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**Table of Contents**

## 0. Introduction

Asia has become a major driver in world energy markets, largely due to China's remarkable growth in energy demand. As the gap between energy demand and supply levels in Asia increases, the region's economic powers are becoming more eager to secure stable and reliable supply of energy. Moreover, they are concerned that potential diminishing supplies and price increases may constrain their economic growth and negatively influence the stability of the region.

Bearing in mind the importance of energy supply as a factor influencing both economic and political relations in East Asia this paper focuses on the oil&gas supply security policy in China and Japan. Oil and gas are considered as strategic commodities since they are essential for core functions of any economy and country's national defense. Therefore, this paper in particular focuses on oil&gas and presents a comparative analysis of two different approaches in oil&gas supply security policy-making in China and Japan. The reason why the paper focuses on China and Japan is straightforward. China and Japan are two largest Asian economies with different economic systems and thus have different approaches in policy-making. By analyzing oil&gas supply security policy in China and Japan, this paper tries to find an answer to the research question: *what are similarities and differences in oil&gas supply security policies in China and Japan*.

In order to find an answer, in the theoretical part this paper develops methodology from theoretical literature as well as analyses of a number of scholars. Review of existing literature on energy security and its indicators shows that a number of scholars have identified various strategies to enhance county's oil&gas supply security. In their work they examined the importance of oil&gas supply security for countries that are energy importers. Furthermore, they looked into policies that oil&gas importers implement in order to become more invulnerable to unexpected disruptions in global oil&gas markets.

Qualitative studies on energy security policy suggest that oil&gas supply security policy could be understood as an insurance measure taken against potential risks that might occur in the oil&gas supply channel (Yergin 1988, Xu 2006, Lai 2007, Vivoda 2009, Meidan et al. 2009). An importing government enhances its own energy security by ensuring 'adequate, reliable supplies of energy at reasonable prices and in ways that do not jeopardize economy' (Yergin 1988). Policy makers limit the concept of energy security to oil and gas. Oil is the most important traded strategic commodity in the world and thus its constant supply is crucial

to energy security of any energy importing country (Vivoda 2009). Natural gas has become an increasingly valuable resource and an increasingly global commodity. In the past, due to the relatively high transportation costs gas was mainly used in the region where it was produced. Nowadays, however, technical developments in gas liquefaction process have diminished the costs significantly making thus liquefied natural gas (LNG) more competitive in global energy markets (Cabalu 2010: 218).

According to Yergin (1988), Andrews-Speed et al. (2002), Christie (2009) and Vivoda (2009), the core of oil&gas security has been diversification. Diversification of oil&gas suppliers remains the key principles by which oil&gas importers maintain energy security. Stringer (2008) distinguishes between source diversification – focusing on oil, coal, natural gas, nuclear, alternative energy, and supplier diversification – focusing on energy suppliers. Diversifying suppliers and routes by which oil&gas is transported reduces the impact of possible disruption in supply. However, diversification by itself is not enough and a number of other factors are equally important.

Von Hippel et al. (2011) and Singh (2012) claim that diversification can enhance country's oil&gas supply security, but also recognize that strategic petroleum reserves could significantly limit economic damages. Similarly, Downs (2000) views establishment of strategic petroleum reserves beneficial for country's oil&gas supply security in four different ways: i) reduces country's vulnerability to short-term energy supply interruptions; ii) stabilizes domestic oil&gas prices in case of some abrupt disruptions; iii) prevents negative effects of political or economic embargos; iv) increases country's diplomatic flexibility by giving more space for maneuver.

Additionally, Downs (2000, 2006) and Vivoda (2009) emphasize the importance of expansion of domestic refining capacity. In their analysis they argue that an adequate domestic refining sector could significantly contribute to country's oil&gas supply security, since improved refining facilities could meet country's needs for petroleum products in the long run.

For Zha (2005, 2006), and Verrasto and Ladislaw (2007) in the age of the world increasing interdependence and globalization, ensuring adequate amounts of oil&gas requires decent level of information transparency and sound oil&gas policies that guarantee the security of global oil&gas market.

A number of quantitative studies also dealt with energy security policy. Such type of analyses contributed to empirical measurement and development of indices. Neff (1997) used

Herfindahl-Hirschman Index (HHI) to assess energy supply dependence in Asia Pacific. In addition, Gupta (2008) and Cohen et al. (2011) also applied HHI to measure diversification in sources in of energy supply.

Analysts from Asia Pacific Energy Research Center (APERC) (2007), Jansen et al. (2004) and Kruyt et al. (2009) applied Shannon-Wiener Index (SWI) to measure diversity of total primary energy mix in different countries.

A number of indicators have been proposed in the existing literature. However, no consensus on set of indicators has been agreed on. Moreover, from the available literature we could note that previous scholarly work on energy supply security have not discussed recent dynamics in oil&gas markets in East Asia.

This paper develops methodology upon energy security concept in which core is country's ability to secure constant supplies of oil&gas, since for every country constant supply of strategic resources such as oil and gas is vital for countries' security and economic development.

There are a number of different events on global and local level that could challenge country's constant oil&gas supply. Some of those events include policy discontinuity, production discontinuity, force majeure, export disruption, natural catastrophes, embargo disruptions etc. In order to overcome possible disruptions that might suddenly occur and thus challenge ceaseless supplies of oil&gas, a county may opt for a number of strategies to enhance county's oil&gas supply security.

One of the key strategies to diminish vulnerability to disruptions in energy markets emphasizes maximization of domestic production. An increase in oil&gas self-sufficiency is an ambition of every economy. However, since natural resources are ample in some whereas scarce in other countries, in order to satisfy domestic demand the majority of countries depend on oil&gas imports from energy abundant countries. Nevertheless, import of oil&gas by its nature does not necessarily make an economy invulnerable to disruptions in energy markets. The crucial measure to enhance oil&gas security thus puts an emphasis on diversification of suppliers and routes by which oil&gas is transported. Thirdly, in order to increase oil&gas supply security many countries aim to improve their access to global resources by acquiring stakes in overseas assets producing oil or gas. Similarly to the strategy of diversified imports, geographical diversification of oil&gas overseas production directs strategies behind acquisition of upstream assets shaping thus overseas production as a strategy behind oil&gas supply security. Fourthly, resilience is another important measure to enhance

supply security and overcome disruptions in energy supply system. Strategic oil and gas reserves can provide a cushion against sudden supply interruptions and support the economy in case of potential disruption. Lastly, expansion of oil refining capacity further enhances supply security as country's end-user demand for oil is actually demand for oil products and not crude, and without access to refining capacities all potential crude supplies or reserves are deemed almost worthless in case of disruption, if the country's does not possess sufficient domestic refining capacity to cover its needs. The oil&gas supply security policy conceptual framework develops upon these five key strategies that steer formation and implementation of a country's oil&gas supply security policy. Those are:

i) domestic production,
ii) imports,
iii) overseas production,
iv) securing strategic reserves, and
v) expansion of refining capacity.

The empirical part of the paper examines oil&gas supply security policy in China and Japan using the methodology developed in the theoretical framework. This paper applies conceptual framework as guidelines and looks into a number of indicators that support each presented strategy of oil&gas supply security policy.

Finally, in the analytical part, the paper assesses findings and looks into main similarities and differences between China and Japan in order to find an answer to the research question: what are the similarities and differences in oil&gas supply security policies in China and Japan.

# I. Theoretical Framework

## 1.1 Energy Security Concept

The theoretical framework develops around the concept of energy security in which core is country's ability to secure constant supplies of oil&gas, in sufficient quantities and at reasonable prices and methods that do not jeopardize country's objectives (Yegin 1988, Xu 2006, Meidan et al. 2009). Furthermore, energy security is also influenced by economic and political costs and risks that arise from increasing dependence on imports of oil&gas from natural resources abundant countries (Andrews-Speed et al. 2002, Lai 2007, Xu 2006).

The concept of energy security is based on the concept of security in which security relates to both military and non-military policy (Von Hippel et al. 2011: 6719). According to Japanese scholar Akihiko Tanaka three key questions develop security concept and shape security policy (Von Hippel et al. 2011: 6719):

- *What to protect?*
- *What risks to be protected from?*
- *How to protect?*

This paper uses this particular concept of security presented by Akihiko Tanaka and develops it further for concept of energy security using above listed questions as guidelines.

For most of the developing and developed countries the supplies of strategic resources such as oil and gas needs to be protected. It is important to keep in mind that oil remains the dominant fuel in the total primary energy supply[1]. In addition, oil is also considered as the strategic fuel[2] since a country's industry, transportation and military heavily depends on it. Hence securing oil and gas supply is vital for both country's security and economy.

A number of risks might influence sudden energy supply disruptions such as supplier's embargo, accidents, natural disasters, logistics disruptions, political stability, fundamental global shortage, exports cut-off, etc. (Andrews-Speed et al. 2002, Von Hippel et al. 2011).

[1] According to International Energy Agency (IEA) in 2011 oil was the most used fuel with share of 31.5 % in the world's total primary energy supply. It was followed by coal and natural gas with share of 28.8 % and 21.3 %, respectively (IEA 2013b: 6).

[2] Crude oil is considered as a strategic commodity since it is i) indispensable for core functions of modern economic systems and national defense; ii) not sustainable in the short-run; and iii) in insufficient supply in most states, while abundant in a few others (Christie 2009: 66).

In response to those risks a number of measures develop in order to overcome sudden disruptions and threats that occur in global energy markets. Some of those measures are maximization of domestic output, diversification of resources, geographical diversification of supply, overseas investment, constructing infrastructure, fostering diplomatic relations with oil suppliers, securing strategic reserves, integration into regional and global energy markets through prices liberalization and increased transparency etc. (Andrews-Speed et al. 2002: 16, Von Hippel et al. 2011).

In the following chapters this paper discusses more profoundly the threats to oil&gas security and measures to enhance oil&gas security while further developing its theoretical framework.

## 1.2 Energy Security Definition

In the straightforward way Xu YiChong defines energy security as 'security of an "adequate" and "reliable" energy supply at a "stable" price' (Xu 2006: 266). Similarly, Daniel Yergin defines energy security as a 'country's ability of assuring adequate, reliable supplies of energy at reasonable prices and in ways that do not jeopardize major national values and objectives' (Yegin 1988: 111). Firstly, energy supplies are adequate if a country is able to obtain a sufficient quantity of energy for its economic development or military actions from global energy markets at reasonable prices. Secondly, energy supplies are reliable if an energy importing country receives resources on time and under regular conditions which are in accordance with country's expectations. Thirdly, since oil&gas markets are highly integrated and thus influenced by the global market mechanism it is required to specify what makes a price reasonable[3]. In addition, Yergin discusses two opposite viewpoints that evolve from two opposite directions but both simultaneously influence dynamics in global energy markets. Energy-exporting countries focus on maintaining the 'security of demand' for their strategic resources' exports since they account for the vast share of their government revenues. Energy-importing countries, on the contrary, heavily depend on the strategic resources form energy abundant countries and thus changes in energy prices vastly affect their balance of payments. Therefore, for countries such as China and Japan it is of great importance to be able to adjust

[3] A comparative economic approach is considered to be the most practical method to determine what constitutes a reasonable price in the context of international security, since the higher the price that a country pays for a barrel of oil the less reasonable price is for a country to afford (Korn 2008: 11).

to abrupt changes in global energy markets through energy diversification, trade and overseas investment (Yergin 1988: 71).

