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The People's Republic of China's Development of Strategic Petroleum Stockpiles

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Abstract
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Keywords
East Asian Literature and Civilizations, Ayako Kano, Ayako, Kano, China, PRC, Oil, Petroleum, Stockpile, Reserve, Security, Economic, Resource nationalism

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List of Abbreviations

PRC	People's Republic of China
WTO	World Trade Organization
IEA	International Energy Association
WTI	West Texas Intermediate (Crude oil benchmark)
NYMEX	New York Mercantile Exchange
CNOOC	Chinese National Offshore Oil Company
EWC	East-West Center
FACTS Inc	Fesharaki Associates Consulting and Technical Services, Incorporated
SPR	Strategic Petroleum Reserve (US)
EPCA	Energy and Policy Conservation Act
DOE	Department of Energy (US)
MMS	Minerals Management Service
OPEC	Organization of Petroleum Exporting Countries
OECD	Organization of Economic Cooperation and Development
APEC	Asia-Pacific Economic Cooperative
ASEAN	Association of Southeast Asian Nations
ASEAN + 3	The ten countries of ASEAN and Japan, China and South Korea
JOGMEC	Japan Oil, Gas and Metals National Corporation
METI	Ministry of Economy, Trade and Industry
KNOC	Korean National Oil Company
Bbl	Barrel
b/d	Barrel per day
mb/d	million barrels per day

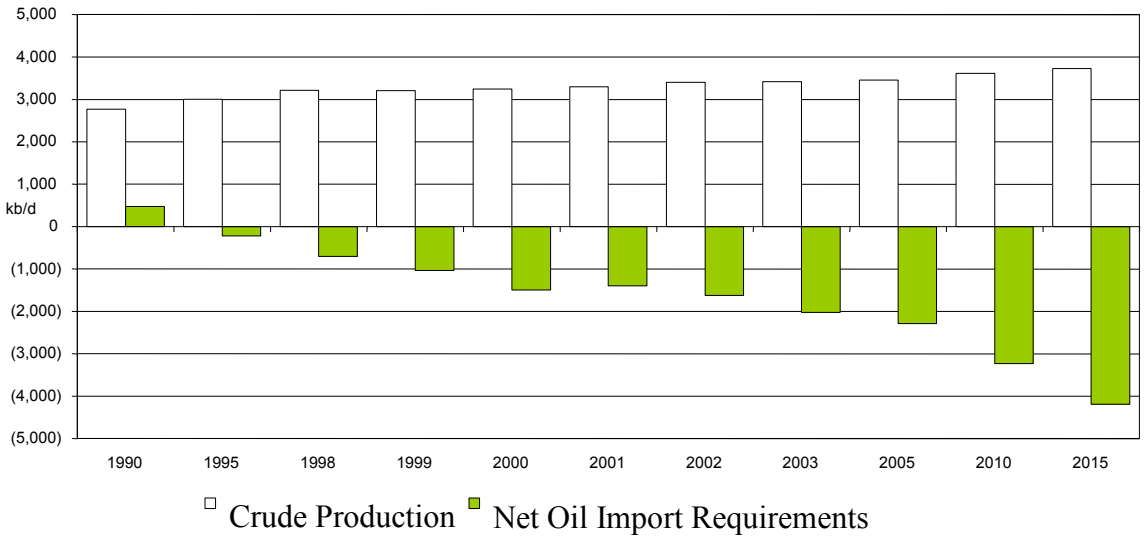
1.1 Introduction: China and Energy Security in the 21st Century

Today, few issues loom larger in the realm of international relations than the competition for the world's dwindling supply of oil. At the same time, the People's Republic of China's transition from third world economy to global superpower constitutes the greatest challenge to the post-Cold War world order. If America's rise to global hegemonic power was the story of the 20th century, China's similar emergence may be the story of the 21st. So it is not surprising that China's energy security—the confluence of these two issues of immeasurable global import—is garnering more and more international attention.

China's role in the global oil market has only recently become a subject of international concern. China's economic reform began in 1978, but not until the PRC's accession to the World Trade Organization in 2001 did Western apprehension of China's rise begin to approach today's fervent pitch. Producing more oil domestically than Venezuela, Iraq or Kuwait, China did not become a net importer of oil until 1993 (see figure 1). China's oil consumption passed Japan's in 2002; today, only the United States consumes more oil than the PRC. Then, in 2004, China's oil imports increased by an unprecedented 49 percent, contributing to a 33 percent jump in global oil prices. By some calculations, China has accounted for about 40% of incremental world oil demand in the past 5 years.[1]

[1] *BP Statistical Review of World Energy*, June 2005.

Figure 1: China Crude Production and Net Oil Import Requirements (1990-2015)[2]



Turmoil in Venezuela, Iraq and Iran, natural disaster in the Gulf of Mexico and continued strong global oil demand growth have led to record nominal crude oil prices in the second quarter of 2006. High prices have focused attention to the geopolitical oil situation and, unsurprisingly, China.

