

China's Strategic Petroleum Reserves: A Reality Check

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Summary

China consumed about 9.2 million barrels of oil per day in 2010, of which 4.8 million barrels per day (52 per cent) was imported. Analysts believe that, by 2020, nearly 65 per cent of the oil consumed in China will have to be imported. According to China's stated policy on SPR, the country plans to maintain an SPR of 500 million barrels of oil, equivalent to 100 days of consumption at normal rates. The discussion for the need for an SPR began in 1993, although the construction of the first four SPR projects commenced only in 2004 with a capacity of about 103 million barrels. By 2009, all of the country's Phase 1 SPR projects were in operation, containing about two weeks supply of oil. The oil that filled the first SPR facilities averaged \$58 per barrel, much lower than the average price during the period, thanks to the global financial downturn. In 2009, construction commenced on a second batch of SPR projects for Phase 2, with a designed capacity of 169 million barrels, while a third batch of SPR locations are undergoing the site selection process. The third group of SPR projects will also have a capacity of 169 million barrels, and is likely to be finished by 2020. Some sources suggest that this figure may be 204 million barrels or 28 million tonnes for both Phase 2 and Phase 3. These different figures notwithstanding, within a decade, China's SPR would have a capacity of about 100 days worth of imported consumption at present consumption rates. While this may be the stated policy of the Chinese government, an analysis of the existing capacities seems to suggest that China may be in a position to store much larger strategic oil reserves should it desire to increase its SPR beyond the stated 100 days. This issue brief analyses the extra capacity that China can possibly store, its financial effect, and the global implications of utilising its complete capacity of oil storage.

Strategic Petroleum Reserve (SPR) is the emergency fuel storage of oil maintained by a nation. It can also be defined as a nation's first line of defence against an interruption in the regular petroleum supply chain. The strategic oil reserve is crucial for a nation's energy security, especially when its domestic production is limited and the sea lanes through which oil comes to its shores are extended. SPR was recommended to be maintained by all countries by the International Energy Agency (IEA) in the aftermath of the first oil shock in 1973. Due to various reasons like lack of government control and large private enterprises in the oil sector, China entered the SPR business quite late. The country's lack of strategic oil reserves became a matter of concern during the steep oil price surge during 2004–2007, which left Chinese oil companies with huge losses in contrast to the US and Japan which maintain SPR of up to 100 days. SPR stocks absorb the price shock and enable countries to take advantage of falling prices to build storages. But more importantly, SPR doubles up as war reserves. It was only in the 12th Five Year plan that China pledged to “reasonably plan energy infrastructure and improve oil reserve system”¹ with the commencement of building a SPR.

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¹ Yan Pei, “China Picks Sites for Second Oil Reserve Phase”, 26 July 2011, available at <http://www.china.org.cn/business/2011-07/26/content-23074277.htm>, accessed on 4 September 2011.

² China Energy Data and Statistics, available at <http://www.eia.gov/cabs/china/Full.htm>, accessed on 18 April 2012.

³ Wang Qian, “Oil Imports Hit Alarming Level in China: Study”, *China Daily*, 14 January 2010, available at http://www.chinadaily.com.cn/bizchina/2010-01/14/content_9317926.htm, accessed on 4 September 2011.

⁴ Xina Xie, “Strategic Petroleum Reserve in China”, *Energy Tribune*, 8 July 2010.

million tonnes for both Phase 2 and Phase 3.⁵ These different figures notwithstanding, within a decade, China's SPR would have a capacity of about 100 days worth of imported consumption at present consumption rates. While this may be the stated policy of the Chinese government, an analysis of the existing capacities seems to suggest that China may be in a position to store much larger strategic oil reserves should it desire to increase its SPR beyond the stated 100 days. *This issue brief analyses the extra capacity that China can possibly store, its financial effect, and the global implications of utilising its complete capacity of oil storage.*

In 2007, China announced an expansion of its crude reserves into a two part system. Chinese strategic oil reserves would consist of a "government controlled strategic reserve" and a mandated commercial reserve also called "enterprise reserve".⁶ However, Chinese sources are more specific and state that China's oil reserve system can be divided into four grades: SPR, oil reserve maintained by local governments, commercial reserve at State-owned oil companies, and other medium- and small-sized oil companies.⁷ SPR provides China with a measure of security on the oil supply front, but the facilities are monopolised by the big national oil companies. It was only as recently as May 2010 that the government took a decision to open up the SPR to commercial entities when several private enterprises were allowed to join the SPR business for the first time.