Most of the existing definitions of the energy security focus on maintaining energy supplies. Energy security definitions usually mention diversification between various energy sources as the major factor in increasing the country's energy supply security. However, an analysis covering all the energy sources would be too extensive and would go beyond the scope of this thesis, therefore this paper exclusively focuses on oil&gas energy security. Those two fossil fuels are both indispensible and still irreplaceable as energy supply sources due to the high degree of their international trade and limited application of alternatives. This fact remains since the governments see security of oil&gas supply as a major objective for country's energy policy[4] (Kruyt et al. 2009: 2166).

When a country becomes a net oil importer it becomes vulnerable to potential external energy threats and could likely be involved in political and military competition with other energy hungry countries (Xu 2006: 266). In order to diminish potential military engagement over resources and preserve security on the regional and global level energy policy programs emphasize a number of measures. Some of those measures are: i) the reduction of foreign threats or pressure, ii) prevention of a supply crisis to occur, iii) minimization of economic and military impact of supply crisis once the crisis has occurred (Downs 2000, 2006, Von Hippel et al. 2011: 6720).

> 'A nation state is energy secure to the degree that fuel and energy services are available to ensure: i) survival of the nation, ii) protection of national welfare, and iii) minimization of risks associated with supply and use of fuel and energy services' (Von Hippel et al. 2011: 6724).

According to the International Energy Agency (IEA) oil&gas supply security is defined from two different perspectives: long-term and short-term perspectives. Long-term supply security focuses on investments to supply energy in line with country's economic development and environmental sustainability. Short-term supply security emphasizes the ability of the energy system to react promptly to abrupt changes in supply and demand (IEA 2009).

In addition, oil&gas supply security is closely linked to country's national security. One could argue that the most important institution for any country's national security is an effective and strong military (McCann 2013: 5). East Asian countries have developed a very

[4] Securing of energy supplies has been associated with imminent fossil fuels depletion. Particularly oil crises in the 1970s and 1980s made the over-dependence of importing countries on the exporting countries in the Middle East evident (Kruyt et al. 2009: 2167).

capable defense force, however, one should not fail to note that their whole military heavily depends on imported oil to power the most crucial elements of the defense system such as its aircraft, ships, land vehicles etc.

In definitions of energy security Bert Kruyt et al. identify four main criteria to measure energy security (Kruyt et al. 2009: 2167). These are:

- *Availability* – or geological existence elements
- *Accessibility* – or geopolitical elements
- *Affordability* – or economical elements
- *Acceptability* – or environmental elements

Availability of energy to an economy relates to an absolute availability or physical existence of fossil fuels. Accessibility demands an element of divergence between consumption and production of resources and thus further relates to geopolitical implications. Affordability involves costs related to supply of energy security. Finally, acceptability, relates to environmental sustainability.

A desired trend towards multilateralism, liberalization of energy markets, increased mutual trust and cooperation would most likely reduce concerns over dependence on oil&gas rich countries. Furthermore, in such a scenario the attention would move away from geopolitical issues and accessibility towards increasing importance of economic elements and affordability. However, raising competition between energy hungry nations (particularly rapidly developing energy intensive Asian countries such as China and India) vastly influence dynamics in global energy markets increasing political tensions between regions and emphasizing energy independence. In this case the focus remains on the accessibility of resources. Therefore, this paper mainly focuses on the accessibility of resources as one of the main element of oil&gas supply security while assessing policies in China and Japan.

## 1.3 Definition of Oil&Gas Supply Security Policy

The energy sector has a significant impact on the formation of domestic industries and markets. According to Andrews-Speed, the structure of the domestic energy industry 'depends on energy policy and regulation, and affects the performance of the sector and its interactions with the rest of the domestic and global economy' (Andrews-Speed 2004: 3). Therefore, it is crucial for the government to develop an oil&gas supply security policy that has clear objectives for the energy sector and which is coherent with other policies.

As Meidan et al. advocate energy policy does not affect only economic policy but also a wide range of other policies such as social, foreign, industrial and environmental policies what also applies to the narrowed down version of energy policy observed here as oil&gas supply security (Meidan et al. 2009: 594). According to their analysis social equity, supply security and economic efficiency shape formation of oil&gas supply policy. Therefore, in order to formulate an oil&gas supply security policy the government needs to make decisions based on those factors.

Firstly, the government has to determine how the oil&gas supply is to be secured. It has to develop some administrative and economic instruments in order to promote constant and secure usage of oil&gas (Meidan et al. 2009: 599). Secondly, it has to determine what measures should be taken in order to improve the oil&gas regulation system. Since there should be some institutions developed and implemented that promote efficiency in the oil&gas supply security policy-making structure. Thirdly, it has to verify how the energy sector should be structured and managed. In particular, what mechanisms steer energy sector. Lastly, on the macro-economic level, the government should fulfill the objective of promoting oil&gas accessible and affordable fossil fuels (Meidan et al.: 600, 615, Kruyt et al. 2009: 2167).

The starting point in oil&gas supply security policy formation is identification of possible threats that might arise in global energy markets and have negative effects on oil&gas supply security. After identification of possible risks that will be discussed in the next chapter of this paper, an effective oil&gas supply security policy develops a number of strategies that diminish country's vulnerability to sudden disruptions in global energy markets.

## 1.4 Threats to Energy Security

A wide range of different events could cause disruptions to oil&gas markets and threaten a country's oil&gas supply security. According to Andrews-Speed et al. two groups of events may be distinguished: global events and local events. Global events are related to the disruptions on the global level, whereas local events relate to the events that have an impact on a country or region (Andrews-Speed et al. 2002: 13).

GLOBAL EVENTS

*Policy discontinuity*

The energy security might be threatened due to tight oil market and high oil prices. Such changes in the energy market might also occur as a response to anxiety of struggle for resources supplies, geopolitical rivalries and countries' greed for energy to fuel their economic growth (Yergin 1988: 69). This threat is caused by 'OPEC policy decisions on output levels which are driven by a desire to rise or lower international crude oil prices' (Andrews-Speed et al. 2002: 13). Such events occur as a result of information asymmetries between energy export and import countries.

*Production discontinuity*

Discontinuity in investing in production, transportation or processing capacity is also considered as a threat since it could result in global shortage of production capacity. Nowadays, this threat is considered as the most severe since such an event could have a serious impact on the energy importing economies with vast effects on the global economy (Andrews-Speed et al. 2002: 13-14).

*Force majeure disruption*

Superior force over energy conversion and transportation is widely spread threat to security of energy supply since disruptions can occur anywhere in the supply chain (Kruyt et al. 2009: 2167). Civil unrest, terrorist actions, war or deliberate blockage of trade routes create disruptions to the transportation of energy from the energy production country to the energy importing country (Andrews-Speed et al. 2002: 14).

*Export disruption*

Export decline by main exporters could also create serious problems for the global energy markets. Only Saudi Arabia is believed to be in position to be able to rapidly increase output in order to compensate for potential shortfalls in supplies from other countries, but even Saudi Arabia power is limited due to the amount of barrels lost and production disruptions in other country. Therefore, a major global or regional war could threaten energy supplies for a certain period of time (Andrews-Speed et al. 2002: 15).

*Natural catastrophes*

Natural catastrophes also account as a threat to energy supply on the global level since events of this kind could have huge impact not only on the region but on the whole world as well. The ability of the system to cope with extreme events such as hurricanes, earthquakes, floods etc. in order to overcome disrupted flows of oil or gas is thus of great importance (Yergin 1988: 70).

LOCAL EVENTS

*Embargo disruptions*

Embargo disruptions could have major effects on a country's economy very quickly. Embargo disruption could flow from two opposite directions. Firstly, the embargo could be imposed by an oil&gas importing country to a specific exporting country. Secondly, the direction of might be opposite imposing an embargo on an importing state by a specific exporter or transit state[5]. The former is less effective and likely only in a major regional war. The latter on the other hand could likely occur if exporting and transit state have some disputes over the importing state. Such technique could be used in order to increase negotiating power of exporting or transit country over some political or economic issues (Andrews-Speed et al. 2002: 15).

*Logistical disruptions*

On the local level accidents, incident or terrorism along the transportation infrastructure could create disruptions to the energy supply chain and thus have serious impact to country's energy

[5] China could be vulnerable to such threats from Central Asian states, Russia and via sea routes (Andrews-Speed et al. 2002: 15).

security. An effective management could reduce the occurrence of such events (Kruyt et al. 2009: 2167). Pipelines that transport fossil fuels from Central Asia to the north-west province Xinjiang in China are likely to be exposed to such threats (Andrews-Speed et al. 2002: 17).

*Local market disruption*

Local market disruptions occur under the presence of monopoly suppliers, pressure groups or through government mismanagement. Such threats could thus be in the form of deliberate restriction of energy supply by a monopolist, or a poorly implemented government program (i.e. liberalization or privatization process) (Andrews-Speed et al. 2002: 18).

## 1.5 Measures to Enhance Energy Security

In order to overcome all the threats that may occur and disrupt constant supply of oil&gas on either global or local level, a government of an energy-importing country has to identify a number of measures to enhance domestic energy security.

Firstly, every country is eager to become energy self-sufficient. Therefore, putting an emphasis on domestic production is one of the key strategies to diminish vulnerability to disruptions in energy markets. Becoming oil&gas self-sufficient is an ambition of every economy, but not many countries can achieve it as oil and gas reserves tend to be concentrated in a few large basins, thus making most of global economies oil and gas importers.

Secondly, as most of the countries cannot achieve energy self-sufficiency for objective reasons (natural resources are abundant in some while scarce in other countries) in order to satisfy domestic demand countries depend on imports of oil&gas. Therefore, the crucial strategy to enhance oil&gas security puts an emphasis on diversification of suppliers and routes (Yergin 1988: 76, Christie 2009: 68).

Thirdly, if countries cannot produce sufficient amounts to cover their oil and gas needs domestically, an alternative is to acquire oil&gas producing assets overseas in order to fill the gap in satisfying domestic demand. Geographical diversification of oil&gas overseas production direct strategies behind access to global resources while simultaneously enhances country's oil&gas supply security (Andrews-Speed et al. 2002: 19).