1.2 Distinctive Characteristics of the Oil Market

Oil consumers, producers and traders buy and sell oil on global commodities markets, and crude oil behaves much like other commodities such as steel, timber and diamonds. However, oil is the world's most strategic resource. Its scarcity and its centrality to the world economy prevent it from adhering to the rules of market economics. The term "energy security" refers almost exclusively to oil, and within that context, mostly to the supply of oil imports; other sources of energy, including nuclear, hydroelectric, and coal, are relevant to energy security only in that they constitute opportunities to become less dependent less on oil. Many oil majors, such as Saudi Aramco, the world's largest company, are state-owned; these firms tend to prioritize

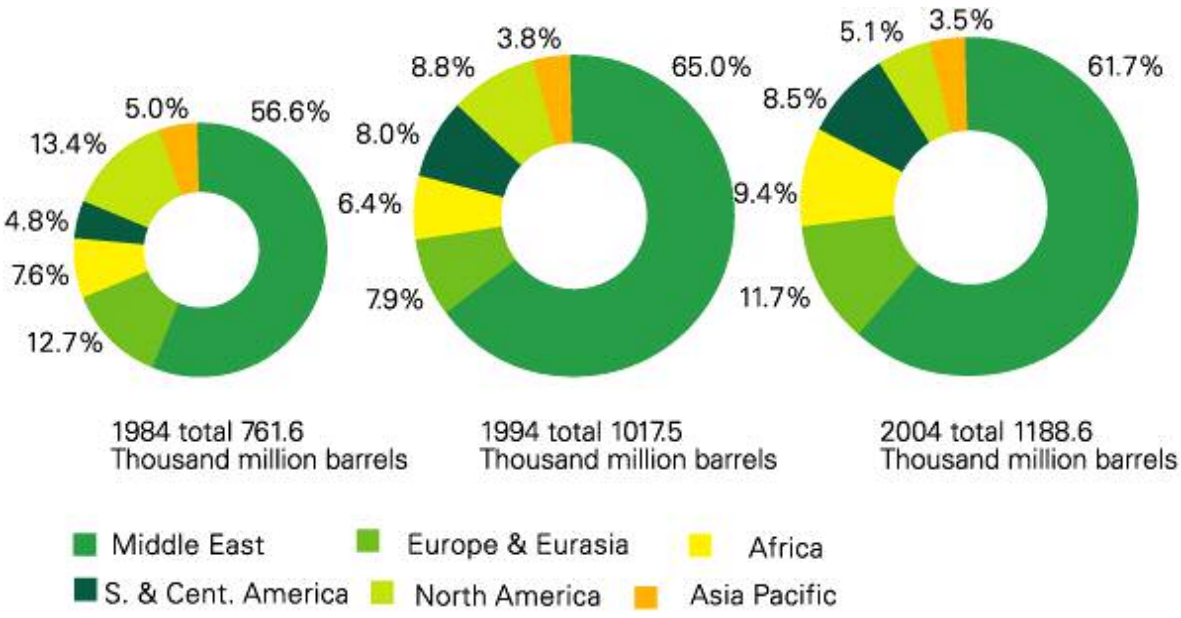
[2] FACTS Inc, "China Multi-Client Study," 2002.

government policy above profitability. All of China's significant oil companies fall into this category.

The irregularity of the oil market extends beyond state control of oil companies. Governments frequently meddle in demand side oil economics. Around the world, oil is heavily taxed and subsidized. Domestic price controls in large markets including China and India remain obstacles to oil market liberalization.

Intense politicization also affects the behavior of the global oil outlook. The vast majority of the world's proven oil reserves[3] lie in the Middle East, North Africa, South America and central Asia; today, these areas are rent by political and ethnic strife.

Figure 2: Distribution of Proved Oil Reserves 1984,1994, 2004[4]



The United States accounts for roughly one fourth of global oil consumption, and the quest for energy security exerts a significant influence on United States foreign policy. As the world's largest consumer, largest importer and third largest producer of oil, the United States is

[3] Note that "reserve" here refers to oil in the ground available for future production. In the context of this paper's topic, "reserve" is also frequently used as a synonym of "stockpile," as in "United States Strategic Petroleum Reserve;" in this usage, the term refers to produced oil stored in tanks, salt caverns and so on.
[4] *BP Statistical Review of World Energy*, June 2005.

the most dominant and most concerned player in the world oil market. Around the world, oil is exclusively traded in US dollars.[5]

Disparate evaluations of the future of petroleum further complicate the oil market. As figure 2 indicates, the world's total proven oil reserves, in spite of being consumed at a rate of roughly 80 mb/d, continue to increase with exploration. But whether or not exploration and production can keep up with consumption remains a point of contention. Recent treatises such as "Out of Gas" and "The Empty Tank" contend that oil production will soon peak, with potential consequences ranging from global economic recession to large-scale military resource competition.[6] Pessimistic "peak oil" predictions have been made throughout the history of the oil industry; to date, obviously, none have proven accurate. More mainstream projections forecast a leveling off of oil production in the next 10 to 20 years as new projects struggle to replace dwindling productivity in the world's super-giant fields: Ghawar in Saudi Arabia, the North Sea and so on.[7] Still others, most notably the International Energy Agency, have forecast that new production will continue to meet demand; in the IEA's *World Energy Outlook*, the organization projects that in 2030, the world will comfortably be consuming 120 mb/d.[8] The development of superior recovery technology (e.g. gas-to-liquids technology) and the increasing commercial practicability of alternative oil sources (e.g. Canada's shale oil and tar sands) further obfuscate projections of oil's future.