Government Reserves

The government reserves were planned to be completed in three phases as under:

- Phase 1: 16.4 million cubic metres or 103 million barrels (approximately 31 days of net imports or 15 days of total consumption) in four sites.
- Target for Phase 2: Another 26.8 million cubic metres or 169 million barrels, totalling 272 million barrels (approximately 60 days of net imports or 33 days of total consumption).
- Target for Phase 2: To establish 500 million barrels of SPRs.⁸

⁵ Ibid. Also see, Ministry of Finance, Government of People's Republic of China Report dated 20 July 2006, available at http://www.mof.gov.cn/zhengwuxinxi/caijingshidian/zgzb/200805/t20080519_24105.html, accessed on 3 May 2012.

⁶ See [http://en.wikipedia.org/wiki/strategic_petroleum_reserve_\(China\)](http://en.wikipedia.org/wiki/strategic_petroleum_reserve_(China)), accessed on 6 September 2011.

⁷ Yu Hongyan, "Oil Reserve to Reach 85m Tons by 2020", *China Daily*, 18 January 2011.

⁸ "Building a Long Term Energy Relationship between Alberta and China", Report by China Institute of University of Alberta, available at http://www.china.ualberta.ca/~media/University%20of%20Alberta/Administration/Academic/China%20Institute/Documents/Energy_Report_Rev.pdf, accessed on 19 April 2012. Also see, China mining report available at http://app.chinamining.com.cn/Newspaper/E_Mining_News_2012/2012-03-29/1332989348d57827.html accessed on 3 May 2012.

The details of the SPR are:⁹

- Phase 1: To stock 101.9 million barrels (the exact quantity of barrels varies from source to source due to conversion factor of tonnes/cubic metres to barrels), approximately 14 million tonnes, by 2008.¹⁰ This was completed in time. The locations are as given below:
 - Dalian, Liaoning Province – approximately 19 million barrels.
 - Qingdao, Shandong Province – approximately 19 million barrels.
 - Zhenhai, Zhejiang Province – approximately 33 million barrels in 52 over-ground tanks.
 - Zhoushan, Zhejiang Province – approximately 33 million barrels; to be increased by 15 million barrels (2.5 million cubic metres) subsequently.
- Phase 2: To stock 169 million barrels, approximately 23 million tonnes. (Some sources suggest 204 million barrels or 28 million tonnes).¹¹ The locations are:
 - Dushanzi, XUAR – 33 million barrels (5.4 million cubic metres) at a cost of 2.65 billion Yuan.
 - Lanzhou, Gansu Province – 19 million barrels.
 - Huangdao, Shandong Province – 19 million barrels (3.2 million cubic metres) in 32 over ground tanks.
 - Jinzhou, Liaoning Province – 18 million barrels (3 million cubic metres) underground.
 - Zhanjiang, Guangdong – Details Not Known (DNK).
 - Huizhou, Guangdong – 30 million barrels (5 million cubic metres).
 - Jintan, Jiangsu – 18 million barrels (3 million cubic metres) underground.
 - Shanshan, XUAR – 49 million barrels (8 million cubic metres) at a cost of 6.5 billion Yuan.

⁹ Wu Peng Wang Xiaozong, "Description of China's Strategic Oil Reserves", translated from *China Oil Weekly*, 17 January 2011, available at <http://hexun.com/2011-01=17/126848881.html>, accessed on 2 May 2012.

¹⁰ Various sources have different figures for each phase varying from 101.9–103 million barrels for phase 1 and 169 or 170 million barrels for phases two and three. For purposes of symmetry in this paper, the figures of 102 and 169 million barrels may be assumed for all calculations.

¹¹ See note 5.

- Phase 3: 204 million barrels by 2020. The locations are likely to be as under:-
 - Wanzhou, Chongqing Municipality – DNK.
 - Henan Province – DNK.
 - Caofeidian, Hebei Province – DNK.
 - Tianjin – 60 million barrels (10 million cubic metres).