Fourthly, by building strategic petroleum reserves (SPR) a country increases its resilience in dealing with the threats of oil&gas supply disruptions. SPRs can guarantee some amount of

supply and support up the economy in case of any disruption in global oil&gas market (Yergin 1988: 76, Von Hippel et al. 2011:6720).

Finally, expansion of refining capacity as a strategy behind oil&gas supply security is of great importance for every nation, since ultimately the demand for oil boils down to the demand for oil products (gasoline, diesel, jet fuel, kerosene, fuel oil, etc.) to allow for uninterrupted functioning of the road, air and maritime transportation systems, production of electricity, heating, cooking, etc. Therefore sufficient refining capacity to turn crude oil into products is crucial for every country in order to secure its energy security and even more so large oil&gas consumers and growing economies, such as China.

In addition, it is important to give credit to other measures for improving energy security that besides the above explained measures also enhance country's oil&gas supply security and diminish county's vulnerability to disruptions in oil&gas energy markets. Since those measures are below the scope of the research question, they will not be closely looked into in the course of this paper. However, they are briefly explained in the following lines of this chapter.

Diversification remains the fundamental principle of energy security for both oil and gas. Apart from diversification of oil&gas suppliers and routes explained above, diversification of resources is very important strategy behind oil&gas supply security. Recently, there great emphasis has been put on developments of alternative energy (i.e. hydro energy, wind energy, solar energy, etc.) or nuclear energy (Yergin 1988: 70, Christie 2009: 68). Global awareness about green energy and energy efficiency has been getting momentum. Both developed and developing countries have been making great investment in new technologies and research and development projects in order to make some improvements in the field of alternative energy. However, since diversification of resources with a focus on green energy is a very broad field by itself, this strategy as an alternative is not taken into consideration while assessing countries' oil&gas supply security policy.

Additionally, in the times of globalization, integration into regional and global markets influences most of the countries' oil&gas supply security policy. Information transparency is the core of this particular measure since the high-quality information reinforces well integrated and functioning markets. On the global level the International Energy Agency (IEA) has been coordinating the improvements of the information flows in the world energy markets (Yergin 1988: 76, Andrews-Speed et al. 2002: 19). However, due to lesser importance of this factor owing to limited transparency in some countries and data restrictions

to measure the integration of a country into global energy markets this paper excludes this strategy while examining oil&gas supply security policy in China and Japan.

As we have learned in this section there are a number of measures that enhance country's oil&gas supply security policy. However, the theoretical part of this paper focuses on five key strategies that shape oil&gas supply security policy and examines them in the course of next few chapters. Those strategies include: i) domestic production of oil&gas, ii) imports of oil&gas, iii) overseas production of oil&gas, iv) securing strategic petroleum reserves, and v) expansion of refining capacity.

## 1.6 Oil&Gas Supply Security Policy Conceptual Framework

The oil&gas supply security policy conceptual framework develops a number of criteria extracted from the frameworks of a number of scholars who in their research mostly dealt with the concept of energy security and specifics of oil&gas supply security policy. In order to overcome possible disruptions that might suddenly occur and thus challenge ceaseless supplies of oil&gas, a county may invest in a number of strategies to enhance county's oil&gas supply security. As mentioned above, those include: i) domestic production, ii) imports, iii) overseas production, iv) securing strategic petroleum reserves, and v) expansion of refining capacity.

Since political, economic and social factors differ from country to country, every country has different priorities in approaching the formation and implementation of oil&gas supply security policies. The methodology developed in following chapters helps us to assess similarities and differences between oil&gas supply security policies in China and Japan.

### *1.6.1 Domestic Production as a Strategy behind Oil&Gas Supply Security Policy*

Since every country is eager to become energy self sufficient in energy resources, the maximization of domestic production of oil&gas is of utmost importance for securing oil&gas supply security. A number of indicators shape country's domestic production structure and its level such as: nature of property rights, nature of coordination and incentive structure and domestic oil and gas production cover.

While assessing the nature of property rights the key question that arises is who owns the means of production. The answer to this question usually results with private-owned – where

the means of production are owned by private capitalists, or state-owned – where the means of production are owned by the state (Neuberger 1971). This particular indicator examines the nature of ownership behind country's domestic oil and gas production and assesses whether state-ownership or private-ownership dominates country's oil&gas sector.

Further on, the level of country's oil&gas sector liberalization implies the nature of coordination and incentive structure. In the liberalized oil&gas sector prices are deregulated and market incentives coordinate oil&gas sector (Neuberger 1971). In addition, higher level of liberalization leads to more efficient production and usage of oil&gas.

Maximization of domestic oil&gas production requires an efficient pricing system. 'While in the short-term the demand for oil tends to be fairly price-inelastic, longer-term higher prices provide strong incentives to use energy more efficiently' (Cornelius and Story 2007: 11). Conserving energy and increasing energy efficiency thus is a very important strategy of oil&gas supply security policy.

Efficient supply of energy could be observed as a two-dimensional approach: firstly as a productive efficiency – producing a given output at the lowest cost, and secondly as an allocative efficiency – goods are allocated according to market mechanisms (Meidan et al. 2009: 594).

The strategy of price liberalization is important for developing countries (e.g. China) since the core idea is to link domestic prices for oil and gas to world market prices[6] (Li and Leung 2011: 5161). However, we note a significant difference in oil and gas prices between countries. Oil and gas prices in most major exporting countries are significantly below market value. This phenomenon is definitely not an outcome of market competition and market mechanisms. Such a scenario thus makes trade of resources much unreliable. Additionally, it is also negatively influences effective allocation of resources (Mao 2006: 110-111).

Apart from the price liberalization strategy, the competition of the energy industry is another way to rationalize the distribution of resources in the market (Andrews-Speed et al. 2002: 19, Von Hippel et al. 2011: 6722). Higher degree of competition and greater number of players involved into domestic oil&gas production lead to increased efficiency of energy sector. In order to measure the degree of the competition among companies involved in the domestic production of oil&gas the paper applies a statistic measure of concentration, Herfindahl-Hirschman Index – HHI (Hirschman 1964: 761, Rhoades 1993: 188).

[6] 'The value of foreign exchange, gold, oil and grain are all established by the international market each day. Price equilibrium is in turn an essential condition for optimum resource allocation' (Mao 2006: 110).

Level of Market Concentration (LMC)

$$\text{LMC} = \text{HHI} = \sum_{i=1}^{n} (\text{MS}_\text{i})^2 \qquad (1.6.1.1)$$

The number reaches value from zero to 10,000. The closer the market is to a monopoly the higher is market concentration and thus the number is getting closer to a maximum value of 10,000. In the contrast, if there are a number of companies operating in the theoretically perfectly competitive market, the share of each will be low and thus the LMC value will be closer to zero (Hirschman 1964: 761, Rhoades 1993: 189).

Finally, in order to assess country's oil&gas domestic production cover it is important to understand the ratio between domestic oil&gas production and consumption. This factor examines the level of country's self-sufficiency in oil&gas.

Domestic Oil Production Cover (DOPC)

$$\text{DOPC} = \frac{\text{Total Domestic Production of Oil}}{\text{Total Domestic Consumption of Oil}} \qquad (1.6.1.2)$$

Similarly, to the domestic oil production cover indicated in the formula above the paper also assesses country's domestic gas production cover as specified in the formula below.

Domestic Gas Production Cover (DGPC)

$$\text{DGPC} = \frac{\text{Total Domestic Production of Gas}}{\text{Total Domestic Consumption of Gas}} \qquad (1.6.1.3)$$

In conclusion, as presented in the course of this chapter, a number of indicators help us to understand characteristics of domestic production as a strategy behind country's oil&gas supply security policy. Those indicators include:

- Ownership (state-ownership vs. private-ownership)
- Prices (regulated vs. liberalized)
- Market concentration (level of competition in domestic oil&gas production)
- Domestic oil&gas production cover (level of self-sufficiency)

*1.6.2 Imports as a Strategy behind Oil&Gas Supply Security Policy*

Natural resources are abundant in some while scarce in other countries. In order to satisfy domestic demand countries can only rarely rely on its domestic oil&gas production. Most of the countries, therefore, tend to increase oil&gas imports to meet their national economies' needs. The key strategy behind oil&gas supply security enhancement thus puts an emphasis on diversification of suppliers and routes by which oil&gas is transported. Indicators that shape imports as a strategy behind oil&gas supply security policy include: oil&gas imports dependency, diversification of oil&gas imports by origin and developing close political relationship with key energy suppliers.

With a specification of fuel's role in the energy mix the indicators Net Oil Import Dependency (NOID) and Net Gas Import Dependency (NGID) provide a more specific indication of import dependency on oil and gas to meet country's energy demand. NOID measures the degree of country's dependency on oil in country's primary energy mix, whereas, NGID measures the level of country's dependency on gas in a country's primary energy mix (APERC 2007: 45) (see formula 1.6.2.1 and 1.6.2.2).

Net Energy Oil Import Dependency (NOID)

$$\text{NOID} = \frac{\text{Net Oil Imports}}{\text{Oil Primary Energy Demand}} \text{ x } \frac{\text{Oil Primary Energy Demand}}{\text{Total Primary Energy Demand}} \qquad (1.6.2.1)$$

Net Gas Import Dependency (NGID)

$$\text{NGID} = \frac{\text{Net Gas Imports}}{\text{Gas Primary Energy Demand}} \text{ x } \frac{\text{Gas Primary Energy Demand}}{\text{Total Primary Energy Demand}} \qquad (1.6.2.2)$$

The final value acquired from indicators NOID and NGID is a value between 0 and 100. A value closer to zero implies that the economy relies on domestic sources of oil/gas to meet its

primary energy demand, while a value close to 100 implies that the economy is highly dependent on imports of oil/gas required to meet its primary energy demand[7].

Furthermore, in order to measure geographical diversification of supply this paper examines country's oil import dependency from Middle East and oil&gas imports diversification with adjusted political risk. The former one is very important to look into since Middle East is considered as one of the most politically unstable, however, leading petroleum export regions in the world. About 30 percent of total petroleum production is produced in Middle Eastern countries, resulting with petroleum exports reaching high 20 million of barrels per day (IEA 2013b). The data for Middle East Oil Import Dependency (MEOID) is acquired from a number of statistical databases that report international crude and products trade for each country and then calculated as a share.