Also complicating matters of projection is the interested nature of most relevant projectors. The estimates of China's oil demand in table 2 demonstrate how much forecasts vary from source to source. Many projectors are cogs in the oil business or oil-producing country's

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[5] Petrov, Krassimir. Countercurrents.org, "The Proposed Iranian Oil Bourse," 01.20.2006 < http://www.countercurrents.org/us-petrov200106.htm>
[6] "Steady as She Goes," *The Economist*, 04.20.2006.
[7] Interviews, Honolulu, July 2005.
[8] International Energy Agency, *World Energy Outlook 2002*.

governments with a vested stake in oil's continued dominance of the world energy trade; others are environmentalists who a priori oppose the use of oil and eagerly anticipate its demise; still others are talking heads and public intellectuals on the watch for a catchy book title. Estimates of oil reserves generally come from the governments that possess them, leaving plenty of opportunity and motivation for number-fudging: A leaked Kuwaiti government paper suggesting that the small oil producing state's reserves had been overstated twofold recently roiled the industry.[9]

Table 1: Projections of China's Oil Demand (mb/d)[10]

	2000	2005	2010	2015	2020	2025	2030
IEA (2002)	4.9		7.0		9.4		12.0
US EIA (2003)	4.8	5.5	6.5	7.7	9.4	10.9	
APERC (2002)	4.2	5.2	6.6	8.1	9.9		
ERI/SDPC (2000)	3.9 – 4.1		5.5 – 6.0	6.5 – 7.1			
PRC Industry (2002)			7		9		
PRC Media (2002)			5.8		7.8		

The relationship between the price of oil and its supply and demand is less concrete than often assumed. The most commonly discussed oil price is that of the one month forward contract for a barrel of West Texas Intermediate crude on the New York Mercantile Exchange. These contracts are bought and sold on a large scale by commodities traders, and not necessarily by the actual producers and consumers of oil. Simply put, the price of oil is greatly speculative.

[9] "Steady as She Goes," *The Economist*, 04.20.2006.
[10] Downs, Erica Stricker. "China's Energy Security," January 2004. IEA Figures from *World Energy Outlook 2002*, p. 92; US Energy Information Agency figures from *International Energy Outlook 2003*, p185; APERC figures from *APEC 2002*, p. 57; Energy Research Institute, State Development Planning Commission (ERI/SDPC) figures from Gao Shixian, "China," in Paul b. Stares, ed., *Rethinking Energy Security in East Asia* (Tokyo: Japan Center for International Exchange, 2000), pp. 46; PRC Industry figures from Yang Qing, "Zhongguo shiyou wenti de zhanlüe diwei fenxi," *Zhongguo shiyou,* 1 January 2002, *China Infobank*; PRC Media figures from "Zhongguo de shiyou ziyuan shiyou xuqiu he shiyou anquan," *Zhongguo chanjing xinwen*, 10 July 2002, *China Infobank.*

According to one industry expert, the present oil price includes a "fear premium" of up to $30 above the price that market fundamentals support. Anxiety about the possibility of supply disruptions, magnified by the market's sparse spare capacity, accounts for this "fear premium."[11]

The oil world is unique and uniquely complicated, and all its different players have their own versions of the facts and the future. It is within the framework of these conditions that China formulates its own energy security policy.

1.3 Equity Oil: the Chinese Energy Dilemma

The Chinese oil debate centers on a tug of war between two different outlooks within the realm of international political economy: economic liberalism and economic nationalism. The former emphasizes the utility of international trade in increasing general welfare through the exploitation of comparative advantages. It is the worldview of free market capitalism. The latter posits trade in the context of the maximization of national power, emphasizing self-sufficiency and relative rather than absolute welfare. Economic liberalism suggests a separation between the spheres of politics and economics; economic nationalism insists that politics ultimately drive economics. The ultimate conclusion of economic nationalism is autarky.[12]

Today, China is in the midst of a massive transition from the extreme economic nationalism of the Maoist era to an economic liberalist market capitalism. As the government deregulates industries and privatizes state-owned enterprises, China's economy functions more and more independently of its political system. However, China's oil industry remains dominated by economic nationalism. As noted above, all of China's major oil companies are state-owned, and the government continues to regulate petroleum product prices. Most importantly, economic nationalism continues to influence China's search for a steady supply of oil.

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[11] Lauerman, Vincent. "The Fear Premium in the World Oil Market," *Geopolitics of Energy* July 2005.
[12] Downs, Erica Stricker. "China's Energy Security," January 2004, p. 23.

In the past decade, China has pursued a neo-mercantilist oil security policy often called "equity oil." Rather than purchase oil through the conventional avenues of international exchange, the PRC has instead guided its state-owned oil companies to purchase oil equity abroad, generally in the form of shared exploration and production rights. The consensus among industry experts is that China overpays for these acquisitions in exchange for a perceived greater oil supply security. "This obsession with equity oil is most likely due to a poor understanding of oil markets … and to the belief that in a crisis situation, Chinese oil companies will be more concerned about meeting China's energy needs than foreign oil companies," suggests one Brookings Institute China expert.[13]

Indeed, the equity oil approach relies heavily on the notion that as global oil supplies tighten, Chinese stakes in oil projects abroad will ensure a steady supply. This demonstrates a Chinese lack of faith in the economic liberalist view of the oil market, in which the sole criterion of oil access is the capacity to buy it. In many ways, these approaches act as self-fulfilling prophecies; if the Chinese government requires Chinese oil importers to make financially unjustifiable acquisitions and sell to the Chinese market at a loss, the liquidity of the global oil market will correspondingly decrease.