In addition to the above, local governments maintain a “local government reserve”. While the exact details in this regard are not easily accessible, a broad guideline would appear to be the local government reserves of Guangdong province which were at 20 days in 2008; the province is endeavouring to increase it gradually to the mandated 90 days.¹²

Enterprise Reserve

The exact details of China’s enterprise reserve are not clear.¹³ Only Wikipedia has identified the figure as 209.44 million barrels,¹⁴ which has not been authenticated by any official Chinese government sources. However, *China Daily* reported that by 2009 “commercial reserve capacity at oil enterprises came to 300 million barrels, with the country’s major oil firms Sinopec and CNPC accounting for 50 percent and 40 percent, respectively.”¹⁵ China has massive private oil storage facilities, built up by oil companies since the country opened its oil markets to private operators in the mid-1990s. Since China National Petroleum Corp (CNPC) and China PetroChemical Corp (Sinopec) control oil-importing licenses, in 2008, hundreds of private oil distributors and refiners were sitting on empty tanks.¹⁶

Zhao Youshan, head of the Petroleum Distribution Committee of the China General Chamber of Commerce, an industry group, submitted a proposal to harness 230 million tonnes (one tonne equals 7.33 barrels) worth of storage tanks, available with 600 private oil companies all over China.¹⁷ Just how did China get such a massive idle storage capacity? In the 1980s

¹² Hao Zhou, “Guangdong Plans 2 Oil Storages to Ease Shortage”, *China Daily*, 27 July 2008.

¹³ There are no authentic Chinese or other sources confirming the exact details of mandated “Enterprise Reserve”. However, going by proportion, the filling of SPR in Phase 1 was 102 million barrels of government reserve (by 2008) and 300 million barrels of commercial reserve (by 2009), i.e., in an approximate ratio of 1:3.

¹⁴ See [http://en.wikipedia.org/wiki/Strategic_Petroleum_Reserve_\(China\)](http://en.wikipedia.org/wiki/Strategic_Petroleum_Reserve_(China)), accessed on 25 April 2012.

¹⁵ Yu Hongyan, note 7.

¹⁶ Sun Xiaonhua, “China to Bolster Oil Reserves”, *China Daily*, 2 March, 2009.

¹⁷ Ibid.

and 1990s, the Chinese petroleum and petrochemical industry was relatively open. In the absence of a regulatory body, exploitation of oil mining and establishment of refining assets by private players was permitted. In fact, 85 per cent of the oil business was owned by private companies and there were no fewer than 3,340 such companies.¹⁸ They accounted for 33.4 per cent of the refining industry and 56.3 per cent of the gas stations in the retail business.¹⁹ In 1998, the Chinese government took control of the oil and petrochemical industry, forcing two-thirds of the private players to close down their business. Thus, a total of 663 private enterprises were left in the oil business in 2007.²⁰ The China Chamber of Commerce Oil Distribution Committee statistics show that of these 663 private companies, 247 are in the storage business and have built up a *total storage capacity of 230 million tonnes* at a cost of 770 billion Yuan.²¹

Xina Xie writes in the *Energy Tribune*:

Sinopec has 50 percent of the capacity in the SPR and PetroChina has 40 percent. However, in May several private enterprises have been allowed to join the SPR business for the first time. *Even before the bidding, those companies had storage space and piers for oil transportation and storage. It is estimated that the private storage capacity is as high as 220 million barrels (emphasis added)*²². Recent news reports indicate that six companies have won bids to participate in the SPR and they will contribute about 9.4 million barrels of storage capacity.²³

Zhao Youshan's proposal is a win-win for the Chinese government. It would create existing capacities far in excess of the planned capacities, which would be readily available for immediate use with almost no investment by the government. More importantly, it allows China to increase its SPR levels to well above the 90 days recommended by the IEA.

¹⁸ See, "Three Barrels of Oil Monopoly Reactive", a translated report from Hong Kong's Ta Kung Pao Southwest office, dated 21 September 2010, available at <http://cq.takungpao.com/content.asp?i>, accessed on 2 May 2012.

¹⁹ Ibid.

²⁰ Ibid.

²¹ See Shi Nei Kong Qi Jing Hua, "China National Petroleum Reserve System to Start the Three Level", translated report, 6 January 2009, available at <http://en.cn-iaq/pub/Info3346.aspx>, accessed on 2 May 2012.

²² "Strategic Petroleum Reserves in 2020 to 85 Million Tonnes", *China Review News*, 18 January 2011, available at www.chinareviewnews.com, accessed on 18 May 2012, wherein private oil companies storage capacity is given as 230 million tonnes. Also see, Sinopec Shanghai Zheshe Futures company report, which when translated from Mandarin mentions private oil storage capacity in China as 230 million tonnes, available at <http://www.zsqh.com/Research/Research/122010/44619.html>, accessed on 16 May 2012.