Middle East Oil Import Dependency (MEOID)

$$\text{MEOID} = \frac{\text{Middle East Imports}}{\text{Total Imports}} \qquad (1.6.2.3)$$

Oil&gas imports diversification with adjusted political risk is another indicator to assess country's geographical diversification of supply. This indicator helps us to understand the nature of county's oil&gas imports by examining imports from countries known for high political risk. The political stability of supplier countries is of great importance to the security of the energy supply since governments control the energy supply and conditions under which the energy is produced and exported. Therefore, energy importers are eager to import from politically stable regions. However, since the competition in global energy markets has become more intense due to rapid increase in demand from developing countries (in particular China and India), the newcomers tend to increase imports from politically unstable regions (Gupta 2008: 1195, Kruyt et al. 2009: 2169, Cohen et al. 2011: 4865).

Risk ratings for each country are taken from Political Stability Risk Index that ranges between 0 for least risky and 100 for most risky (Economist's Intelligence Unit Economist 2013). According to Gupta geopolitical oil risk is defined as the 'exposure of an economy to physical supply distortions due to strategically motivated control of supply by oil exporting

[7] Net oil import dependency is defined as the ration of net oil imports that is defined as the sum of net crude oil imports to the oil supply that is defined as the sum of crude oil domestic production and net oil import. Net gas import dependency is defined same as the net oil import dependency (APERC 2007).

countries or breakdowns in political and economic systems' (Gupta 2008: 1198). Results for Oil&Gas Import Diversification Index with adjusted political risk range from 0 to 1, where the value close to zero implies higher risk, while the value close to 1 indicates lower risk.

Import Diversification Index (IDI) with adjusted political risk

$$IDI_{pol} = \sum_i \left( \left( \frac{NPI_i}{C} \right)^2 \text{ x } POL_i \right) \qquad (1.6.2.4)$$

C … country j's total consumption of the fuel
$NPI_i$ … net positive imports from country i to country j
$POL_i$ … political risk in country i

$$POL_i = 1 / \frac{Risk_i}{100} \qquad (1.6.2.5)$$

Finally, building close political relationship with energy exporters is the last indicator the paper looks into while assessing imports as a strategy behind oil&gas supply security policy. Investing in good political relations with energy exporting countries either through strategic or economic projects contributes to adequate imports of oil&gas. Therefore, in order to secure constant inflow of oil&gas to support domestic economy and national security, countries invest in building close relations with key energy exporters (Andrews-Speed et al. 2002: 19, Jakobson and Zha 2006: 60).

In conclusion, similarly to the previous chapter in order to assess imports as a strategy behind oil&gas supply security, this paper examines a number of indicators presented in the course of this section and investigate them for China and Japan, respectively. Those indicators include:

- Oil&gas imports dependency (low vs. high imports dependency)
- Geographical diversification of oil&gas supply (geostrategic vs. market approach)
- Foreign policy towards oil&gas exporters (oil diplomacy)

### *1.6.3 Overseas Production as a Strategy behind Oil&Gas Supply Security Policy*

In the previous chapter we have learned that in order to meet domestic oil&gas demand countries tend to import energy from oil&gas ample regions. In this chapter the paper goes one step further and assesses overseas production as a strategy behind oil&gas supply security policy. Overseas production is one of the key strategies to diminish countries vulnerability to oil&gas supply disruptions since in the form of overseas investments in upstream assets it aims to secure a country constant supply of oil&gas. The indicators that this paper looks into while assessing overseas production as a strategy behind oil&gas supply security policy include: incentive structure behind 'going out' policy, geographic diversification of overseas production and development of close political relationship with countries where invested into.

Incentive structure behind county's 'going out' policy directs the investments in overseas oil&gas assets. It shows whether decision makers are provided with ego-satisfying or material benefits when entering new energy markets and acquiring upstream assets overseas (Neuberger 1971).

It is important to note that 'going out' strategies and investments in overseas energy resources enable countries to acquire resources, technology and markets while simultaneously enhancing the competitiveness of their domestic oil companies (Cheng 2008: 314, Houser 2008: 143, Li and Leung 2011: 5161, Wolfe and Tessman 2012: 184).

Similarly to the geographical diversification of fossil fuels imports, geographic diversification of oil&gas overseas production also shapes country's oil&gas supply security policy. Investment into overseas oil&gas upstream projects could significantly diminish the vulnerability to abrupt threats in global energy markets and thus enhance country's energy supply security. High level of diversification, therefore, enables the country to carry out short-run adjustments to external shocks in case of any disruption coming from one supplier or energy source (Yergin 1988: 76, Buckley et al. 2007: 503, Cohen et al. 2011: 4861).

An emphasis on geographical diversification of supply behind oil&gas supply security policy formation and implementation leads to the overseas investment of domestic oil&gas companies. The 'going out' strategies may be enforced in the form of acquisition of equity stakes in oil exploration and production assets in energy abundant countries (Wu and Fesharaki 2006: 267, Jaffe and Lewis 2007: 122, Wolfe and Tessman 2012: 179). The internalization theory emphasizes the importance of equity-based control in the exploitation

of scarce natural resources. The Foreign Direct Investment (FDI)[8] [9] inflows are positively associated with host country endowments of natural resources. Furthermore, internalization theory asserts that countries experiencing high political risk are less attractive for investment and thus resource-oriented firms are discouraged from committing substantial sunk costs in the form of FDI projects (Buckley et al. 2007: 505).

Although high political risk is associated with low values of FDI inflow, the East Asian countries (i.e. China), on the contrary, pour their investments in political risky *rouge* countries. Since higher risk host countries also offer higher returns or strategic assets FDIs still flow to them. Nevertheless, fostering diplomatic relations with exporting countries diminishes political risks and reduces other risks that appear when working in unfamiliar countries.

Geo-economic and geostrategic motivations shape county's foreign policies towards countries where invested into (Jakobson and Zha 2006: 60, Wolfe and Tessman 2012). Since the energy supply has to be secured in order to support further economic development, fostering close diplomatic ties with energy exporters could significantly contribute to the enhancement of country's energy security. Long-term sales arrangements and tight political links with energy exporters are the core of this measure to enhance energy security of energy importing country (Andrews-Speed et al. 2002: 19).

In conclusion, in order to assess overseas investment as a strategy behind oil&gas supply security, this paper develops a number of indicators that support criteria of overseas production and in the empirical part examines them for China and Japan. Those indicators include:

[8] In the report on Foreign Direct Investment Trends and Statistics the International Monetary Fund (IMF) defines Foreign Direct Investment (FDI) as a category of international investment that reflects the objective of a resident in one economy (the direct investor) obtaining a lasting interest in an enterprise resident in another economy (the direct investment enterprise) (IMF 2003: 6).

[9] The firms use FDI as an instrument for internalization and expansion of markets in order to replace imperfect external markets in intermediate products and know-how, and gain profits while doing so. According to Dunning (1988: 18-19, 1993: 192) three primary motivations for FDIs arise: i) Foreign market seeking FDI; ii) Efficiency seeking (cost reduction) FDI; and iii) Resources seeking FDI.

Market seeking FDIs are popular among developing emerging economies in order to enable domestic firms to go global. The market seeking FDI emphasizes access to distribution networks and facilitates the exports of domestic producers. Efficiency seeking FDIs focus on the cost reduction. Investors who follow the efficiency seeking strategies search for lower-cost locations for operations and lower-cost labor. Resource seeking FDIs focus on acquisition of raw materials and energy sources that are in short supply at home. Furthermore, resource seeking FDIs also look for specific assets with high R&D capacity and output in developed industrialized countries.

- Incentive structure behind country's 'going out' policy
- Geographic diversification of overseas production (geostrategic vs. market approach)
- Foreign policy towards countries where invested into (oil diplomacy)

### *1.6.4 Securing Strategic Petroleum Reserves as a Strategy behind Oil&Gas Supply Security Policy*

Maximizing strategic petroleum reserves is another useful measure to enhance oil&gas supply security, as in the period of disruption it provides a country with required amounts of oil and allows the economy to continue functioning uninterruptedly for some period in such an event.

By implementing the strategy of securing strategic reserves the country becomes much less vulnerable to prices fluctuations and disruptions on the global energy markets what further enhances its energy security. A number of indicators shape country's strategic petroleum reserves structure such as: nature of property rights, infrastructure to support strategic reserves and transparency of petroleum reserves levels.

Building strategic oil reserves is a very important long-term priority. It is crucial for countries with limited domestic production and transportation sea routes that could face possible challenges (Yergin 1988: 76, Andrews-Speed et al. 2002: 20, Singh 2012). Moreover, a sufficient commercial storage capacity enables countries in the period of diminishing oil prices to take advantage of low world oil prices and build up their reserves (Xu 2006: 279).

The maintenance of strategic petroleum reserves is observed as one of the crucial measures that energy importing countries implement in order to increase their ability to manage changes in the international energy markets.

There are two key reasons why the states are primary focusing on construction of strategic petroleum reserves leaving strategic natural gas reserves in the background. Firstly, oil is essential for country's economy since it powers economic sector and is essential for country's national defense. In case there is no substitute to the oil the economy comes to a halt. Secondly, traditionally natural gas was mainly transported via transnational pipelines what made countries more vulnerable to potential embargos implied by exporting or transit countries. In addition, the concept of SPR has historically been strongly advocated by the IEA

and the minimum level of SPR is mandated for the OECD countries. The call for strategic petroleum reserves has emerged as a reaction to Arab-Israel War and ensuing oil embargo (IEA 2013).

According to Downs (2000: 29-30) the establishment of strategic petroleum reserves could enhance country's energy supply security in four different ways. Firstly, construction of strategic reserves would reduce country's vulnerability to short-term energy-supply interruptions. Secondly, the strategic energy reserves could also stabilize domestic oil&gas prices in the case of some abrupt disruptions and price increases in the international energy markets. Thirdly, strategic oil and gas reserves could prevent negative effects on domestic economy by imposing some politically or economically motivated embargos. Finally, strategic reserves could also increase country's diplomatic flexibility by untying authorities' hands and giving more room for maneuver while taking actions in the global diplomatic arena.

Furthermore, while assessing the nature of property rights of strategic petroleum reserves, the key question that arises is who holds strategic reserves and who has the right for usage in times of supply shortage. The answer to this question usually results with private-ownership and state-ownership (Neuberger 1971). Therefore, while assessing strategic petroleum reserves we could also differentiate between strategic petroleum reserves and commercial petroleum reserves. In line with that we distinguish between an energy market in which big state-owned oil&gas companies hold petroleum strategic reserves, or a market in which besides the government petroleum reserves are also held by private-owned companies.

Building infrastructure to support development of adequate strategic reserves sites is inevitable indicator that manifests in a number of forms. Construction of transnational and national pipelines, stockpiling reserves and tanker terminals play crucial role in determining country's strategic reserves network. Oil&gas supply constraints can be also result of inadequate infrastructure (Vivoda 2009: 4620).