The equity oil approach has tarnished China's image abroad, damaging any illusion of separation between the government and China's major oil companies. For example, the US Congress's uproar over the Chinese National Offshore Oil Company's bid for Unocal arose mainly due to the Chinese government's control over CNOOC. China has also engaged in strategic bilateral consumer-producer relationships, offering political accommodations in hopes of securing access to oil. China's partnerships with Iran and Sudan in particular have raised

[13] Downs, Erica Stricker. "China's Energy Security," January 2004, p. 137.

hackles in the West, and some hawkish commentators have even warned of potential weapons-for-oil relationships between China and Middle Eastern pariah states.

Through its equity oil approach, China has positioned itself for competition, rather than cooperation, with the rest of the oil-consuming world. If and how China applies this approach to its development of oil stockpiles will crucially influence their success.

1.4 The Basics of Oil Stockpiling

The world's first strategic oil stockpiles appeared in oil-importing states in the aftermath of the OPEC embargo of the early 1970s. The primary purpose of such stockpiles is the amelioration of oil supply disruptions—like the one caused by the embargo. Supply disruptions could take the form of international political conflict, natural disaster, technical malfunction and so on. Therefore, a supply disruption could affect either the domestic or the international oil supplies of a given oil-consuming state. However, due to the volatile nature of the global oil trade, import substitution remains the primary contingency of strategic oil stockpiles; thus, only net oil importing states maintain significant strategic oil reserves.

Oil reserves are measured both in barrels of oil and also days of forward cover; however, this measurement of preparation can be deceiving. For example, the US Strategic Petroleum Reserve's 700 million barrels of oil provides less than 35 days of forward cover, given the US' consumption of over 20 mb/d. However, the SPR could completely replace the US' imports of oil from the Middle East—less than 2 mb/d—for roughly a year. This figure is unquestionably more relevant.

Presently, the world's oil-importing countries are maintaining roughly 1.4 billion barrels of strategically stockpiled oil. Non-strategic oil stockpiles—that is, commercial oil stockpiles—

maintained by oil companies amount to another 2.7 billion barrels of oil currently held in reserve.[14]

The IEA, also formed in the early 70s, serves as an international energy policy organizer for 26 OECD member states. Centered in Paris, the agency advises stockpiling policy globally, and all states with significant stockpiles are IEA members. The IEA's past coordination of stockpile releases in emergency oil scenarios, as well as the relevant characteristics of the major oil stockpiling systems, will be discussed later in this paper.

[14] "Fact Sheet on IEA Oil Stocks and Emergency Response Potential," International Energy Agency, 04.14.2006 <http://www.iea.org/Textbase/Papers/2004/factsheetcover.pdf>

2.1 The Current Status of China's Stockpiling Plans

High-level discussion of the need for strategic oil stockpiles began after China became a net importer of oil in 1993. The Tenth Five-Year Plan, passed in 2001 by the Fourth Plenum of the Ninth National People's Congress, named the development of strategic stockpiles a primary goal. Construction of the first storage sites did not begin until after the Chinese leadership transition in 2003, allegedly because some senior officials, including former premier Zhu Rongji, objected to the expensive nature of the stockpiling plans.[15]

Presently, construction of tanks for the storage of crude oil is underway at four sites designated as the first phase of the stockpiling plan: Zhenhai and Aoshan in Zhejiang province, Huangdao in Shandong province and Dalian in Liaoning province. Zhenhai and Aoshan will eventually store roughly 5,000,000 cu m (31,400,000 bbls) crude oil each, while the Huangdao and Dalian sites will be smaller at 3,000,000 cu m (18,900,000 bbls) apiece. Therefore, the first phase of China's stockpiling plans, which the government seeks to complete by the end of 2008, will include roughly 16,000,000 cu m of crude oil: more than 100,000,000 barrels.

Construction of 16 of the 52 tanks planned for the Zhenhai facility, each with 100,000 cu m of crude oil capacity, was completed at the end of August 2005. The state-run Chinese media announced in June 2005 that the government would begin to fill the tanks later that year.[16] To date, the tanks remain unfilled. In light of tightness in the world oil market and unprecedented nominal crude prices, how and when the government will purchase crude for the Zhenhai facility remains unclear. Zhang Guobao, vice-minister of the National Development and Reform Commission, told the state-run Xinhua news agency that domestically produced crude would be

[15] Ibid p. 164
[16] "China to Fill Petroleum Reserves this Year," Xinhua News, 06.24.2005 <http://news.xinhuanet.com/english/2005-06/24/content_3128762.htm>

used to fill the Zhenhai tanks, preventing increased pressure on the international market.[17] Zhang's comments do not make sense from an oil economics perspective; use of domestic crude to fill the tanks would still affect the market by increasing Chinese import demand. Moreover, domestic crude may not be the optimal stockpiling option (as discussed below).

Chinese officials and experts admit that no final decisions have been made about how to fill the reserve.[18] Oil prices have remained high into the spring of 2006, and no plans to fill the completed Zhenhai storage space have been announced.

Sinopec oversees construction at the Zhenhai facility, which neighbors the massive Sinopec Zhenhai Refinery. Sinopec is also responsible for construction at the Huangdao site; PetroChina and Sinochem are building the Dalian and Aoshan sites respectively. But China's state oil companies will not manage the petroleum reserves. That role will fall to the nascent State Oil Stockpiling Office and State Oil Stockpiling Center, established under the National Development and Reform Commission (NDRC). The nature and structure of these organizations remain ambiguous.

