



中国天然气发展报告

2016

国家能源局石油天然气司
国务院发展研究中心资源与环境政策研究所
国土资源部油气资源战略研究中心

石油工业出版社

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(2016)

Oil and Gas Department, National Energy Administration

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前 言

能源是人类生存和发展的重要物质基础，人类文明的进步离不开优质能源的出现和先进能源技术的使用。18 世纪英国工业革命之前，柴薪、木炭等生物质是人类的主要能源来源；其后煤炭大规模使用，至 19 世纪中后期取代生物质成为主要能源；进入 20 世纪中期以来，石油大量使用，使人类衣、食、住、行发生巨大变化，并定义了“现代社会”形态。煤炭和石油消费为世界带来工业文明巨大进步的同时，也带来了日益严峻的大气环境影响。大气污染防治的根本出路是能源的绿色发展和实施清洁能源替代。天然气是低碳、清洁能源，资源丰富，发达国家大都把天然气作为能源清洁替代的重要选项。美国“页岩革命”大幅度提高了世界对天然气资源储量的预期，天然气已成为世界最具发展潜力的主体能源。

习近平总书记提出“四个革命、一个合作”的发展战略，为中国能源革命指明了方向，是中国发展天然气、推进天然气领域改革遵循的基本原则。2016 年在杭州召开的 G20 峰会上，中国政府签署了《巴黎协定》，承诺在 2030 年左右实现碳排放达到峰值。走绿色、清洁、低碳的能源发展道路不仅是中国经济社会可持续发展的有力保障，也是中国作为最大发展中国家对全世界庄严承诺的践行，大规模发展天然气势在必行。

Preface

Energy is an essential material for human survival and development. The progress of human civilization cannot be separated from the emergence of high quality energy and the use of advanced energy technologies. Before the British Industrial Revolution in the 18th century, wood, charcoal and other biomass were the main source of energy for mankind. After that coal was used on a large scale, exceeding biomass as the main energy source at the mid- and late 19th century. Since the mid-20th century, the extensive use of oil has resulted in dramatic changes in the life of human, and defined the form of “modern society”. While the consumption of coal and oil has brought great progress of industrial civilization to the world, however at the same time, increasingly serious atmospheric environmental impacts have been brought. The fundamental ways to prevent and control air pollution are the greening of energy and the implementation of clean energy replacement. Natural gas is a low-carbon and clean energy with abundant resource. Most developed countries consider natural gas as an important alternative towards a cleaner energy structure. The “Shale Gas Revolution” in the United States has greatly increased the world’s estimation of natural gas reserves. Natural gas has become the world’s most promising form of energy.

General Secretary Xi Jinping put forward the development strategy of “Four-Revolution, One-Cooperation”, pointing out the direction of China’s energy revolution and forming the basic principles for China to develop natural gas and to promote the natural gas reform. At the 2016 G20 Summit in Hangzhou, the Chinese Government signed the “Paris Agreement” and promised to achieve carbon emissions peak around by 2030. The green, clean, low carbon energy development path is not only a powerful guarantee for China’s sustainable economic and societal development, but also China’s practice for its solemn commitment to the world as the largest developing country. Therefore, large-scale development of natural gas is imperative.

目前中国正处于能源转型的关键时期，新能源、新业态不断出现，又值国际油价低位运行，必须抓住这一重要时间窗口，加速推进中国天然气大发展。发布《中国天然气发展报告》，旨在梳理中国天然气的发展现状，明确未来天然气发展定位、方向和目标，阐明天然气发展战略与政策取向，为中国天然气快速发展汇集多方力量，凝聚广泛共识。

Currently, China is in a critical stage of energy transformation with the global feature of new energy and new industries keeping emerging, and international oil price running at a historically low level. It is important to seize the time window to accelerate the development of China's natural gas industry. "China Natural Gas Development Report" is published in order to summarize the development status of natural gas, explain the position, direction and target of natural gas development of China, clarify the strategy and policy orientation, and bring together all the stakeholders as well as reach a broad consensus for the rapid development of China's natural gas industry.

