

Analysis of Chinese Strategic Petroleum Reserve from the Non-traditional Security Perspective

Xiangyang Wan
Dept. of PER
Hubei University of Police
Wuhan, China
wancooke@sina.com

Abstract—The objective of this thesis is analyses the strategic petroleum reserve, which is the important guarantee of national economic security. The current Chinese oil dependency and consumption are two ranks first in the world, but the amount of strategic oil reserves is relatively insufficient, reserve infrastructure is costly and still under construction, the government finance regulating prices previous failed to solve the optimization of energy structure, these difficulties seriously affected the Chinese energy security. These research methods of perspective analysis of defects Chinese strategic petroleum reserve for firstly, further reveals the challenges faced by China strategic petroleum reserve. And then through the international comparison, discusses the developed countries deal with the oil crisis and improve the strategic petroleum reserve way. Finally put forward the foreign oil resources, reduce reliance on oil imports, to ensure oil security, change the energy structure, speed up the construction of energy reserve system, establish a modern oil market mechanism six measures such as the use of a full range of specifications. Results is made of normative analysis China strategic petroleum reserve security, and conclusions have predictive and reference.

Keywords-strategic;non-traditional;security;petroleum reserve;analysis.

I. INTRODUCTION

The strategic petroleum reserve is a reserve way to respond to short-term oil supply large-scale reduction or interruption, at the same time with abnormal fluctuations to stabilize domestic oil price, it belongs to the nation in non-traditional security fields. The strategic petroleum reserve system originated in 1973, at that time because of the oil embargo to engage the OPEC oil producing countries of the western developed countries, the developed countries jointly established the International Energy Agency, IEA's member were forced to have reserve at least 60 days of oil reserves to deal with the oil crisis. And that time increased to 90 days after the second oil crises, but only a few countries can achieve [1]. Chinese as the world's second largest economy, the domestic petroleum resource consumption and demand is very large, although Chinese also has more oil reserves, but the ratio of bay and Central American oil rich countries, the domestic oil exploration costs more, resources is poor.

So, establish compatible with the strength of the Chinese strategic oil reserves, is not only the demands of the market, is based on national security considerations.

II. THE PRESENT SITUATION AND PROBLEMS OF CHINESE STRATEGIC PETROLEUM RESERVE

A. Chinese strategic petroleum reserve constrained by domestic oil resources

Although China crude oil production has been stable at 2 tons or so, since 2009 to become the fourth largest crude oil producer in Russia, Saudi Arabia, America after, but Chinese oil and gas resources are relatively lack of. At present our country onshore and offshore oil prospect 115 resources of basin volume of 108.6 billion tons, of which 93.4 billion tones of land, 15.2 billion tons of petroleum resources offshore; the amount of 76.5 billion tons, of which 658 tons of land, offshore oil 10.7 billion tons; recoverable resources 21.2 billion tons, of which 18.3 billion tons 2.9billion tons of coastal land. USA Energy Information Administration (EIA) and the CIA world report lists the global oil reserves in the 15 most populous countries [2], Chinese ranked fourteenth, per capita oil remaining recoverable reserves of only 1.87 tons, equivalent to the world average level of 7.8%, belong to "lean oil country".

TABLE I. THE ONSHORE AND OFFSHORE 115 PETROLEUM GEOLOGY OF BASIN AND RECOVERABLE RESOURCES EVALUATION RESULTS

The evaluation scope	Geological resources /Billion tons				Recoverable resources /Billion tons			
	95%	5%	5%	EXP	95%	5%	5%	EXP
115 Basin	56.8	76.2	105	76.5	16.2	21.1	28.7	21.2
Continental domain	49.7	65.7	90.9	65.8	14.3	18.2	24.8	18.3
Near sea	7.1	10.5	14.1	10.7	1.9	2.8	3.8	2.9

In addition, although China has found more than 500 oil, except Daqing, Shengli and other major oil, other oil and gas field reserves per unit area generally small, mostly low grade oil, but buried deep, complex type, poor quality, technical requirements for high. In the remaining recoverable reserves of high quality, lack of resources, low permeability or oil, heavy oil and deep buried more than 3500 meters more than 50% extra low permeability, and is mainly distributed in the northwest and the eastern

region [3]. With the deepening of exploration and development, quality is poor. The remaining oil resources to mining the proportion will be growing. And, the old oilfield has entered the high water cut, high recovery stage, comprehensive water content is higher than 80% [4], the average recovery degree greater than 65%, the output of crude oil showed a decreasing trend, the development became more and more difficult, mining process requirements more and more high.