Various sources within the PRC have revealed glimpses of China's future stockpiling plans. A potential second phase, resembling the first, has already been tentatively sited. Phase two plans for an additional 89 million barrels of overground tank storage, originally slated for completion by 2010.[19] An Fengquan, a senior engineer at Sinopec's Economics and Development Research Institute, suggested that the government may require China's oil importing companies to hold government-mandated oil stocks, imitating Japan's stockpiling system (outlined below).An also articulated China's hopes to meet the IEA's requirement of 90

[17] "New Strategic Reserve to See Oil by Year's End" Xinhua News, 07.05.2005 <http://news.xinhuanet.com/english/2005-07/05/content_3175606.htm>
[18] Interviews, Beijing, July 2005 and "China to have Strategic Oil Reserve Soon," Dalian News, 06.13.2005 <http://english.runsky.com/homepage/english/news/biz/userobject1ai563039.html>
[19] "China to Build Oil Reserve in Stages to Limit Effect on Prices," Bloomberg News, 12.13.2005 <http://www.bloomberg.com/apps/news?pid=10000080&sid=amWykbFER1n4&refer=asia>

days of forward cover, even though the PRC is not an IEA member: this goal may be issue of image for the Chinese government. Changing conditions in the global oil market and conflicting conceptions of the reserve's ultimate utility within the PRC establishment have led to uncertainty about China's long-term stockpiling plans. In searching for the best way to build, fill and manage its strategic petroleum reserve, China will look to the established reserve policies of other major oil importers; an examination of existing stockpiling models shows some of the approaches that China is considering.

2.2 Existing Petroleum Stockpiling Models: The United States

The United States government operates the largest public petroleum stockpile in the world: The United States Strategic Petroleum Reserve. Established in 1975 under the Energy Policy and Conversation Act in response to the 1970s OPEC oil embargo, the SPR provides an efficient and conservative oil stockpiling model. Presently, the SPR holds about 700 million barrels of oil at four storage sites located in Texas and Louisiana. Salt domes, a geological feature that allows for cheap and efficient oil storage, dot the Gulf Coast. These salt caverns hold the entire SPR, facilitating large scale storage, rapid drawdown capability and minimal maintenance costs compared with other modes of storage.

The US Department of Energy operates the SPR and fills it via the "royalty in kind" program devised by the Clinton administration in 1999. Through this program, the DOE Minerals Management Service collects royalties in oil form from oil companies operating under government off-shore leases in the Gulf of Mexico, and uses this oil to fill the SPR. Prior to 1999, MMS collected royalties in cash.

At the time of President George W. Bush's inauguration in 2001, the SPR held under 600 million barrels of oil. Following the terrorist attacks of September 11, 2001, President Bush instructed the DOE to fill the SPR to 700 million barrels, close to its capacity of roughly 730

million barrels. The comprehensive energy bill passed by the US congress in July 2005 calls for the expansion of the SPR to 1 billion barrels – as long as purchases of oil for the reserves do not raise oil or oil product prices.

As the world's leading importer of crude oil (nearly 11 mb/d) and as the world's dominant economic and military power, the US governs its oil stockpiles conservatively. Government policy dictates that oil from the reserve can be released only at the order of the president and only in an oil supply disruption scenario.

The issue of reserve release policy is not without controversy. In 1996, President Clinton allowed the sale of 28.1 million barrels from the SPR to raise federal revenue. Prior to the 2004 election, Democratic presidential hopeful John Kerry advocated greater flexibility in managing American oil reserves. Many conservatives, including President George W. Bush, see releasing oil from the reserve as a strategic measure to fall upon only in the case of a supply disruption emergency and not as a tool of economic policy.

The US SPR has been accessed for emergency drawdown only twice in its 31-year history. The first emergency drawdown, in 1991, came in response to oil market anxiety created by the Persian Gulf War. The mere announcement of President George H. Bush's plans to release oil brought a degree of stability to market prices. The IEA, which serves as the main supranational entity coordinating energy information and policy among developed countries, issued a coordinated emergency response plan that mandated a global drawdown of strategic oil reserves in all 20 member states in cooperation with the US release.

The massive damage caused to Gulf of Mexico oil production, terminals, pipelines and refineries by Hurricane Katrina in late August 2005 led to the second emergency drawdown of the US SPR. In this release, also part of an IEA-coordinated response, the DOE made 30 million barrels of SPR oil available for sale, 11 million of which were purchased. In addition to the

emergency sale of 11 million barrels, the DOE approved the loan of 9.8 million barrels of SPR crude to refiners in Katrina's immediate aftermath. The refiners will repay these "emergency oil loans" in kind; the US SPR will receive 10.3 million barrels of oil in compensation.[20]

Other past SPR releases include a handful of test sales, exchange arrangements with private companies, and limited exchanges to smooth supply disruptions caused by Hurricanes Lili (2002), Ivan (2004).

