
ENERGY DEMAND AND SUPPLY IN CHINA

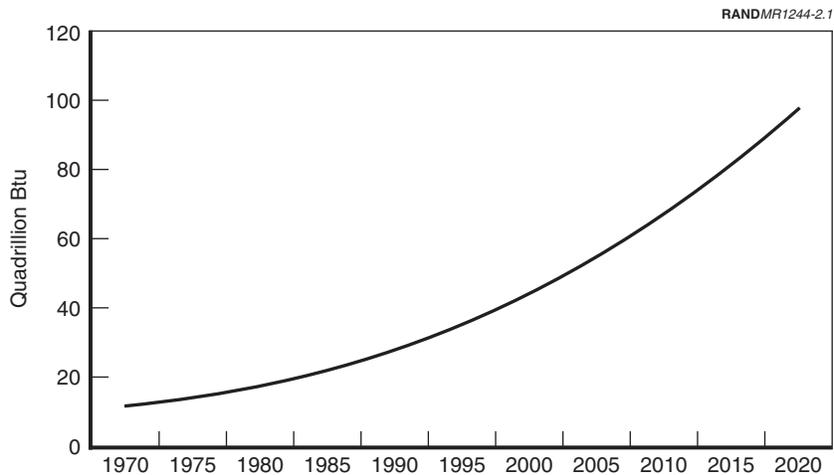
Concerns about China's energy security are rooted in projections of the country's future energy demand and supply. China's consumption of energy is projected to rise dramatically over the next two decades. Rapid economic growth has resulted in a rising demand for energy resources, particularly oil and gas. Prospects for increased domestic production, however, appear to be more limited. The widening gap between consumption and production means that China will become increasingly dependent on imports to satisfy its growing oil and gas requirements.

CHINA'S ENERGY DEMAND

China's spectacular economic growth is largely responsible for its rising energy demand, and projections assume that fairly rapid growth will continue. Gross domestic product (GDP) grew at a rate of 9.8 percent per year during the period 1985–1995 and is expected to average 6.6 percent per year until 2020.¹ China's energy consumption has grown and will continue to grow along with its economy.

As shown in Figure 2.1, total primary energy consumption in China increased from less than 18 quadrillion Btu in 1980 to 37.1 quadrillion Btu in 1996. It is projected to reach 98.3 quadrillion Btu

¹World Bank, *China 2020: Development Challenges in the New Century*, Washington, DC, 1997, p. 21.



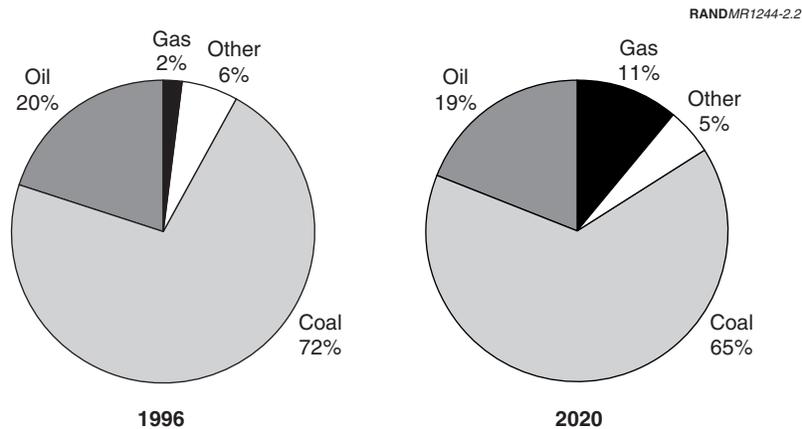
SOURCE: *International Energy Outlook 1999*.

Figure 2.1—China's Total Primary Energy Consumption, 1970–2020

by 2020, which will approach the projected level of primary energy consumption in the United States.²

²Total primary energy consumption in the United States is projected to be 119.9 quadrillion Btu in 2020. United States Energy Information Administration, *International Energy Outlook 1999 (IEO99)*, Washington, DC: Government Printing Office, April 1999, p. 141; United States Energy Information Administration, "China: An Energy Sector Overview," www.eia.doe.gov, October 1997. The *IEO99* projections cited in this report are those for the reference case for China, which assumes an average annual economic growth rate of 6.7 percent for the period 1995–2020. *IEO99* also includes a high economic growth case and a low economic growth case. Projections for the low economic growth case assume an average annual economic growth rate of 3.8 percent. Projections for the high economic growth case assume an average annual economic growth rate of 8.1 percent. *IEO99*, p. 17. It should be noted, however, that there is major uncertainty regarding the measurement of China's GDP and its impact on energy demand. Projections of future energy demand may be inflated because of overestimates of China's economic growth. For evidence that China's statistical authorities have overestimated past growth rates, see Angus Maddison, *Chinese Economic Performance in the Long Run*, Paris: Organization for Economic Cooperation and Development, 1998; and Ren Rouen, *China's Economic Performance in an International Perspective*, Paris: Organization for Economic Cooperation and Development, 1997.