²³ Xina Xie, note 4.

The IEA has repeatedly criticised Beijing for not publishing national oil stock volume figures, which are needed to calculate global oil demand. By the end of 2010, China's petroleum reserve capacity was enough for 39 days of consumption, comprising of SPR oil and a further 168 million barrels of commercial reserve capacity. The country's second phase of SPR is expected to be completed by 2012, with eight sites scheduled to be ready. This will likely boost SPR capacity to 37.53 million tons or 270 million barrels. When China finishes filling its reserve of about 500 million barrels, it will roughly equal three months of imports and constitute the second-largest stockpile in the world.²⁴ Analysts believe that the Libyan oil crisis and the Iranian oil embargo are likely to drive nations to increase stockpiles. In respect of China's SPR it is said "With the expectation that prices are going to rise, they will accelerate the pace of tank-filling," says K.F. Yan, director at energy consultants CERA in Beijing.²⁵

There are reports, however, from *China Economic Weekly*, a magazine run by the official *People's Daily*, that China's total SPR capacity could increase to 85 million tonnes or 621 million barrels by 2020 when the three phases of storage facilities are completed.²⁶

Assessment of Actual Reserve Capability

The distinction between commercial and strategic petroleum reserves in China is blurred as major state-owned oil companies are mandated to oversee some of these stocks. With such a large commercial storage capacity of 230 million tonnes, equivalent to 1,685 million barrels,²⁷ China's capacity to actually store reserves by the year 2020 would be 2,185 million barrels. This translates to 168 days of consumption at normal rates or 257 days of import²⁸ (see notes 27 and 28 for calculations). Thus, there is a huge ambiguity between capacities

²⁴ Tyler Durden, "DOE Announces Details of Strategic Petroleum Reserve Firesale", 23 June 2011, available at <http://www.zerohedge.com/article/doe-announces-details-strategic-petroleum-reserve-firesale>, accessed on 18 April 2012.

²⁵ Ibid.

²⁶ "FACTBOX—China's Strategic Oil Reserve Plan", *Reuters*, 25 January 2011, available at <http://mobile.reuters.com/article/article/idUSTOE70J06X20110125?irpc=932>, accessed on 16 April 2012. Also see "Oil Reserve to Reach 85m Tons by 2020", *China Daily*, 18 January 2011.

²⁷ One tonne = 7.33 barrels; 230 million tonnes = 1,685 million barrels. Thus 1685 + 500 (SPR) = 2,185 million barrels.

²⁸ "China Oil Demand Expected to Hit Almost 560 Million Metric Tonnes by 2015", Singapore (Platts), 24 May 2011, quotes Liu Xiao Li of the Energy Research Institute, part of China's economic planning agency, the National Development and Reform Commission, as stating that China's consumption will go to 13–14 million barrels per day (mbd) by 2020 with 65 per cent of oil being imported. Also see, Interfax China at <http://www.interfax.cn/news/20076>. At 13 million barrels per day, 65 per cent is approximately 8.5 million barrels per day of import. Thus, 2,185 million barrels of storage is equal to 168 days of consumption at normal rates (13 mbd) or 257 days of import (8.5 mbd).

and actual holdings. Based on the report²⁹ that 300 million barrels of commercial reserve and 102 million barrels of government reserve were filled by 2008–09, it would be prudent to assess the ratio of filling of government reserve to enterprise reserve at 1:3. When this ratio is extrapolated to the stated SPR policy target of 500 million barrels, China can store 1500 million barrels of commercial reserve. Thus, China has the capacity to maintain an overall reserve ratio of 500 million barrels of “government controlled strategic reserve” and 1,500 million barrels of ‘commercial reserve’, adding up to a grand total of 2,000 million barrels of SPR. Interestingly, this figure is close to China’s assessed overall capacity of 2,185 million barrels. According to the *Wall Street Journal*, the Chinese daily *Xinhua* only publishes the monthly percentage change estimates of commercial stockpiles and does not provide volumes of oil held in stocks, while government departments do not release stock figures.³⁰ China treats SPR details as a secret. The lack of authentic and accurate figures lends credibility to speculation about China’s SPR plans. It would be prudent to state that this is the assessed capacity; how much China actually utilises may be much lesser.

