more likely to decline largely.

1.4. Energy revolution should be further promoted and the “13th Five-Year” oil and gas development planning should be worked out

In recent years, to ensure the national energy security and protect the environment against pollution, the government has

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