Finally, it is important to look into information transparency of country's petroleum stock levels since the high-quality information reinforces well integrated and functioning markets. On the global level the International Energy Agency (IEA) has been coordinating the improvements of the information flows in the world energy markets (Yergin 1988: 76, Andrews-Speed et al. 2002: 19). Although many countries report their level of strategic reserves, some countries, however, do not reveal the real level of its strategic reserves. The transparency indicator thus investigates the overall level of stocks known vs. unknown.

In conclusion, in order to assess oil&gas supply security policy in China and Japan, this paper measures three key indicators that support criteria of securing petroleum strategic reserves. The indicators that the paper assesses in order to examine the similarities and differences between oil&gas supply security policy related to oil&gas strategic reserves include:

- Ownership (state-ownership vs. private-ownership)
- Infrastructure (development of infrastructure network)
- Transparency (overall level of stocks known vs. unknown)

### *1.6.5 Expansion of Refining Capacity as a Strategy behind Oil&Gas Supply Security Policy*

Expansion of refining capacity is the final strategy that this paper examines while assessing country's oil&gas supply security policy. Since refining capacity of an oil-importing country may severely limit the success of an importer's oil diversification policy, countries that are big energy importers tend to make great investments in its domestic refining sector. The construction of transnational and national pipelines, national petroleum refineries and natural gas refineries thus play crucial role in country's oil&gas supply security enhancement (Vivoda 2009: 4620). Those indicators include: nature of property rights, nature of coordination and incentive structure, and domestic refining production cover.

Energy importers seek the ways in order to enhance domestic oil&gas supply security through the expansion of its refining capacity with facilities capable of processing crudes they import. Developments in refining facilities would meet country's needs for derivates by processing imported crude oil instead of importing refined products (Downs 2000: 31). Processed crude divides in two groups: major petroleum products and minor petroleum products. Major petroleum products include: diesel, gasoline, fuel oil, naphtha, kerosene/jet fuel and liquefied petroleum gas (LPG). Minor petroleum products, on the contrary include: lubricants, asphalt, solvents and wax (Wu and Fesharaki 2007: 38).

The nature of property rights is one of the key indicators while assessing country's refining structure. The key question that arises is who owns the means of production. Similarly, to the criteria discussed above, the answer to this question usually results with private-ownership or state-ownership (Neuberger 1971). This particular indicator will examine the nature of

ownership behind country's refining sector and look whether state-ownership or private-ownership dominates country's refining sector.

Apart of the ownership, the nature of coordination and incentive structure also shapes the nature of country's refining industry. The former determines the degree of competition in the domestic energy market and raises a question whether the energy market is coordinated by few big national oil and gas companies, or by a number of small privately owned domestic players. The latter examines degree of liberalization of petroleum product prices and thus emphasizes an efficient pricing system as the key of a sustainable domestic refining sector (Cornelius and Story 2007: 11, Meidan et al. 2009: 594).

The strategy of price liberalization is important for developing countries (e.g. China) since the core idea is to link domestic prices for petroleum products to world market prices. However, in some countries that subsidize their domestic prices we note significant difference in derivatives prices between countries. This phenomenon is definitely not an outcome of market competition and thus makes trade of resources much unreliable. Additionally, it is also damaging to the effective allocation of resources, as they discourage imports but making them economically not feasible in case of subsidized domestic petroleum prices. Domestic price regulations for petroleum products could cause losses for local refineries and even shut production (Mao 2006: 110-111, Li and Leung 2011: 5161).

Further on, in order to measure the degree of market concentration of domestic refining production this paper uses Herfindahl-Hirschman Index - HHI, as the basis on which it then measures petroleum products market concentration (see chapter 1.6.1) (Hirschman 1964: 761, Rhoades 1993: 188).

Level of Market Concentration (LMC)

$$\text{LMC} = \text{HHI} = \sum_{i=1}^{n} (\text{MS}_\text{i})^2 \qquad (1.6.5.1)$$

As already explained in the chapter on domestic oil&gas production the number reaches value from zero to 10,000. The higher is the value the closer is the market to a monopoly. In the contrast, if there are a number of companies operating in the theoretically perfectly competitive market, the share of each will be low and thus the LMC value will be closer to zero (Hirschman 1964: 761, Rhoades 1993: 189).

Finally, in order to assess country's petroleum products domestic production cover it is important to understand the ratio between domestic petroleum products production and consumption. Domestic refining cover indicator measures the ratio between capacity of domestic refineries and total domestic petroleum products demand.

Domestic Refining Cover (DRC)

$$DRC = \frac{\text{Total Capacity of Domestic Refineries}}{\text{Total Domestic Petrolem Product Demand}} \quad (1.6.5.2)$$

In conclusion, in order to assess oil&gas supply security policy in China and Japan, this paper measures a number of indicators that support criteria of expansion of country's refining capacity as a strategy behind oil&gas supply security. The indicators that the paper will assess in empirical part of the paper include:

- Ownership (state-ownership vs. private-ownership)
- Prices (liberalized vs. regulated)
- Market concentration (level of competition in domestic refining production)
- Domestic refining cover (level of self-sufficiency)

### *1.6.6 Oil&Gas Supply Security Policy Conceptual Framework – Summary*

The previous chapters examine five key strategies that every country targets in order to enhance its oil&gas supply security. The oil&gas supply security policy conceptual framework develops upon these five key strategies that steer formation and implementation of a country's oil&gas supply security policy. Those are:

i) domestic production,
ii) imports,
iii) overseas production,
iv) securing strategic reserves, and
v) expansion of refining capacity.

By analyzing the oil&gas supply security policy in China and Japan according to the methodology developed in previous sections and summarized in the table below (Table 1.1), this paper seeks an answer on the research question: *what are the similarities and differences in oil&gas supply security policy between China and Japan*.

Table 1.1 Oil&Gas Supply Security Policy Conceptual Framework – Summary

| Criteria for Classifying Oil&Gas Supply Security Policy | Indicators that support Criteria for Classify Oil&Gas Supply Security Policy |
|---|---|
| **Domestic Production as a Strategy behind Oil&Gas Supply Security Policy** | • **Ownership** (state-ownership vs. private-ownership)<br>• **Prices** (regulated vs. liberalized)<br>• **Market Concentration** (level of competition in domestic oil&gas production)<br>• **Domestic oil and gas production cover** |
| **Imports as a Strategy behind Oil&Gas Supply Security Policy** | • **Index of oil&gas import dependency in the energy mix**<br>• **Geographical diversification of supply** (geostrategic vs. market approach)<br>• **Foreign policy towards oil&gas exporters** (oil diplomacy) |
| **Overseas Production as a Strategy behind Oil&Gas Supply Security Policy** | • **Incentive structure behind 'going out' policy**<br>• **Geographic diversification of overseas production** (geostrategic vs. market approach)<br>• **Foreign policy towards countries where invested into** (oil diplomacy) |
| **Securing Strategic Reserves as a Strategy behind Oil&Gas Supply Security Policy** | • **Ownership** (state-held vs. commercially-held)<br>• **Infrastructure** (development of SPR network)<br>• **Transparency** (overall level of stock known vs. unknown) |
| **Expansion of Refining Capacity as a Strategy behind Oil&Gas Supply Security Policy** | • **Ownership** (state-ownership vs. private-ownership)<br>• **Prices** (regulated vs. liberalized)<br>• **Market Concentration** (level of competition in domestic refining production)<br>• **Domestic refining production cover** |

Source: created by the author based on the literature of a number of scholars presented above

## II. Empirical Framework

### 2.1 Oil&Gas Supply Security Policy in China

China has been witnessing an astonishingly accelerating economic development. Since China's reform and opening-up initiated by Deng Xiaoping in 1978, Chinese economy has been developing at an impressive pace. The security of constant oil&gas supply, therefore, was and is an imperative for China's economic growth and regional stability.

China's energy consumption has been increasing rapidly as a result of the on-going economic development, expanding middle class population, increase in nation's motorization and urbanization. In line with that, in recent years, China has become more eager to secure a growing amount of energy resources which are necessary to satisfy country's needs and further boost its economic development.

This section of the paper assesses oil&gas supply security policy in China by following key criteria developed in the theoretical part of this paper and summarized in oil&gas supply security policy conceptual framework. Those are: domestic production, imports, overseas production, securing strategic petroleum reserves and expanding of refining capacity.

#### *2.1.1 Domestic Production as a Strategy behind Oil&Gas Supply Security Policy in China*

In this chapter this paper investigates indicators that examine domestic production as a strategy behind oil&gas supply security policy in China. In order to understand the nature of domestic production of oil&gas in China this paper looks into four key indicators: ownership of oil&gas companies in China, domestic prices of oil, market concentration of domestic oil&gas production and China's domestic oil&gas production cover.

Chinese energy sector is still dominated by only three large national oil companies (NOCs): China National Petroleum Corporation (CNPC) – which is dominant in upstream oil and gas exploration and production; China Petroleum and Chemical Corporation (Sinopec) – whose stronghold is downstream, marketing and petchem; and China National Offshore Oil Corporation (CNOOC) – specialist in offshore upstream production (Houser 2008: 145, IEA 2011: 9).

Reforms initiated in China in late 1990s were supposed to reduce transactional costs and increase the transparency and energy efficiency by separating government from the industry

(Andrews-Speed et al. 2000: 19). However, although the role of government was separated from the business, China's leading oil and gas companies remained state-owned. Ever since Chinese NOCs have functioned as state-authorized investment institutions with the Communist Party as the biggest shareholder (Guizot 2007: 179). However, it is important to emphasize that Chinese NOCs are majority owned by the state but not necessarily run by the state. Moreover, they enjoy a decent level of independence due their comparative size and capacities, and power due to previous close relation with ministries (IEA 2011: 25).

In addition, the oil&gas sector restructuring in late 1990s enabled Chinese NOCs to compete internationally. Introduction of energy sector liberalization policies encouraged competition among NOCs in the domestic market and gradual price liberalization. The price reform provided incentives to Chinese NOCs to improve their operation efficiency and partly close the gap to their international counterparts.

Chinese leadership did a number of reforms in order to enhance the economic efficiency in oil&gas sector. The major NOCs were listed on domestic and foreign stock markets. Moreover, although NOCs remained predominantly state-owned, the roles and responsibilities of government and NOCs were adjusted. As a result of gradual deregulation, market mechanisms were developed and implemented in order to support progressive commercialization of oil&gas sector in China (Meidan et al. 2009: 604).

Furthermore, China's petroleum sector[10] was restructured under two dimensions.

> 'Firstly, the government functions were removed form the state companies and placed with the State Economic and Trade Commission (SECT). Secondly, the assets of CNPC and Sinopec were redistributed to create two regional, vertically integrated companies which spanned the full range of activities from exploration through refining to marketing' (Andrews-Speed et al. 2002: 14).