How much SPR can China fill every year? Based on data released by the IEA for China for the year 2009, China’s total supply of crude (domestic production plus import) was 3,831 million metric tonnes. Of this 3,711 million metric tonnes was transformed through the refining processes, leaving almost 10.1 million metric tonnes (74.03 million barrels) of crude available for strategic/buffer storage. This gave China a capacity to fill 74.03 million barrels or 202,830 barrels per day of SPR capacity in 2009.³¹ While it is difficult to calculate the same for 2012, for the first quarter ending March 2012 alone, Platts³² figures for China suggest that it has stored/saved 1.87 million metric tonnes of crude oil (13.70 million barrels). If extrapolated for the entire year, the crude available for strategic/buffer storage could be almost 7.5 million metric tonnes (55 million barrels) – a figure which indicates that China’s plans of filling 169 million metric tonnes of Phase 2 of the SPR could be on target. In fact, at an annual average of 10 million metric tonnes through 2009–2011, China may have already completed filling Phase 2 of the SPR in 2011 alone. The latest IEA 2012 report states, “we also noted that new strategic storage capacity in China could accommodate

²⁹ Yu Hongyan, note 7.

³⁰ *Wall Street Journal*, 21 March 2012, available at <http://online.wsj.com/article/BT-CO-20120321-702248.html>, accessed on 19 April 2012.

³¹ See IEA Energy Statistics 2009, available at http://www.iea.org/stats/oildata.asp?COUNTRY_CODE=CN accessed on 27 April 2012. The total supply, import + domestic output was 3,81,305,000 metric tonnes and the transformed amount was 3,71,158,000 metric tonnes leaving a spare of 10,147,000 tonnes or 78,131,900 barrels for 2009.

³² See Platts Report, *China’s Oil Demand Drops in March*, 24 April 2012, available at <http://www.platts.com/PressReleases/2012/042412>, accessed on 27 April 2012. The total supply for March was $(17.27 + 23.55) = 40.23$ million metric tonnes and the transformed amount was 38.37 million metric tonnes, leaving a spare of 1.63 million metric tonnes for March 2012 alone.

150–200 kb/d (150–200,000 barrels per day) of crude, over and above expected Chinese products demand growth, if spread evenly over 2012.”³³ This could translate to at least 10 million metric tonnes (73.3 million barrels) in 2012.

India’ Strategic Petroleum Reserves

India imports nearly 80 per cent of its crude consumption and has also commenced constructing its own SPR to cater for potential supply disruptions. India’s Integrated Energy Policy 2006 recommends a 30-day SPR, to be gradually built up to 90 days in keeping with IEA guidelines. The Government of India has also set up the Indian Strategic Petroleum Reserves Ltd (ISPRL) under the auspices of the Ministry of Petroleum and Natural Gas. ISPRL is constructing reserves with a capacity of five million tonnes of crude oil (36.7 million barrels) or about 10 days of consumption to be stored in underground rock caverns at three locations, one on the east coast at Vishakapatnam (one million metric tonnes) and the other two on the west coast at Mangalore (2.5 million metric tonnes) and Padur (1.5 million metric tonnes).³⁴ The projects are slated for completion in 2012. SPR does not come cheap. It is estimated that based on the current price of about US \$110 per barrel, the facilities will contain \$4 billion worth of crude oil. The capital cost of such a facility is Rs 1225.2 crore (approximately US\$ 250 million) and the maintenance cost will be Rs 29.3 crore (\$5.8 million).³⁵

Other Factors

Since no cost figures are available for China’s SPR, using similar cost figures as applicable for India, China’s SPR of 70 million metric tonnes (approximately 500 million barrels) is likely to incur a capital cost of \$3.5 billion, a recurring maintenance cost of \$81.2 million besides the cost of crude at \$55 billion – a grand expenditure of approximately \$60 billion.³⁶ But should China use its full capacity of 2,185 million barrels or 298 million tonnes, the cost would escalate to \$256 billion!

Besides the huge cost, SPR also has political implications. The political party in power can be tempted to misuse this huge oil reservoir as a popularity tool at critical junctures of governance by releasing it partly or as a whole to auctioneers or oil companies at below

³³ See International Energy Agency, *Oil Market Report 2012*, available at <http://omrpublic.iaea.org/currentissues/full.pdf>, p. 3, accessed on 12 May 2012.