As China's economy continues to grow, its demand for all sources of energy, notably oil and natural gas, will increase. Oil demand is projected to grow at an average annual rate of 3.8 percent during the period 1996–2020, increasing consumption from 3.5 million barrels per day (mb/d) to 8.8 mb/d (see Figure 2.2). However, the share of oil in China's primary energy consumption will remain around 20 percent, partly because of the Chinese government's effort to expand natural gas production and consumption.³ Natural gas demand is expected to grow at an average annual rate of 11.7 percent over the same period, increasing consumption from 0.7 to 9.5 trillion cubic feet (tcf). China's demand for natural gas is growing more rapidly than that for other sources of energy, with the result that natural gas is expected to grow from 2 percent of China's energy consumption in 1996 to 11 percent in 2020.⁴ Increased natural gas consumption is largely responsible for the projected decline in the use of coal from 73 percent to 65 percent of energy consumption between 1996



SOURCE: United States Energy Information Administration.

Figure 2.2—Primary Energy Consumption in China, 1996 and 2020

³IEO99, pp. 141 and 145.

⁴IEO99, pp. 141 and 146.

and 2020, although demand for coal is expected to grow at an average annual rate of 3.6 percent during this period.⁵ Demand for nuclear energy and renewable sources of energy also is projected to increase, but those sources will likely remain a tiny fraction of primary energy consumption because of financial, technological, and ecological constraints.⁶

CHINA'S ENERGY SUPPLY

Domestic resources will not be able to meet China's rising demand for energy in general and oil and gas in particular. Although China is rich in energy resources on an absolute basis, it is poorly endowed on a per capita basis. China's vast coal reserves will continue to provide most of its energy well into the foreseeable future. The nation's oil and natural gas supply, however, will increasingly be unable to satisfy demand.

China's oil supply situation is precarious. China has proven oil reserves of 24 billion barrels (bb), which constitute just 2.3 percent of the world total for a country with 22 percent of the world's population.⁷ Estimates of China's potential reserves are highly speculative. Figures provided by the Chinese government are suspected to be artificially high to attract foreign investment, while those offered by oil companies may be artificially low to strengthen their bargaining position vis-à-vis the Chinese government. Scattered evidence suggests an industry consensus of around 68 bb for total proven and potential reserves. This estimate includes 39 bb for onshore reserves and 29 bb for offshore reserves, divided between the East China Sea

⁵*IEO99*, pp. 141 and 147.

⁶Demand for nuclear energy is projected to grow at an average annual rate of 9.2 percent between 1996 and 2020, and its share of primary energy consumption is expected to increase from 0.3 percent in 1996 to 1.1 percent in 2020. Demand for renewable sources of energy is projected to grow at an average annual rate of 3.2 percent over the same period, and that share of primary energy consumption is expected to remain around 5 percent. *IEO99*, pp. 141, 145–149.

⁷British Petroleum Company, *BP Statistical Review of World Energy*, London, 1998, p. 4.

(12 bb), the South China Sea (including the Taiwan Strait) (8 bb), the Yellow Sea (4.5 bb), and the Bohai Gulf (4.5 bb).⁸

China's growing demand for oil production is exacerbated by the fact that the major oil fields in eastern China, which account for about 90 percent of total crude production, have peaked and are in decline. Furthermore, efforts to develop both offshore reserves and the Tarim Basin in Xinjiang Uighur Autonomous Region have proved disappointing. Offshore production for 1996 was around 7.3 million barrels, only 10 percent of total output at a cost more than double that of onshore wells.⁹ The potential profitability of oil exploration in the Tarim Basin, once likened to Saudi Arabia, is being seriously questioned. Investment is declining because of the failure of both Chinese and foreign companies to make the kind of discovery that would confirm the basin, which has proven reserves of only 1.5 bb, as a major oil source.¹⁰ Nonetheless, China's oil production is projected to grow somewhat over the next two decades, increasing from 3.1 mb/d in 1996 to 3.6 mb/d in 2020. This growth in production, however, will not be able to keep pace with consumption, which is projected to increase from 3.5 mb/d to 8.8 mb/d over the same period.¹¹