Until the late 1990s domestic prices of crude oil was thoroughly regulated. Chinese government maintained a two-tiered pricing system[11]. Under such a system Chinese NOCs were required to sell most of their produced crude oil on the domestic market. CNPC as a national specialized upstream company had to sell most of its oil to Sinopec that was

[10] 'The petroleum industry was regulated by four bodies: the Price Administrative Department of the State Development Planning Commission (SDPC), the Transport and Energy Department of the SDPC, and the new Ministry of Land and Resources' (Andrews-Speed et al. 2000: 14).

[11] The dual pricing system established in the 1980s for oil was gradually modified so that the average price realized by the energy producers better reflects the market. In 1998, the government introduced a single pricing framework and prices of all crude and oil products were explicitly tied to international prices, though still dependent on systems controlled by the State Development and Planning Commission (Meidan et al. 2009: 605).

specialized in downstream at a state-controlled (first-tier) price significantly below the real market price. Such circumstances left CNPC with limited funds for further investment in exploration activities what resulted with stagnation of domestic production and increased imports. Facing great loses the government had to adopt changes in energy price policies. By the mid-1990s the first-tier price for crude oil increased. Largely as a result of price increase the value of CNPC's total output reportedly thus tripled from $6 billion in 1993 to $21 billion in 1997 (Downs 2000: 14). Ever since controls on crude prices in China have been gradually relaxed.

Since the implementation of the market-oriented growth model the energy market has become more institutionalized and market mechanisms such as prices, market supply and demand, and competition have been gradually introduced. In line with that, subsidies on natural resources prices were abandoned and prices for natural resources were gradually liberalized (Mol & Neil 2006: 158).

In 2009, the Chinese government launched reform of the domestic product pricing mechanism with the goal to link retail oil prices to international energy markets. The main objective behind this strategy was to attract foreign investment and reduce energy intensity (EIA 2013a).

Crude oil prices thus have been at levels referenced to those of the international markets in order to maintain the incentive for exploration and production of crude oil within China. This means that prices should not be too high to destabilize Chinese economy, and simultaneously not too low to dampen the incentive of Chinese oil producers to supply oil consumers adequately (Zha 2006: 10, Cornelius and Story 2007: 11, Li and Leung 2011: 5160, 5162).

According to State Council Think Tank Development Research Center the government is planning to continue with the implementation of market liberalization measures. In the Third Plenary Session of the 18$^{th}$ Central Committee of the Chinese Communist Party (CCP), the Development Research Center presented reform blueprint '383 Plan'. They advocated for a number of measures that would lead to a more liberalized domestic energy market such as: i) implementation of a new pricing system that would be in line with international energy markets, ii) lessening of barriers to oil and gas exploration, and iii) promotion of the shale gas reserves development (China Briefing 2013, Bloomberg 2013a, Financial Times 2013a).

Price reform that allows domestic prices to reflect movements in international energy markets more closely creates more transparency and thus attracts more foreign investment. However, although oil&gas prices reform has been implemented and prices began converging

with prices in global oil&gas markets, we observe that oil&gas pricing system in China is still not fully liberalized.

Chinese NOCs are making great investments in order to upgrade technology and increase production from the already mature domestic oilfields. Recent exploration and production activities have been focused on a few offshore and onshore domestic oil and gas fields. Offshore oil and gas fields are mainly based in Bohai Bay and the South China Sea, while onshore oil and gas fields dominate western provinces such as Xinjiang, Sichuan, Gansu, and Inner Mongolia (EIA 2013a). In addition, it was reported that in 2012 China held 17.3 billion barrels of proven oil reserves and 3.1 trillion cubic meter of proven natural gas reserves (BP 2013).

According to Energy Information Administration (EIA), in 2013, overall China's oil production counted 4.1 million barrels per day (b/d) (EIA 2014). Onshore exploration activities have been mainly dominated by CNPC and Sinopec. About 85 percent of China's domestic production comes from onshore oilfields. The Northwest Xinjiang Uygur autonomous region rich in oil and gas resources is planned to become one of China's key oil and gas production areas by 2015 (EIA 2013a). The Tarim Basin has been the key focus of production in Xinjiang with an annual increase of 4 percent of crude oil production (EIA 2013a). Further areas that hold developed exploration sites include: Junggar, Turpan-Hami and Ordos Basin.

About 15 percent of overall Chinese oil production derives from offshore reserves. The Bohai Bay basin is China's oldest producing offshore oilfield. In 2007, CNPC initiated development activities of Jidong Nanpu oilfield with production target of 200,000 b/d (EIA 2013a).

In 2011, CNOOC also started with production activities in Penglai oilfield, Bohai Bay area. The oilfield has been proven as a very productive area with production volumes reaching 406,000 b/d. Still, due to oil leakages and potential environmental disaster the oilfield was closed in September 2011. Although, the company has suffered a huge loss in production in Bohai Bay area, however, new oilfields with great potential reserves have been explored (EIA 2013a).

Nevertheless, CNOOC has been also present in gas-rich South China Sea. In 2010 and 2011, CNOOC had successful discoveries of Enping and Liuhua oilfield that initiated further opportunities for exploration (EIA 2013a).

Table 2.1 Domestic oil and gas production by Chinese NOCs in 2012, (in percentage)

| Company | | 2012 |
|---|---|---|
| CNPC | Domestic oil production (mmbbs) | 57% |
| | Domestic gas production (bcm) | 80% |
| SINOPEC | Domestic oil production (mmbls) | 24% |
| | Domestic gas production (bcm) | 18% |
| CNOOC | Domestic oil production (mmbls) | 20% |
| | Domestic gas production (bcm) | 2% |
| Oil Market Concentration | | 4,225 |
| Gas Market Concentration | | 6,728 |

Source: CNPC 2013b, SINOPEC 2013, CNOOC 2013

Form the table above we observe that CNPC dominates oil and gas sector in China. In 2012, 57 percent of country's total domestic crude oil and 80 percent of country's total domestic natural gas production was competed by CNPC. Sinopec as the second largest NOCs produced 24 percent of oil and 18 percent of natural gas, respectively. CNOOC as the smallest among the 'big three', in 2012, produced 20 percent of oil and 2 percent of natural gas in China.

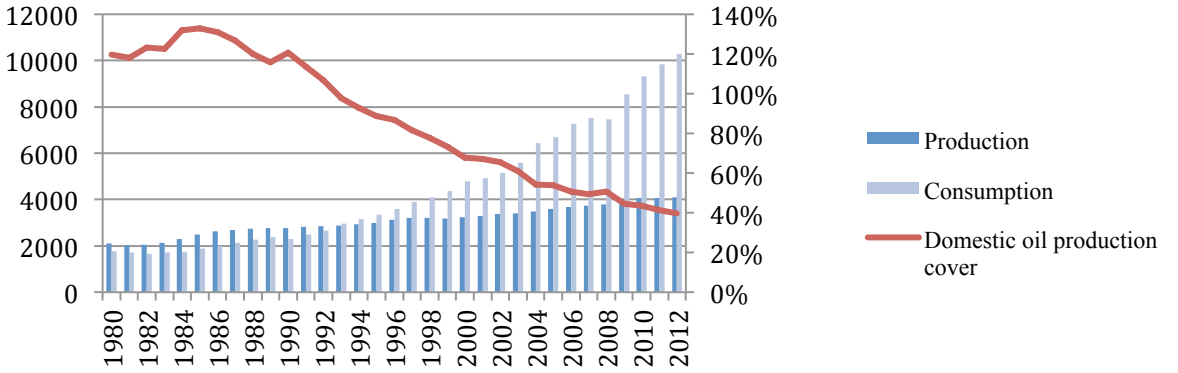
By applying formula to calculate level of oil and gas market concentration (1.6.1.1) for oil market concentration in China we got the value of 4,225, while for gas market concentration in China the value 6,728. From previous chapters we remember that the calculation for market concentration reaches value from zero to 10,000. The closer the market is to a monopoly the higher is market concentration and thus the number is getting closer to a maximum value of 10,000. In China, we observe relatively concentrated oil&gas market with three companies that dominate the sector. Since values for both oil and gas market concentration are relatively high we observe in China a form of a traditional oligopoly with market concentration higher in gas sector, as one company alone accounts for 80 percent of the total output.

China's oil&gas domestic production has been increasing and the leadership has been investing in exploration activities and applying various techniques in order to increase the production capacity of county's domestic fields. As a result of rapid economic development and increase in domestic motorization and urbanization, China's oil&gas consumption has witnessed prompt increase. In the last two decades we observe sharp increase in oil&gas consumption levels in China. Until 1993 China was self-sufficient in crude oil. Nowadays, the

county is the second biggest oil importer in the world after United States. The figure bellow Figure 2.1) illustrates rapid increase in oil consumption in China since the country became an oil net-importer. Additionally, the ratio on the secondary axis indicates rapid decrease in domestic oil production cover.

Figure 2.1 China's Oil Production and Consumption

(Thousands barrels per day)

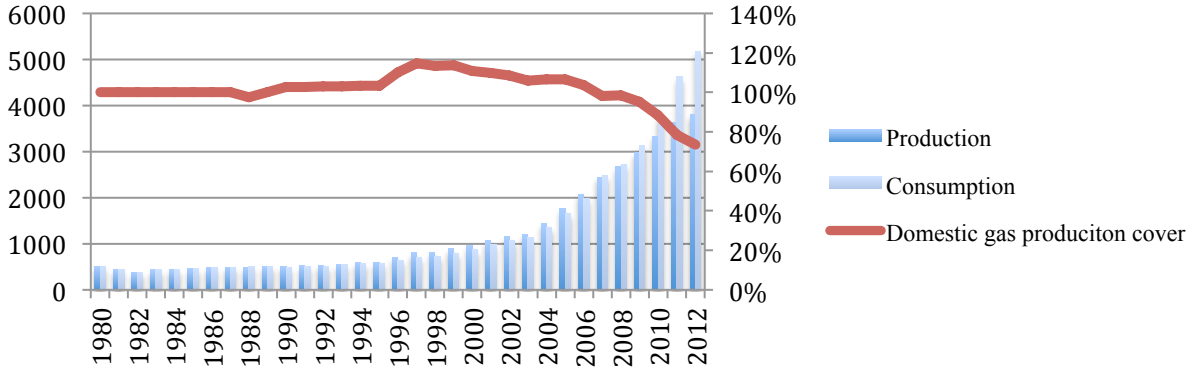



Source: U.S. Energy Information Administration (EIA): 2013a

Similarly to the consumption of oil, the consumption of natural gas in China in recent years has increased significantly. The figure below (Figure 2.2) shows a rapid increase in natural gas consumption levels in China. Additionally, on the secondary axis we observe decrease in China's domestic gas production cover. Since 2007, China is also a natural gas net importer. Proven reserves show that China is rich in unexploited natural gas reserves, a fact that in the long-term could potentially increase domestic natural gas production, however the question remains whether the potential output increase will be sufficient to follow consumption rise.