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一、世界天然气发展现状^①

世界天然气资源丰富,供应相对充裕。亚太和中东地区消费量增长迅速、占比逐年提高,亚太地区在世界天然气市场的地位逐渐增强。

(一) 世界天然气资源丰富

截至2014年底,世界常规天然气可采资源量为559.5万亿立方米,累计产量103.5万亿立方米;非常规天然气可采资源量为543.5万亿立方米(其中致密气83.6万亿立方米,页岩气196.8万亿立方米,煤层气52.4万亿立方米,天然气水合物184万亿立方米,其他为水溶气),累计产量5.9万亿立方米。按照目前年产量3.6万亿立方米测算,世界天然气资源可供开采200年以上。

(二) 世界天然气产量逐年增加

2005年世界天然气产量为2.8万亿立方米,2015年增至3.6万亿立方米,其中年产量居前五位的国家分别是美国(7673亿立方米)、俄罗斯(5733亿立方米)、伊朗(1925亿立方米)、卡塔尔(1814亿立方米)和加拿大(1635亿立方米)。分区域看,2015年,北美地区产量9840亿立方米,占世界总产量的27.3%;前苏联地区产量7513.8亿立方米,占比20.9%;中东地区产量6179.0亿立方米,占比17.2%;亚太地区产量5566.6亿立方米,占比15.5%。

① 本节储量、产量、消费量和贸易量统计数据主要来源于《BP世界能源统计》。



1. Global Natural Gas Development Status^①

The global natural gas resources are abundant, providing relatively ample supply. The natural gas consumption in Asia-Pacific and Middle East regions has been growing rapidly, with yearly growing proportion of the world total. Asia-Pacific is playing a gradually increasing role in the global natural gas market.

(1) Abundant Global Natural Gas Resources

As of the end of 2014, the global conventional natural gas reserves were 559 Tcm with 103.5 Tcm cumulative production; unconventional gas reserves were 543.5 Tcm (including 83.6 Tcm of tight gas, 196.8 Tcm of shale gas, 52.4 Tcm of coalbed methane, and 184 Tcm of gas hydrate, with the others being water-soluble gas) with 5.9 Tcm cumulative production. Based on the current 3.6 Tcm annual production volume, the global natural gas reserves can last for more than 200 years.

(2) Yearly Increasing of Global Natural Gas Production

The global natural gas production was 2.8 Tcm in 2005 and increased to 3.6 Tcm in 2015, of those production the top five countries were United States (767.3 Bcm), Russia (573.3 Bcm), Iran (192.5 Bcm), Qatar (181.4 Bcm) and Canada (163.5 Bcm), respectively. In terms of regions, in 2015, North America produced 984 Bcm; former Soviet Union produced 751.38 Bcm; Middle East produced 617.9 Bcm; Asia-Pacific produced 556.66 Bcm, accounting for 27.3%, 20.9%, 17.2% and 15.5% of the global total production, respectively.

① The reserves, production, consumption and trade volume data in this chapter are mainly from “BP Statistical Review of World Energy” .

(三) 世界天然气消费量持续增长

2005 年世界天然气消费量为 2.77 万亿立方米, 2015 年增至 3.47 万亿立方米。2015 年天然气在世界一次能源消费中占比为 23.7%。2015 年天然气消费量超过 1000 亿立方米的国家有美国(7779.7 亿立方米)、俄罗斯(3914.8 亿立方米)、中国(1931 亿立方米)、伊朗(1912 亿立方米)、日本(1134 亿立方米)、沙特阿拉伯(1064 亿立方米)和加拿大(1025 亿立方米)。分区域看, 2015 年, 北美地区占比 27.8%, 亚太地区占比 20.2%, 前苏联地区占比 16.7%, 欧洲地区占比 13.3%, 中东地区占比 14.1%, 其中亚太、中东地区天然气消费量快速增长, 占比逐年提高, 北美、前苏联地区的增速相对较缓, 占比呈下降趋势。