³⁴ Rajeev Lala, *StratPost*, 3 November 2011, available at <http://www.stratpost.com/wp-content/uploads/2011/09/SP.jpg>, accessed on 20 December 2011.

³⁵ As quoted in the Integrated Energy Policy, Report of the Expert Committee, Planning Commission, Government of India, August 2006, p. 64.

³⁶ Calculated at \$110 a barrel and daily import of 8.5 mbd as expected in 2020.

prevailing costs to gain public approval. It can also be used to impact oil prices and influence markets. Unforeseen crises tempt political leaders to “do something” in order to appear responsive to the will of the people. In June 2011, President Obama released 30 million barrels from the American SPR into the market, the third time ever in its 31-year history, which led to severe criticism as it drove oil prices down³⁷ besides reports that the oil thus released may have found its way to filling up China’s SPR.³⁸ Anthony J. Alfidi, an investment analyst, puts it very succinctly:

“Tapping a reserve intended to provide an emergency supply for national defence just to lower pump prices for American casual motorists is a huge error....Politicians now consider the SPR to be a political football that can win votes from Americans addicted to spontaneous driving.”³⁹

Implications of Enhanced Oil Capacities

- China has the capacity to stock up a maximum of 168 days of oil consumption at normal rates or 257 days of imports. *This capacity is enhanced by existing commercial enterprises at no additional capital cost to the exchequer.* Of course, commercial storages will incur expenditure on rentals or maintenance, but this will be a fraction of the cost of constructing huge storages. This additional capacity, over and above the mandated 90 days recommended by the IEA, gives China flexibility in various ways – buffering against oil price spikes, diverting additional stocks for specific use, and short term bailouts for oil companies.
- Such large storage capacities, if filled, *will significantly mitigate China's “Malacca dilemma”.* With 168 days of oil reserves capacity, by 2020, China need not be concerned about oil blockades or threats to its energy security. While it is reasonable to assume that large-scale diversion of crude oil is difficult to conceal, particularly the imported component, it is possible to divert domestic production towards stockpiling SPR. Military planners need to:
 - Base assessments on capacities rather than stated policies.
 - Track the total oil supply carefully (domestic production plus imports) and the

³⁷ Ayesha Rascoe and Timothy Gardner, “Obama Takes Flak for Tapping Emergency Oil Reserves”, *Reuters*, Washington, 23 June 2011. Also see, Coral Davenport, “Using SPR like a Spigot”, *National Journal*, 15 March 2012, available at <http://www.nationaljournal.com/energy/using-the-strategic-petroleum-reserve-like-a-spigot-20120315>, accessed on 18 May 2012.

³⁸ Tyler Durden, note 28.

³⁹ See <http://alfidicapitalblog.blogspot.in/2011/03/misuse-of-strategic-petroleum-reserve.html>, accessed on 24 April 2012.

throughput figures to calculate crude available for diversion to SPR.

- These huge strategic reserves, if filled in a hurry, will in the long term cause a *strain on the world energy resources*. Experts believe China will need 100,000 barrels per day for years to come to fill its SPR.⁴⁰
- Excessive oil can be used as an *economic weapon*. A US Congressional Research Service report cites the example of the drawdown of the US SPR in the First Gulf War, which triggered a steep \$10 per barrel drop in oil prices to below \$20 a barrel when President Bush ordered its release just as the first air strike commenced against Iraq in January 1991.⁴¹ Triggering such “oil shocks” in a nervous oil market can severely impact the economies of nations.
- In times of need, China can use the capacities as *leverage with smaller nations and create dependence*. Surplus oil can thus be an effective tool of diplomacy.
- At current average rates of filling of SPR per year (10 million metric tonnes or 74 million barrels), China has the capacity to complete its Phase 3 of 170 million barrels by 2015, *five years ahead of schedule*. As a corollary, China can fill an additional 50 million tonnes or 370 million barrels of SPR by 2020.

⁴⁰ Daniel Nieh, “The People’s Republic of China’s Development of Strategic Petroleum Stockpiles”, CUREJ, University of Pennsylvania, p. 24.

⁴¹ See Anthony Andrews and Robert Pirog, “The Strategic Petroleum Reserve and Refined Product Reserves: Authorization and Drawdown Policy”, Congressional Research Service, March 2011, p. 9.