Figure 2.2 China's Natural Gas Production and Consumption

(Billion cubic meter)




Source: U.S. Energy Information Administration (EIA): 2013a

*2.1.2 Imports as a Strategy behind Oil&Gas Supply Security Policy in China*

As observed in the previous chapter, since 1993 China has been a net importer of oil and since 2007 also a net importer of natural gas. According to recent statistics China became the world's second largest net importer of oil after United States overtaking Japan. In addition, as China's demand is slowly increasing, while US demand is stagnant at best, the forecasts predict that it is very likely that China soon overtakes United States becoming the number one net importer of oil in the world (EIA 2013a). Furthermore, China is also the second largest consumer of natural gas in the world. Although the share of coal in the total energy mix is still over 70 percent, the government goal is to differentiate its domestic primary energy mix and diminish the dominance of coal in power generation, partly replacing it with natural gas (BP 2013).

From this short introduction we observe that imports of oil and gas to China have been of increasing importance for China's oil and gas supply security. In the course of this chapter of the paper we will look into three key indicators that support imports as a strategy behind oil&gas supply security policy. Those indicators include oil&gas imports dependency, diversification of imports by origin, and developing close political relationship with key energy suppliers.

In the previous chapter of this paper we have learned that China is not anymore self-sufficient in oil and gas and that net oil&gas import dependency in China during the last decade has been increasing rapidly. The table 2.2 below presents us indexes for Net Oil Import Dependency (NOID) and Net Gas Import Dependency (NGID) in China.

Table 2.2 Net Oil&Gas Import Dependency in China

| | 2001 | 2011 |
|---|---|---|
| Net Oil Import Dependency (NOID) | 8.4 | 10.3 |
| Net Gas Import Dependency (NGID) | 0.0 | 6.7 |

Sources: APEC 2013, IEA 2013, EIA 2013a

The final value calculated for NOID and NGID is a value between 0 and 100. A value close to zero implies that the economy relies on domestic sources to meet its primary energy demand. A value close to 100, by contrast, implies that the economy is highly dependent on imports and likely possesses only a limited supply of domestic sources required to meet its primary

energy demand. From the values in the table we read that China is still relatively modestly dependent on oil and gas as portion of country's total primary energy demand since China's industry still heavily depends on coal as the primary resource. However, from the figures we read an increasing trend of both oil and gas import dependency.

Due to a number of socio-economic domestic and international factors China's dependency on supply of foreign oil will keep increasing. Forecasts of China's growing dependency published by International Energy Agency (IEA) and U.S. Energy Information Administration (EIA) both foresee increase in dependency on foreign oil supply in next decades (see Table 2.3 below).

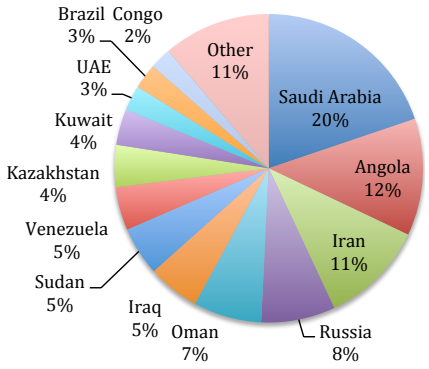
Table 2.3 Forecasts of China's Dependency on Foreign Oil

| Country | 2010 | 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|---|
| China | 46% | 55% | 63% | 69% | 74% |

Source: IEA 2012, EIA 2013a

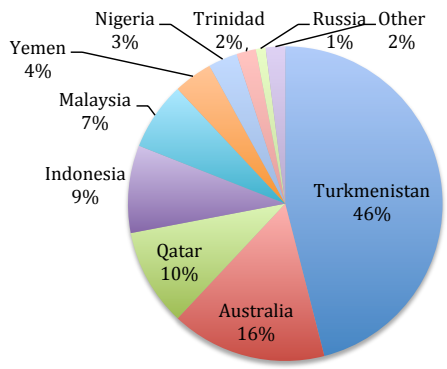
Since China's oil&gas import dependency has been increasing, the leadership has recognized the importance of geographic diversification of imports in order to diminish county's vulnerability to possible disruptions in global energy markets. The Figure 2.3 and 2.4 below show us China's relatively high level of geographical diversification of oil and gas supply.

Figure 2.3 China's Crude Oil Imports by Origin, 2011




Source: EIA 2013a

Figure 2.4 China's Natural Gas Imports by Origin, 2011




Source: BP 2012

The country has achieved high level of geographical diversification of supply by investing in and fostering diplomatic relations with countries that are energy exporters all over the globe. These arguments are supported by the results calculated for MEOID - Middle East Oil Import

Dependency and Imports Diversification Index Adjusted for Political Risk (see Table 2.4). Although Middle East counts as the largest source of crude oil imports to China, however, in spite of increasing China's oil demand, the share of Middle Eastern oil in total oil imports to China remains below 50 percent. These results prove that diversification of oil&gas imports by source is one of the key strategies that shapes China's oil&gas supply security policy.

Table 2.4 Middle East Oil Import Dependency (MEOID)

| Country | 2000 | 2002 | 2004 | 2006 | 2008 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|
| China | 45% | 43% | 43% | 45% | 47% | 50% | 49% |

Source: IEA 2012, IEA 2013a

In addition, although geographical diversification of China's oil&gas supply enhances country's energy security in a way that it diminishes the risks of possible embargos and diversifies energy supply routes, it is important to note that China's presence increases in countries which are known for political instability (see Table 2.5). Risk ratings for each country are taken from Political Stability Risk Index that ranges between 0 for high risk and 1 for low risk (Economist's Intelligence Unit Economist 2013). The data in the table below shows us that absolute values of oil&gas imports in China have been increasing. Additionally, relatively low values imply that the relative share of oil&gas imports from countries with higher political risk has been increasing.

Table 2.5 China's Oil&gas Imports Diversification Index with adjusted political risk

| | 2002 | 2004 | 2006 | 2008 | 2010 | 2012 |
|---|---|---|---|---|---|---|
| Oil | 0.08 | 0.13 | 0.13 | 0.16 | 0.2 | 0.25 |
| Gas | - | - | - | 0.01 | 0.02 | 0.05 |

Source: BP Statistical Review data year collection, Economist Intelligence Unit 2013
Economist Intelligence Unit 2013

Figures 2.3 and 2.4 above show us that in 2011 Middle East supplied about 50 percent of crude oil, Africa about 20 percent, Former Soviet Union about 12 percent, while only about 8 percent of crude oil was imported from the Latina America. Saudi Arabia and Angola are China's largest crude oil exporters. It is important to note that Sudan was one of China's most significant exporters until production interruptions in 2012 due to political conflicts (EIA 2013a). Those losses in import volumes from Sudan were replaced by imports from Angola, Russia, Oman and Venezuela.

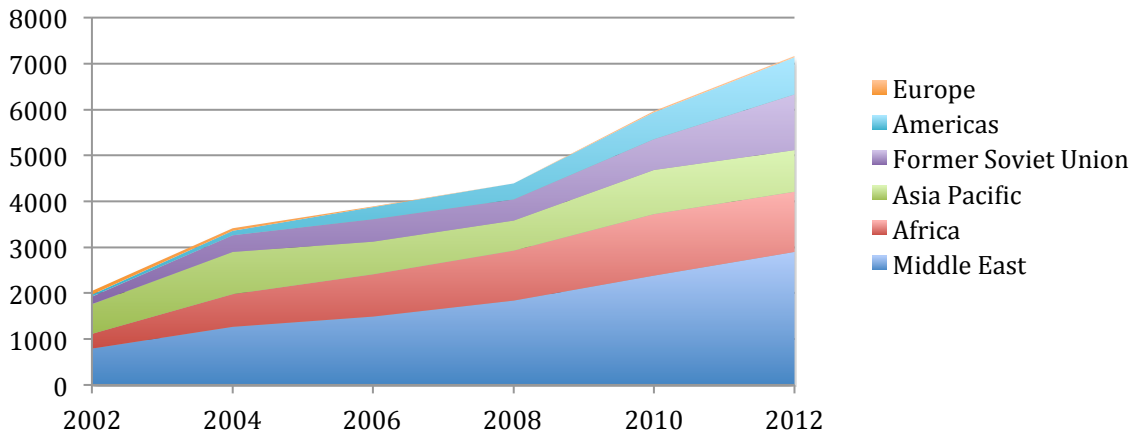
Regarding natural gas imports, Turkmenistan is China's greatest supplier of natural gas. Almost 46 percent of total natural gas supply to China origins from Turkmenistan. The figure 4 above shows that Asia Pacific as a region plays the crucial role as China's LNG supplies.

In addition, above results show that China's crude oil imports heavily depend on a few countries that are disposed to instability and volatility. China's quest for overseas oil and gas supply made the leadership to pursue close diplomatic ties with Iran, Iraq, Sudan, Uzbekistan and Venezuela – countries heavily criticized in the West for their democratic and economic standards, as well as human rights protection (Zha 2005: 48).

Recent events in the Middle East such as the war in Iraq and growing US hegemony encouraged China to reduce its import dependency on the Persian Gulf. In order to avoid heavy dependence on the crude oil imported from the countries in the Middle East, China has been increasing its influence in Central Asia[12] and Africa. Although about half of the China's oil is still being imported from the Middle East (see Figure 2.5 below) the share of oil imports from Central Asia, Russia and Africa have been growing rapidly.