B. Chinese strategic petroleum reserve is subject to the domestic oil consumption

The sustained and rapid development of Chinese economy, determines the Chinese oil and gas resources demand will grow with each passing day. Domestic crude oil output has been stable at 0.19~0.2 billion tons in recent years, but compared to the enormous domestic demand still have more. China over America became the first major oil consuming countries in 2011. At present, Chinese oil consumption more than GDP growth, is expected to 2020, oil consumption at least more than doubling in 2000, will reach 0.45~0.61 billion tons over the same period, if oil and gas resources in China is not a major discovery, domestic oil demand gap will be as high as 0.2 billion tons, domestic oil production level of security on demand just can maintain to the level of 50%. By the middle of this century, the gap between supply and demand will continue to increase, in 2030 China oil consumption 80% need to rely on imports.

C. Chinese strategic petroleum reserve is subject to the import of oil

The degree of dependence on foreign oil is an important index to measure the oil supply security of a country or an area, it is a country of net oil imports accounted for the proportion of domestic oil consumption. With the China the growth of the national economy, Chinese demand for oil is also growing. In 1993 Chinese became a net importer of oil products; a net importer of crude oil in 1996 and into 2009; China's crude oil import dependency for the first time exceeded the internationally recognized warning level of 50%; in 2010 China's crude oil imports 0.239 billion tons, grow 17.5% compared to the same period, the degree of dependence on foreign oil rose 3 percentage points; in 2011 August, the Ministry announced Chinese oil external dependence is as high as 55.2%, more than USA 53.5%, to become the world's first oil importing country; calculation of the state information centre, by 2020, China's dependence on imported oil will be as high as 66% [5]. This shows that the degree of internationalization Chinese energy market is very high, on the other hand to China economic security threatened. Once the import petroleum due to unexpected war or in the emergency and was forced to temporarily interrupt, or once the international oil price volatility, will give China economy and people's life, have significant negative impact and national security.

D. China strategic petroleum reserve constrained by fiscal policy

The main economic function of the strategic petroleum reserve is to relieve the psychological pressure through the release of reserve oil market to market, so as to reduce the rising oil prices may, to relieve the degree of oil

supply on the overall economic impact. For oil importing countries, the strategic petroleum reserve is to deal with the shortage of oil supply and the establishment of the first line of defense, which is not only imports make up for the loss, but also can inhibit the rise in oil prices. Chinese government cannot continue in imports to expand the circumstances, try to mix strategy the use of economic instruments and fiscal policy to regulate the market demand. Especially since 2015, the domestic oil prices rare ushered in twelve losing streak, as a crude oil external dependence close to 60% countries, provides a relatively safe and beneficial "window period of decline in international crude oil prices for energy tax reform China". At the same time, China GDP unit of oil consumption, vehicle fuel consumption per hundred kilometer is higher than that of the developed countries, the lower the efficiency of oil use exacerbated the tension between supply and demand. According to projections, the domestic car retains the quantity in the same circumstances, if the policy measures in 2020, the oil consumption can be reduced to 0.45 billion tons; if no current policy to make the corresponding adjustment, 2020 oil consumption could reach 0.61 billion tons, and for domestic petroleum supply and economic security to bring more severe challenges. Notable is, although China currently all tax accounted for the proportion of refined oil prices can be raised to 45% or so, but still belongs to the medium level in the world [6]. From the major economies, American tax burden level minimum, at around 15%, Britain, Germany, respectively in 59%, about 56%, while South Korea and Japan respectively in the 52% and 41% or so.