2.3 Existing Petroleum Stockpiling Models: Japan

The most expensive and comprehensive system of strategic oil stockpiling belongs to the Japanese. Japan imports more oil than any other country aside from the US, and unlike both the US and China, Japan produces no oil domestically. Versatility in some aspects and rigidity in others characterizes the Japanese system of petroleum stockpiling, which is divided into two sets of reserves: public and private. Roughly 310 million barrels crude, managed by the Japan Oil, Gas and Metals National Corporation under the Ministry of Economy, Trade and Industry, comprise the government managed component of the strategic oil reserve. The ideas and guidelines that govern these stockpiles are similar to those applied to the US SPR, but Japan is not geologically blessed with salt caverns and has instead invested heavily in diverse methods of oil storage. JOGMEC provides information for 10 national stockpiling bases accounting for roughly 215 million barrels of oil, including 112 million barrels in above-ground tanks; 51 million barrels in floating tanks; 30 million barrels in rock caverns; and 22 million barrels in underground tanks. Above-ground tanks and rock cavern storage both represent financially reasonable alternatives in the absence of salt caverns; the vastly more expensive underground and floating tanks demonstrate Japan's efforts to protect its reserves from natural disasters. These

[20] "Releasing Crude From the Strategic Petroleum Reserve," US Department of Energy, 03.01.06 <http://www.fe.doe.gov/programs/reserves/spr/spr-drawdown.html#katrina_sale>

seemingly exorbitant measures make sense in light of the island state's susceptibility to earthquakes and typhoons.

The second set of Japan's strategic stockpiles takes the form of government mandated private storage. Private Japanese oil companies and importers of refined products must maintain stocks equivalent to 70 days of consumption. According to JOGMEC, private stocks amount to nearly 275 million barrels of oil, or 82 days of forward cover. Crude oil composes about half of the private stocks; oil products make up the balance. This requirement is subsidized by the Japanese government, but still constitutes a significant burden on Japanese oil companies and a formidable barrier to entry into the Japanese oil market.

The Japanese government maintains a level of rigidity surpassing that of the US when it comes to drawdown policy. Like the US, the Japanese subscribe to the IEA policy that relegates strategic stockpile releases to emergency scenarios, and the Persian Gulf War is the only incident that saw Japan release strategic oil. Japan's nearly 600 million barrels are the only oil reserve in the world that approaches the size of the SPR, and Japan consumes less than a fourth and imports less than half as much oil as the US. Therefore, Japan's system provides quite extensive protection against supply disruption, but represents an unparalleled fiscal expenditure.

In marked contrast to the situations in China and the US, Japan's oil demand is shrinking. This trend simultaneously decreases Japan's reliance on imports and improves the security afforded by Japan's reserves.

After a recent internal evaluation of its stockpiling practices, Japan has planned measures to increase the "strength, flexibility and readiness" of its reserves, including a reduction of the private company stockpiling requirement from 70 to 60 or 65 days.[21]

[21] Hakozaki, Keiichi. "APEC Best Practices and Oil Stockpiling in Japan," EWC APEC Stockpiling Workshop, July 2005.

2.4 Existing Petroleum Stockpiling Models: South Korea

The South Korean strategic stockpiling model represents a departure from the rigid stockpiling practices of Japan and the United States. Under government auspices, the Korean National Oil Company (KNOC) maintains about 63 million barrels of crude oil, 7.3 million barrels of petroleum products, and 3.6 million barrels of liquid petroleum gas (LPG). About 80% of these stocks are stored in rock caverns; aboveground tanks house the remainder. KNOC ambitiously plans to increase the public stockpile to 140 million barrels by 2008. Current stockpiling bases have the capacity to store about 114 million barrels. Private Korean oil companies must maintain 40 days of forward coverage for domestic sales, which amounts to 72 million barrels of oil today.

KNOC manages the Korean public oil stockpiles with flexibility in order to recoup some of the expense associated with building and maintaining stocks. The company occasionally conducts "time swaps," which entail taking advantage of fluctuating oil prices by lending out oil from the national stockpiles. In one such "time swap," KNOC invites Korean refiners and sometimes international oil purchasers to bid on a quantity of stockpiled oil. The winning bidder must return the oil within a stipulated time period and pay the bid premium. This way, the KNOC can offset costs, keep the stockpiled oil in circulation and maintain a balance of stocks that reflects the present state of Korean consumption. While these measures do not make strategic stockpiling commercially viable, they do alleviate the fiscal burden of developing and maintaining strategic oil reserves.

KNOC also rents its spare storage capacity to foreign oil companies. Statoil, the Norwegian independent oil company, stores over 11 million barrels in KNOC's facilities under this so-called "Joint Oil Stockpiling" program. KNOC developed this program to continue increasing oil stocks under the conditions of the Asian financial crisis of 1998. The program

provides moderate revenue in the form of rental fees and dictates that in the event of a supply crisis Korea would enjoy a preferred right to purchase Statoil's stored stocks at market prices.

KNOC spends the money saved from joint oil stockpiling and time swaps on expansion of the reserve. Korea, an IEA member like Japan and the USA, occasionally comes under criticism for the cost-offsetting measures it employs in its stockpiling strategy. But KNOC's innovative system has broadened the concept of strategic oil stockpiling by showing that stockpiled oil need not be "dead" oil.

3.1 The Key Characteristics of Strategic Oil Stockpiles

All oil stockpiling systems share the same straightforward goals: increasing oil supply security and minimizing the effects of supply disruptions. However, the above descriptions reveal that the world's first, second and fourth ranked importers of oil have employed dissimilar oil stockpiling strategies. The characteristics relevant to this discussion include cost of development, forward cover protection, drawdown policy and economic efficiency.