China's natural gas supply is more limited than oil. Proven gas reserves are listed as 41 trillion cubic feet, 0.8 percent of the world total.¹² These reserves are largely undeveloped as a result of policies based on the view that natural gas exploration and production are subordinate to oil exploration and production as well as a lack of investment, infrastructure, and technology. However, environmental concerns, chronic energy imbalances and shortages, and rising petroleum imports have motivated the Chinese government to de-

⁸These estimates exclude areas defined by China as part of the continental shelf jurisdiction but not treated as such by the UN Law of the Sea Treaty. Disputed areas in the South China Sea are also excluded. Mamdouh G. Salameh, "China, Oil and the Risk of Regional Conflict," *Survival*, Vol. 37, No. 4, Winter 1995-1996, p. 134.

⁹Nicolas Becquelin, "The Oil Industry in China Since the Reforms of the Open Door Policy," *China Perspectives*, No. 9, January/February 1997, p. 24.

¹⁰Pamela Yatsko, "Oh Well, China's Tarim Basin Is Proving a Big Disappointment," *Far Eastern Economic Review*, 19 September 1996, pp. 68-69.

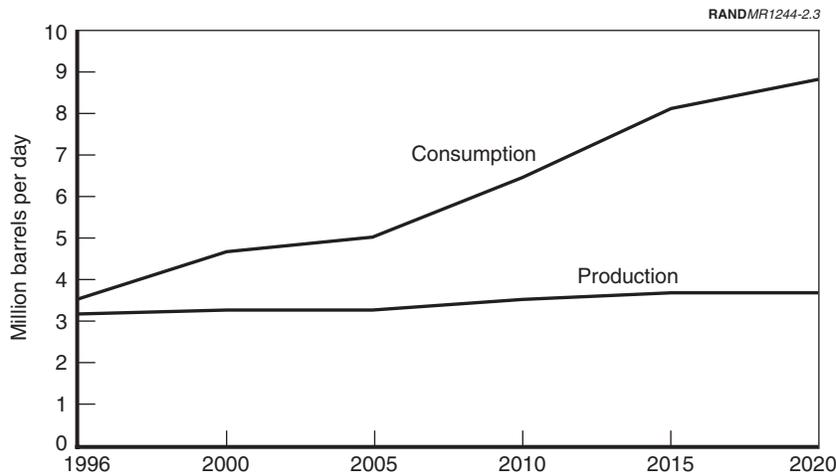
¹¹*IEO99*, pp. 145 and 201.

¹²British Petroleum Company, p. 20.

velop its natural gas reserves. Most of China's natural gas is currently used for industrial purposes, but the share used for power generation and residential cooking and heating is expected to expand significantly. Natural gas production in China is projected to increase from 654.6 billion cubic feet in 1995 to 3.8 trillion cubic feet in 2020, with demand expected to increase from 654.6 billion cubic feet in 1995 to 5.5 trillion cubic feet in 2020.¹³

CHINA'S ENERGY IMPORT REQUIREMENTS

The widening gap between China's oil supply and demand and the projected gap between natural gas supply and demand mean that China will be increasingly reliant on imported oil and gas. As shown in Figure 2.3, the shortfall between oil consumption and production was 400,000 barrels per day in 1996 and is projected to grow to



SOURCE: *International Energy Outlook 1999*.

Figure 2.3—China's Demand for Oil Imports

¹³Cambridge Energy Research Associates.

around 5.2 mb/d in 2020.¹⁴ Without new discoveries, this means that China's oil import dependence will increase from around 11 percent in 1996 to almost 60 percent in 2020.¹⁵ China is projected to begin importing natural gas around 2005. The share of imports in China's natural gas consumption is expected to be at least 30 percent by 2020.¹⁶ Without the discovery of substantial new reserves or a decision by the Chinese government to backtrack from its policy of market reform and restrict imports, these statistics indicate that China's reliance on foreign sources of oil and gas will grow over the next two decades.

¹⁴*IEO99*, pp. 145 and 201; United States Energy Information Administration, *International Energy Outlook 1998 (IEO98)*, Washington, DC: Government Printing Office, April 1998, p. 175.

¹⁵These calculations are derived from *IEO98* and *IEO99*.

¹⁶Cambridge Energy Research Associates. This statistic does not include liquefied natural gas (LNG) imports. Given the Chinese government's recent decision to begin importing LNG around 2005, this number may increase.