TABLE II. REFINED OIL CONSUMPTION TAX

Country	Refined Oil Consumption Tax (Yuan/Litre)
NLD	5.86
ITA	5.63
GER	5.17
SWE	5.09
USA	2.43
CHN	1.13

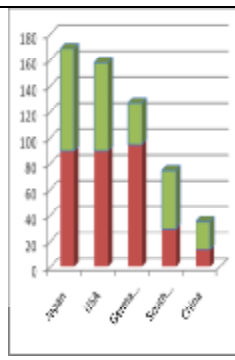
E. Chinese strategic petroleum reserve constrained by infrastructure

A decline in use of global energy demand the opportunity to increase the strategic petroleum reserve is the effective measures of various countries general, China currently no strategic reserves of oil or natural gas, the country should plan to put some oil or gas field exploitation of archive or reduction, as a strategic reserve. At the same time, in view of the weak link China foundation construction of oil reserves, the state actively the construction of oil reserve center response similar to the refined oil supply shortages, and encourage enterprises to use of idle storage capacity, increase oil reserves. In December 18, 2007, Chinese national oil reserve centre was formally established, aimed at strengthening the construction of China strategic petroleum reserve, a sound oil reserve management system. Decision making level in 15 years time, completed in three phases construction of oil reserve base. By the end of 2020 when the completion of the entire project, the total size of the China strategic

oil reserves will increase to 85 million tons, net imports of oil by the equivalent of 90 days, which is the International Energy Agency (IEA) strategic oil reserve capacity specified "Standard Line" [7].

TABLE III. OIL RESERVES CAN BE CONSUMPTION DAYS

Country (Area)	Oil reserves can be consumption days		
	Total Days	Official Reserve	Civilian reserve
JPN	169	90	79
USA	158	90	68
GER	127	95	32
KO	74.5	29.7	44.8
CHN	35	14	21
FRA	96		
EU	90		
TWN	60		
SGP	44		
THA	36		



III. THE INTERNATIONAL COMPARISON OF THE STRATEGIC PETROLEUM RESERVE

A. Petroleum resources is extremely uneven distribution

Crude oil distribution from the overall is extremely uneven. In the increasingly fierce international energy competition, Chinese has long been at a disadvantage. A case study of oil resource, currently the world's top 20 large oil companies monopolize the world's proven oil reserves of high quality 81%. Developed countries use the oil resource control advantage all the strategic petroleum reserve, is actually on the world energy resource plunder.

B. Petroleum reserves related to the energy structure

According to the research and the provisions of the International Energy Agency, Member States should maintain the equivalent of 90 days of imports of oil reserves, but national security based on the consideration, the total oil reserves of all countries are actually more than 90 days. National oil reserve model and the structure of primary energy, petroleum resource distribution and import dependence is closely related to. In general, a higher proportion of energy in the oil, oil import dependency is greater, the greater the size of oil reserves. America oil consumption accounted for the world's supply of 1/3, import dependence is about 60%, its oil reserves and oil imports hook. Japanese and German, oil import dependency is in 98% above, oil reserves and consumption hook. Japan's oil consumption accounted for a 52% of energy, and at almost no oil resources, oil and interrupt possibility and causes serious damage, therefore, Japan's oil reserves the most days, the government reserves larger proportion.

C. Petroleum reserves and reserves related cost

American has be richly endowed by nature reserves of oil condition. Mexico Bay near Luis Anna S, and Texas within the concentration distribution of more than 500 salt domes, they all close to the petrochemical industrial belt. American federal government use of these salt domes built four large reserve bases, is near the terminal, and from the large refineries not far, also developed the oil pipeline facilities can be quickly transmitted to the user's hand. Salt dome storage technology is currently the

world's lowest cost oil storage technology, the construction of salt dome storage cost in American is about \$1.5 a barrel volume; the daily operation and maintenance costs per barrel of oil reserves is 25 cents. If the use of aboveground storage tank facilities, a barrel capacity facility investment needs 15~18 dollars, is at least 10 times the salt dome. USA government for the strategic petroleum reserve invest a total of about \$20 billion, of which 4 billion are used to build storage facilities, 16 billion to buy oil. Every year the daily operation and management costs about \$160 million to \$170 million. Japan's oil mainly depend on import, the land is narrow islands, refinery dispersion in coastal areas, therefore, adopt decentralized model.