(四) 世界天然气贸易市场加快发展

世界天然气贸易量占消费量的比重呈增长态势。2005 年世界天然气贸易量为 7214 亿立方米, 2015 年贸易量增至 10424 亿立方米, 其中管道天然气贸易量 7041 亿立方米、LNG 贸易量 3383 亿立方米, 管道天然气仍是天然气贸易的主要形式。世界天然气贸易流向继续向亚太地区转移。2010—2015 年期间, 欧洲地区的贸易量共减少 384.8 亿立方米; 而同期亚太地区贸易量共增加 886.8 亿立方米; 北美地区进口管道气和 LNG 贸易呈平稳下降态势。2015 年, 世界天然气供需总体宽松, 价格大幅下滑。从区域价格看, 美国亨利中心的年均价格为 2.62 美元/百万英热单位, 同比跌幅近 40%; 英国国家平衡点(NBP) 年均价格为 6.62 美元/百万英热单位, 同比下跌 14%; 与“日本一揽子进口原油价格”(JCC) 挂钩的亚洲液化天然气(LNG) 进口年均价格为 10.64 美元/百万英热单位, 同比下降 34.4%。



(3) Continued Growing of Global Natural Gas Consumption

The global natural gas consumption was 2.77 Tcm in 2005 and increased to 3.47 Tcm in 2015. Its proportion in the global primary energy consumption was 23.7% in 2015. Countries with more than 100 Bcm natural gas consumption in 2015 included United States (777.97 Bcm), Russia (391.48 Bcm), China (193.1 Bcm), Iran (191.2 Bcm), Japan (113.4 Bcm), Saudi Arabia (106.4 Bcm) and Canada (102.5 Bcm). In terms of regions, in 2015, North America accounted for 27.8%, Asia-Pacific accounted for 20.2%, former Soviet Union accounted for 16.7%, Europe accounted for 13.3%, and Middle East accounted for 14.1%, of the global total consumption, respectively. Asia-Pacific and Middle East regions have rapid growth in natural gas consumption, with gradually increasing proportion, while the growth rate in North America and former Soviet Union was relatively slow, with decreased proportion.

(4) Accelerated Development of Global Natural Gas Trade Marking

The proportion of the global natural gas consumption trade volume is showing an increasing trend. The global natural gas trade volume was 721.4 Bcm in 2010 and increased to 1042.4 Bcm in 2015, of which pipeline trade volume was 704.1 Bcm and LNG trading volume was 338.3 Bcm, indicating pipeline gas was still the main natural gas trade form. The global natural gas trade continues to shift to Asia-Pacific Region. From 2010 to 2015, Europe's trade volume decreased by 38.48 Bcm, while over the same period Asia-Pacific trade volume increased by 88.68 Bcm; North America's pipeline gas import and LNG trade showed a steady downward trend. In 2015 the global total natural gas supply and demand were generally easing, causing prices to fall sharply. In terms of the regional prices, the annual average price of the Henry Center was \$2.62/MMBTU, a nearly 40% year-on-year decline; the British NBP average price was \$6.62/MMBTU with a 14% year-on-year decrease; and the Asian LNG average import price linked to "Japan Customs-cleared Crude" (JCC) was \$10.64/MMBTU, a 34.4% year-on-year reduction.

(五) 世界典型国家天然气发展经验借鉴

世界典型国家天然气发展遵循启动期、发展期、成熟期的产业发展规律,快速发展期一般经历30年左右。如美国,1945年天然气消费量突破1000亿立方米,1970年增至6000亿立方米,经历了25年的快速发展,期间消费量年均增长约200亿立方米;英国1970年天然气消费量突破100亿立方米,2000年增至968亿立方米,经历了30年的快速发展,期间消费量年均增长约30亿立方米;日本1976年天然气消费量达到100亿立方米,2012年增至1135亿立方米,经历了36年的快速发展,期间消费量年均增长约30亿立方米。

驱动天然气快速发展的因素主要包括政策、资源、基础设施、价格等方面。通常在能源转型中,加大天然气利用由环保问题触发,政策特别是环保政策和产业政策在天然气发展的关键节点起到主要推动作用,而市场化进程则是天然气产业可持续发展的重要保障。19世纪末20世纪初,美国煤炭消费量占一次能源比例达到80%,1943年洛杉矶光化学烟雾事件后陆续发布《清洁空气法》《清洁电力计划》等,“页岩革命”进一步加速了“气代煤”进程,到2015年,天然气占美国一次能源消费比例升至29%,煤炭下降为16%。1952年伦敦烟雾事件,英国出台《清洁空气法》,伦敦市区及近郊区设禁煤区,1974年颁布《污染控制法》,严格限制煤炭大气污染物排放,鼓励利用天然气,随着煤炭逐步被天然气和石油所替代,困扰欧洲国家多年的煤烟型污染才得以解决。