Table 2: Stockpiling System Characteristics and Key Indicators

	Japan	USA	Korea	China
Cost of Development	High	Medium	Medium	?
Size (days of forward cover)	High	Low	Medium	?
Drawdown Policy Flexibility	Low	Medium	High	?
Economic Efficiency	Low	Medium	High	?
2004 Net Oil Imports (million bbl/d)[22]	5.1	11.9	2.3	3.0
2004 Increase in Oil Consumption	-3.00%	2.80%	-0.80%	15.80%

This view of stockpiling strategies depicts the tradeoffs between security and efficiency, with Japan at one end of the spectrum, Korea at the other end, and the United States in the middle. Such delineation must be contextualized; the USA's stockpile is the largest, but high American demand means that the SPR provides the fewest days of forward cover. Japan's high cost of development is partially attributable to pronounced vulnerability to natural disasters as well as the unavailability of salt caverns. Nonetheless, the trends apparent in Table 2 shed light on the contrasting motivations that underlie each stockpiling system.

3.2 Discussion of the Effectiveness of Stockpiling Models

Strategic oil stockpiling, like many energy issues, represents a confluence of geopolitical and economic interests. How these interests play out in the development of stockpiles is no mystery: a conservative, security-based approach is manifest in the Japanese system, while the

[22] *BP Statistical Review of World Energy*, June 2005.

Korean national reserves spring from a more market-oriented, economically liberal philosophy. The US system is efficient and slightly more flexible than the Japanese, but still represents a US strategic measure and not an economic tool; many American conservatives insist on referring to SPR drawdown scenarios as matters of national security.

None of the three systems represents an extreme. Despite KNOC's cost-saving measures, the oil stockpiles do not approach independent commercial solubility. And although the massive Japanese reserves are hardly ever accessed, their mere existence inspires national and global confidence in the oil market.

But ultimately, the differences in cost between the philosophies are readily identifiable, and they are not trivial. The Korean approach constitutes a smaller burden on both the Korean government and the global oil market. On the other hand, the argument for the security-based approach lacks support. No evidence indicates that, in the situation of a global supply disruption, the Korean system would underperform its Japanese and American counterparts. On the contrary, the relatively frequent exercise of KNOC's drawdown and bidding procedures would likely facilitate smooth operation in a crisis scenario. [This comparison is the key to your thesis: must expand]

This thread of analysis indicates the evident superiority of the Korean stockpiling system, but some experts and policymakers in China and elsewhere disagree. A JOGMEC official explaining the abovementioned plans to change the Japanese system praised the greater efficiency of the US SPR but did not mention the Korea model.[23] The IEA, which forbids the use of strategic oil reserves for "price control," frowns upon KNOC's time swaps. An Fengquan, the

[23] Hakozaki, Keiichi. "APEC Best Practices and Oil Stockpiling in Japan," EWC APEC Stockpiling Workshop, July 2005

Sinopec engineer, expressed his doubts about Korea's arrangement with Statoil, asking: "What if there's an emergency, and the oil is not there?"[24]

3.3 The Geopolitical Challenges of China's Oil Stockpiling Plan

How China decides to build strategic oil stockpiles will not only carry significant economic repercussions for the PRC but also affect the world oil market and China's role on the world stage. The opportunity to cooperate with other states in developing and maintaining energy security policies could permit China to improve its reputation as a positive player in international politics. Alternatively, a rigid and unilateral stockpiling regime in the spirit of "equity oil" would decrease the fluidity of the oil market and hamper China's charm offensive on the West.

As China's import requirements continue to rise, stockpiling oil poses two challenges; first, keeping up with growing import dependency; and second, avoiding demand inflation caused by the import of oil for stockpiling. China's growing demand for oil fuels anxiety about China's economic and military rise in the US and elsewhere; while few dispute the desirability of a Chinese oil reserve, filling China's tanks will unquestionably increase the strain on the world oil market. Senior Chinese policy makers are very conscious of China's image abroad and therefore reluctant to augment the PRC's already undesirable oil import demand growth. Filling China's petroleum reserves could add up to 100,000 b/d to Chinese import demand for years to come. "China's strategic reserve has met some difficulty," said Han Wenke, deputy director of the Energy Research Institute, a Beijing-based government think-tank. "You don't want to have too much of a market impact when prices are this high."[25] This reluctance to inflate demand, along with the costs associated with purchasing oil for the reserve at today's record crude oil prices, is preventing the Chinese government from filling the already completed tanks at Zhenhai.

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[24] Interviews, Beijing, July 2005.
[25] "Oil Reserves Plan in Limbo," *The Standard*, 03.02.2006 <http://www.thestandard.com.hk/news_detail.asp?pp_cat=22&art_id=13220&sid=6879537&con_type=1>

In many ways, these choices are paradigmatic of the conundrum of China's rise. Will China evolve into a powerful but benign stakeholder in a multilateral world order? Or will the world's most populous nation become a strategic and economic competitor with the United States and its allies? Ultimately, the decision between economic liberalism and economic nationalism will factor heavily into the outcome of China's global emergence. How China chooses to stockpile oil will be a telling sign of China's direction.

It should be noted that a conservative approach to the development of stockpiles would not constitute preparation for military competition with the United States. In the event of military confrontation, the American military could handily destroy China's stockpiling facilities at their vulnerable locations on the Eastern seaboard. A conservative stockpiling model would indicate Chinese anticipation of Cold War-like tension, not military conflict, with the United States.