IV. THE STRATEGIES OF CHINESE STRATEGIC OIL RESERVE

A. The use of the full range of foreign oil resources

1) The petroleum trade

From the perspective of oil security, oil and gas resources in the future Chinese external supply line must be diverse, and not a single and absolute. China oil trade should take diversified sources of imports, import mode diversification, diversification of import variety and supply channels. At the same time, an important way to take the processing and joint venture, cooperation and other ways to get the oil resources can also be used as Chinese obtain stable oil supply. Chinese foreign oil transport routes more and longer: not only to go by sea import oil from abroad, and travel by land; not only from a distance the introduction, but also brought in from neighbor countries; not only from the Middle East, the Gulf is introduced, and from Russia, Central Asia, the Caspian Sea to introduce. The Middle East, Russia and Central Asia, and South America Africa are four key areas Chinese the introduction of overseas oil. In the future a longer period of time, the Middle East will still be the area Chinese oil supply in the main, positive development will China oil cooperation with Saudi Arabia, Kuwait, Iran, Iraq and other countries. In other areas, China also should seize the opportune moment to work, make it become the important oil supply source China. At present, international oil prices are at the bottom, just use this rare opportunity period to buy oil, the implementation of the "bargain hunting strategy", the Chinese strategic petroleum reserve reaches the maximum value [8].

2) Overseas resource development

The purchase of foreign equity participation of foreign oil resource, oil resource exploration and development, the establishment of overseas oil production base, these can get a share of oil. China has formulated the "going out" policy, encourage foreign companies to undertake exploration, the development of overseas, increase overseas share oil in oil imports in the proportion of Chinese. At the same time to strengthen the modernization of national defense construction, moderate development of naval and air forces, improve Chinese naval and air as soon as possible, in the long-range combat capability, threat and damage to the China oil security to deter hostile forces, hostile action to prevent and combat may damage the China petroleum safety, ensure the offshore oil

national transportation safety, safeguard the interests of the state.

3) *For the international oil pricing right*

China to participate in the competition of the international oil market role on the one hand, is to break the Western powers to control of resources monopoly, on the other hand, the international market price risk as much as possible to release in the international market, to obtain greater initiative and the right to speak and in the international oil market purchase prices and procurement scale. The opening of the oil futures market, Chinese can take the achieved market transactions, settlement rule making power, changing passive to bear international prices for positive influence. If China oil futures prices to become one of the international oil price centre, an important reference to become the international oil prices, China oil trading price will get out of control and manipulation of international capital. Therefore, China enterprise must through transform assets existing form to improve the quality of financial assets and avoid the financial risk, exchange rate risk, effectively through the oil resources of international futures market, strategic reserves increased international oil; avoidance and Multi-National Corporation for petroleum resources and hard conflict, adopted by the mainland financial support to greatly improve the competitive ability of enterprise in China in the international market risk.

B. *To reduce reliance on oil imports*

1) *Transformation of energy development strategy*

From the oil and gas based energy development strategy shift to coal as the main body, power center, oil and gas and new energy all-round development of the energy development strategy. The transformation of the energy development strategy is not to the past coal based energy development strategy is simple repetition, it is the current China energy development priority among priorities, its core content is to adjust and optimize the energy structure, realize the diversification of energy supply and consumption.

2) *To strengthen the exploration and exploitation of petroleum resources*

Although Chinese main oilfield has entered the middle stage, but there is a lot of proved reserves in the area of low, has continued to maintain steady growth of the resource potential of oil production. Especially in the western region and offshore resources, great potential, will become a major area of domestic oil production growth.

3) *To strengthen the development and utilization of oil alternative resources*

Potential alternative of oil is natural gas. We must strengthen the development and utilization of clean energy of natural gas, coal bed gas etc. In view of the present situation China petroleum resource shortage, take the coal liquefaction synthetic oil is the most effective way to solve the energy crisis and feasible way. In addition, the exploration and development of oil sands, attention should be paid to oil shale and other unconventional oil and gas, which strengthen basic research on the application of natural gas hydrate, good technical reserves for future development utilization. Quickening the development and

utilization of bio oil, strengthen the research of biological raw material product and application.

C. *To perfect the mechanism of oil market*

1) *The establishment of a reserve system*

The establishment of the strategic petroleum reserve system in various forms, reasonable configuration, to meet the security needs of different levels, and the establishment of oil reserves and production capacity reserve system, in the realization of technical reserves, the location and layout to from the geographical environment, loading and unloading conditions, use efficiency, construction investment and operation cost and other aspects to consider, proper dispersion and the moderate scale, follow the import and convenient oil, oil refinery near the line, and the concentrated region of consumption principle, combine the height of national interests and economic efficiency. But also to establish safety early warning and response mechanism, set up the early warning response plan in accordance with the corresponding to the extent of the shortage of oil imports. At the same time, we should encourage the private enterprises to invest in the oil industry, and actively cultivate the market main body, the promotion of effective competition, the introduction of private investors in the strategic oil reserve construction and management, make full use of social resources to increase the strategic petroleum reserve capacity. In 2010 August, the National Petroleum Reserve Centre held by "social memory storage capacity of country" qualification of bidding, total storage capacity 6 of the bid winning enterprises is 1.5 million cubic meters, equivalent to the national oil reserve base in Dalian total capacity of half [9]. Data shows, the quantity of total oil 230 million tons of private oil enterprises in China can be fully utilized capacity, inventory is only hundreds of thousands of tons, less than one percent of total capacity, inventory surplus are idle, and the maintenance, the annual management needs high cost. Therefore, to the rational allocation of resources by the form of bidding, which can not only strengthening the national oil reserve capacity, but also can expanding the space for development of private oil enterprises.

2) *To standardize market behaviour*

Modern petroleum market mechanism with the price discovery mechanism is important reflect, by market demand determine the price, the formation of standard, orderly, fair, transparent market rules, to reform the existing management system of oil industry and market access mechanism, and strive to complete the market rules to regulate after the opening of the oil market, and in the interaction in the run in to make it grow and perfect as soon as possible [10]. Oil prices, not the futures market not. At this stage, consider from petroleum long-term construction contract market to start, gradually has formed the modern oil trading market system spot, long-term contracts and Futures and options and other transactions, the final completion of the reform process Chinese oil market. Through the oil stock index futures, futures options trading, portfolio optimization, increase revenue and enhance safety, reduce the whole petroleum industry and petroleum products trading risk, increase enterprise profit opportunities, so as to guarantee the sustainable development of Chinese strategic petroleum reserve.

V. CONCLUSIONS

The strategic petroleum reserve is the construction process of a system, involving the total quantity, area distribution, ownership distribution of these factors, now, the construction of oil reserve system Chinese really began, integrated oil reserve system essence is the construction of the government reserve and enterprise reserves, strategic reserve and compulsory reserve combination. Although part of the first batch of oil reserve bases in our country has been completed, but from the oil storage facilities and other hardware to ensure the basic conditions to start the strategic petroleum reserve. However, the construction of oil reserve system and a series of work to do, such as the strategic petroleum reserve the formulation of related laws and regulations, the reserve operation management mechanism establishment, reserve oil source, the source of reserve funds, new reserve base location, accord with the demand of China reserve scale will be further studied.

REFERENCES

- [1] Wallace F. Lovejoy & Paul T. Homan, "Methods of Estimating Reserves of Crude Oil, Natural Gas, and Natural Gas Liquids", Routledge Press, 2015.
- [2] Bruce A. Beaubouef, "Strategic Petroleum Reserve: U.S. Energy Security and Oil Politics, 1975-2005", Texas A & M University Press, 2007.
- [3] Shmuel S. Oren, "Optimal Strategic Petroleum Reserve Policies: A Steady State Analysis", *Management Science*, January 1, 1986.
- [4] "Strategic Petroleum Reserve Inventory". Retrieved March 3, 2015.
- [5] Catherine Clifford, "Oil ends up after dip below \$100", CNN, retrieved 12 Sept 2008.
- [6] Egon Balas, "The Strategic Petroleum Reserve: How Large Should it be", *Energy Policy Planning Nato Conference Series Volume 9*, 1981, pp 335-386.
- [7] Yi Ming, Gang Wu, Ying Fan, Lan Cui Liu, "Empirical analysis of optimal strategic petroleum reserve in China", Elsevier Press, *Energy Economics*, Vol.30, Issue 2, March 2008, pp. 290-302.
- [8] Yan Liu, "Will China's Strategic Stockpiles Provide the Security of Oil Supply it Needs for the Coming Decade?", *Applied Mechanics and Materials*, Vol. 521, pp. 859-863, doi: 10.4028/www.scientific.net/AMM.521.859.
- [9] Jim Efstathiou Jr., "Bush Should Sell U.S. Oil Reserve, Says an Early Advocate of It," *Bloomberg News*, August 26, 2005.
- [10] Joseph Nye, David Deese, and Alvin Alm, "A U.S. Strategy for Energy Security," in *Energy and Security*, 2014, pp. 402.