4.1 Conclusion: A Flexible Approach to the Future of China's Strategic Oil Stockpiles

With nominal oil prices at unprecedented highs, and with a global spotlight trained on China's oil demand, there is little room for error in the PRC's development of oil stockpiles. At the moment, sentiment in China favors the Japanese model, even as Japan plans to reform its system.[26] Imitating the Japanese system would be a mistake. China would be better off developing a flexible system suited to the unique economic, political and strategic conditions in the PRC.

This paper finds no problem with the first phase of China's stockpiling plan. The 100 million barrels stowed near import terminals and refineries will form the foundation of China's strategic reserve. However, filling these tanks with domestic oil does not make sense. Barring draconian domestic oil rationing, any domestic oil used to fill the barrels would require replacement by import, ultimately having the same effect on the global oil market. Furthermore,

[26] Interviews, Beijing, July 2005.

China is stockpiling oil to replace imports in supply disruption scenarios. The reserve should be filled with the same imported oil that it is intended to back up.

Today, 100 million barrels represents around 40 days of forward cover for China. By the time the first phase of reserves is completed, that number may have dropped to below 25 days. In order to keep up with increasing imports, China should expand its government reserves to maintain at least 50 days of forward cover—market conditions permitting. If, as projected, crude oil prices remain high, the cost of these stocks per barrel will far exceed the money spent in the past by Japan, Korea and the US in the development of their reserves. The $27/bbl cost of the US SPR was once considered expensive, but China may pay more than twice that price. In 2004, a "top energy planner" suggested that Beijing would not pay more than $40/bbl to fill the reserves; today, that goal seems unattainable.[27] These factors suggest that, despite China's mammoth foreign currency reserves, building oil stockpiles as expansive and inflexible as Japan's or the US' could be prohibitively expensive. Instead, China should invest in a comfortable cushion of government stocks, and supplement them with more innovative measures.

The unusual relationship between China's government and its major oil companies could play to China's advantage in developing oil stockpiles. The US and IEA oppose private strategic reserves because they fear that, in an emergency scenario, profit-maximizing companies may not share their government's interest in protecting the domestic economy. In the words of one US DOE official, major US oil companies, if asked to maintain strategic stockpiles, "would tell us to drop dead."[28]

Chinese oil companies are different. The state-owned Chinese oil majors answer to Beijing, an allegiance trumping any conflict of interest in a supply disruption scenario. China

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[27] "Oil Reserve Plans in Limbo," *The Standard*, 03.02.2006 <http://www.thestandard.com.hk/news_detail.asp?pp_cat=22&art_id=13220&sid=6879537&con_type=1>

[28] Price, Robert (US DOE). EWC APEC Stockpiling Workshop, July 2006.

could take advantage of these companies' existing commercial storage capacity by requiring them to hold 40 days of forward cover in a mix of crude oil and refined products, thereby achieving the goal of the IEA-mandated 90 days. These reserves, already in the hands of distributors, would serve as China's first line of defense. The Strategic Oil Stockpiles Office could exercise flexibility in managing the "private" stocks, imitating KNOC by permitting companies to swap oil and take advantage of seasonal price fluctuations.

Other creative stockpiling strategies could complement China's reserves. The Korean Joint Oil Stockpiling program is one example. Two American experts recently put forth an alternative strategy they call "forward commercial storage," urging OPEC producers to store spare-capacity oil in consuming regions (e.g. East Asia) for release in tight supply scenarios.[29] During his visit to Saudi Arabia in April, Chinese President Hu Jintao discussed the development of this kind of forward storage arrangement with King Abdullah.[30] China has established several direct producer-consumer relationships; the foundation for special stockpiling measures has already been laid.

The opportunity to cooperate with other states in developing reserves and drawdown policies is an avenue through which China can improve its standing as a regional leader by pursuing a multilateral approach. Proposals for regional joint stockpiling programs have received some attention at ASEAN, ASEAN + 3 and APEC meetings. In January, India's energy minister expressed support for the creation of an Asian counterpart to the IEA which could "coordinate the long-term energy import policies of major oil importers in the region."[31] And although China is not a member of the OECD, US Deputy Secretary of State Robert Zoellick has recently

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[29] Nissen, David and Knapp, David. "Oil Market Reliability: A Commercial Proposal," *Geopolitics of Energy* July 2005

[30] Ghattas, Kim. "Chinese Leader Ends Saudi Visit," BBC News, 04.23.2006 <http://news.bbc.co.uk/2/hi/middle_east/4938474.stm>

[31] "India Backs China for Asian Energy Agency," *The Financial Express,* 01.14.2006 <http://www.financialexpress.com/fe_full_story.php?content_id=114468>

expressed the United States' interest in linking the Chinese reserve system to the 4.1 billion barrels of petroleum reserves coordinated by the IEA.[32]

Innovative, cooperative measures that could save costs for the PRC abound, but ultimately, the future of China's strategic stockpiling system depends on the mindset of the relevant PRC decision makers. Conservative, security-based thinking will lead to greater costs for the government, more stress on the world oil market, and negative consequences for the PRC's image abroad. A more open-minded approach will facilitate the efficient and comparatively inexpensive completion of the reserves. If Beijing is willing, the potential exists for the development of a strong, flexible and affordable strategic oil stockpiling system.

[32] "Time is Ripe of US-China Energy Links," Reuters, 04.18.2006 <http://go.reuters.com/newsArticle.jhtml?type=reutersEdge&storyID=11881518>