Figure 2.5 China's Oil Import Diversification

(Thousand barrels per day)




Source: BP Statistical data of various years

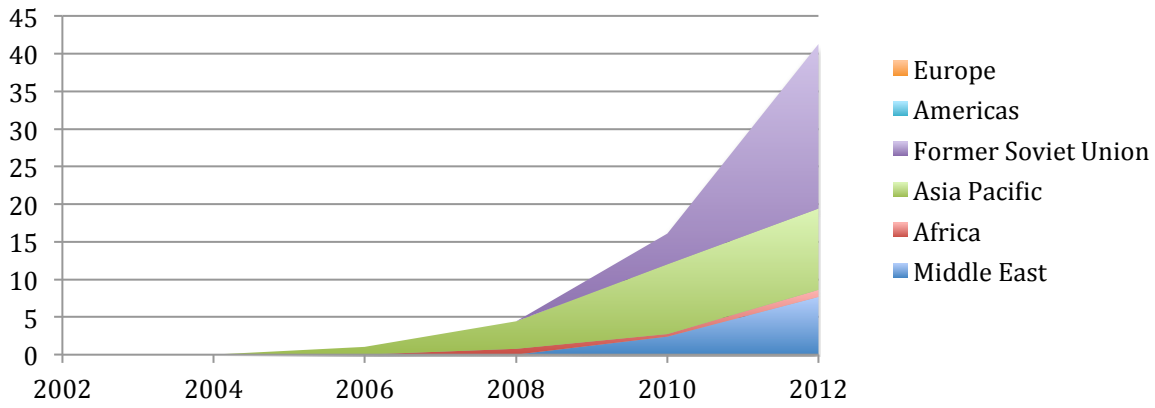
A similar scenario can be observed with regards to China's gas imports. Since the consumption of natural gas in China has been increasing rapidly, the leadership has

[12] Shanghai Cooperation Organization (SCO) is one of the regional organizations in Central Asia. This organization has been actively supported by China and Russia as a part of 'new security concept in Central Asia, which emphasizes the importance of consultation and cooperation as a means of achieving security with its neighbors' (Zha 2005: 50). Member states of SCO include: China, Kazakhstan, Kyrgyzstan, Russia, Tajikistan and Uzbekistan. Recently, also a number of states have obtained observer status. Those countries are India, Iran, Pakistan, Afghanistan and Mongolia.

recognized the importance of gas import diversification. As a result of an increase in natural gas volumes imported from Former Soviet Union (FSU), we note that natural gas imports from FSU overtook imports from Asia Pacific making it thus the most important region to satisfy China's increasing demand for natural gas.

Figure 2.6 China's Natural Gas Import Diversification

(Billion cubic meter)




Source: BP Statistical data of various years

According to Kong, Chinese leadership believes that primary supply regions (i.e. Middle East) are under the control of western capital, primarily from United States. Apart from the rising western dominance in the region, US military actions in the Middle East also cause instability and negatively affect the oil imports to China. Such circumstances make it more difficult for China to negotiate some new agreements and long-term access to resources (Kong 2005: 24). Therefore, nowadays, China's oil&gas import strategies are increasingly oriented towards Africa, Central Asia and Russia.

> 'Perceiving oil as a scarce and strategic commodity and the oil market as manipulated by major international monopoly capital, the Chinese government believes that special relationships with energy producers will guarantee the country reliable access to oil imports' (Kong 2005: 38).

A successful Chinese practice of oil and gas diplomacy in the Middle East, Central Asia, Africa and Latin America is one of the crucial mechanism behind successful implementation of China's oil&gas supply security policy (Cheng 2008: 297, Meidan et al. 2009: 603). Current China's foreign policy strategies are focused on

'the dialogue with Russia and Kazakhstan to build oil import pipelines, a steady increase in the number of oil investments in overseas oilfields made by China's NOCs, the increasing role of energy in China's diplomatic strategies and plans to construct emergency oil storage' (Meidan et al. 603).

Signing agreements with neighboring countries provide opportunities for Beijing to diversify its energy sources and transportation portfolio via pipelines, roads and railways. From the North – oil imports from Russia to be expanded through new pipeline into northeastern Heilongjiang Province (with the natural gas pipeline penciled for construction in the second half of the decade), from the West – oil imports from Kazakhstan and gas imports from Turkmenistan via Uzbekistan and Kazakhstan to Xinjiang, and from the South – oil and gas pipelines to import gas from Burma and to transfer oil shipped from Africa and Middle East while avoiding Strait of Malacca[13] (IEA 2011: 29, Bracken 2013: 7).

The table below shows that Chinese government has been actively promoting its strategic energy diplomacy by establishing bilateral relations with a number of county's key oil exporters. Fostering diplomatic relationship with oil&gas exporting countries remains the high priority on China's oil&gas supply security agenda.

Table 2.6 China's Energy Strategic Partnership

| Country | Nature of Partnership | Year |
|---|---|---|
| Russia | Strategic partnership of cooperation oriented toward 21st century | 1996 |
| Saudi Arabia | Strategic oil partnership | 1999 |
| Venezuela | Strategic partnership of common progress between the two countries in the new century | 2001 |
| Iran | Strategic oil partnership | 2002 |
| ASEAN | Strategic partnership for peace and prosperity | 2003 |
| Brazil | Strategic partnership | 2004 |
| Nigeria | Strategic energy partnership | 2005 |
| Kazakhstan | Strategic energy partnership | 2005 |
| Angola | Strategic energy partnership | 2010 |

Source: Kong Bo 2005: 39 and Chen Mo 2012

[13] 'The Strait of Malacca links the Indian and Pacific Oceans via a long and narrow channel. It is the main route that connects energy producers in Persian Gulf and Africa with East Asian markets. The channel is less than 3 km wide in its narrowest point and at its busy times there is high possibility of accidents. In addition, Strait of Malacca is very important transport route for East Asia. The daily trade is about 15 million barrels of oil – including 80% of China's crude imports. Alternative routes do exist, however, they require more time, have higher costs and are less protected' (IEA 2011: 29, Rahmetulla 2013).

### *2.1.3 Overseas Production as a Strategy behind Oil&Gas Supply Security Policy in China*

China's growing dependency on imported energy is an evident challenge for China's energy policy makers. The Maoist doctrine of self-reliance (ziligengsheng) known as the main principle guiding economic development in 1960s and 1970s is no longer the main strategy behind energy security policy making. Since the reform and opening of China initiated in 1978 by Deng Xiaoping, the essence of the definition of self-reliance has been changed. Self-reliance thus does not mean total independence but rather the ability to keep the initiative in one's own hands (Downs 2000: 11).

In the previous two chapters we have learned that China's oil&gas import dependency in the last two decades has been increasing rapidly. The leadership is aware that a sustainable energy sector in China is the pivot of country's further economic development. In addition, Chinese leadership has recognized the importance of overseas production as a strategy to replace over-dependency on oil&gas imports and enhance country's oil&gas supply security.

This chapter assesses overseas production as a strategy behind oil&gas supply security policy in China by examining three key indicators that shape China's 'going out' policy. Those indicators include: nature of motivational structure behind overseas upstream acquisitions, development of close political relationship with countries where investments have been made and geographic diversification of overseas production.

As we have already learned in the first chapter of empirical part of this paper China's energy sector is dominated by three 'big' national oil companies (NOCs): CNPC, Sinopec and CNOOC. These three NOCs have been dominating and directing oil&gas sector in China. Facing domestic energy shortages and increasing domestic demand for oil&gas, Chinese NOCs have followed a 'going out' strategy and invested in a number of oil&gas upstream assets overseas (Xu 2006: 274, Wolfe and Tessman 2012: 175).

It is important to note that first acquisitions by Chinese NOCs were made already in 1962. However, after the accession to the World Trade Organization (WTO) in 2001, the number of programs worldwide has increased rapidly and China's acquisition of overseas oil&gas upstream assets gained momentum. 'Going out' policy initiated in 2002 by Chinese president Jing Zemin puts an emphasis on investment in new markets and expansion of Chinese companies' international operations. Since 1962 China's foreign acquisitions in energy and power count 333 deals and add up to $162.5 billion in deal value (Zhu and Powell 2013: 4).

Chinese national oil companies (NOCs) have been also obediently following Chinese government's geostrategic pattern of 'going out' policy by investing overseas and diversifying energy supply before such opportunities become more costly, both economically and politically (Downs 2000: 13, Jakobson and Zhu 2006: 65, Xu 2006: 276). Equity oil investments thus have given Chinese NOCs right to explore and drill in the host country and secure them a guaranteed percentage of production. In addition, such investments in energy resources projects have enabled Chinese NOCs to acquire technology and markets in order to further enhance their competitiveness on the global stage (Cheng 2008: 314, Wolfe and Tessman 2012: 175-176). While investing overseas Chinese NOCs take three main factors into consideration: technical capabilities, competition from IOCs, and political and security risks (Houser 2008: 155). As newcomers in the international energy markets the Chinese NOCs have been facing a number of challenges while pursuing their mergers and acquisitions of foreign upstream assets (Cornelius and Story 2007: 6, Zhang 2011: 3). The Chinese leadership has recognized those challenges and started with a number of strategies on both national and international level to enhance oil&gas supply security in China.

In order to start with oil&gas production in natural resources ample regions, Chinese NOCs have been implementing a strategy of access to global oil&gas resources by actively fostering diplomatic relations and signing bilateral cooperation agreements with energy suppliers worldwide. Such behavior of Chinese NOCs was heavily criticized by the developed world. Criticism was above all raised about China's indifferent reactions to domestic policies of countries in which Chinese NOCs have acquired assets.

Chinese NOCs have conducted their operations in the countries where the activities of IOCs are restricted due to human rights violations (i.e. Iran, Iraq, Sudan or Angola). In *rouge* countries such as Sudan or Iraq, Chinese NOCs made investments to gain oil&gas assets. While the United States' congressional banned business dealings with countries accused of supporting terrorism, Chinese NOCs had no constraints in entering those markets. CNPC thus used the opportunity to replace US firm Occidental Petroleum in an oil pipeline in Sudan, for example (Downs 2000: 17).

Although Western scholars have been heavily criticizing China's presence in Africa, China's experts on Africa, on the contrary, share quite different opinion. They view China's presence on African continent as beneficial for Africa's economic development. Furthermore, they point out that Chinese oil companies are more eager than Western companies to help a host country to build up an entire chain of oil industry and also assist in building

infrastructure not directly related to oil exploration. In contrast, according to those scholars, Western oil companies operating in oil-rich African countries, rarely invest in projects that are not energy related, and often operate by extracting crude oil, refining it and selling it back to those countries (Jakobson and Zhu 2006: 67, Bracken et al. 2013: 5).

As already mentioned in the pervious chapter it is inevitable that China's energy imports dependency will keep increasing. In order to enhance China's oil&gas supply security, policymakers have been emphasizing geographical diversification of supply as a crucial point on the agenda.

Investments of Chinese NOCs in oil and gas fields in Former Soviet Union (FSU), Latin America and Africa through loan-for-oil/gas agreements have contributed and will continue to contribute to global upstream investment and global oil and gas supply (IEA 2011: 8, 13). It is important to note that those investments by Chinese NOCs have been directed toward countries that offer CNPC, Sinopec or CNOOC the opportunity to gain international experience without having to compete harshly against Western multinationals. Accordingly, Chinese NOCs have traditionally established operations in countries that are due to high political risk not seen as targets for investment by Western international oil companies (IOCs) (Zha 2005: 48, Houser 2008: 157, Wolfe and Tessman 2012: 179).

The presence of Chinese NOCs worldwide has increased significantly. Taking advantage of the world economic downturn and vast foreign exchange reserves, Chinese NOCs have purchased assets in the Africa, Middle East, Former Soviet Union (FSU), Asia Pacific, North America, Europe and Latin America (see Appendix I). Table 2.7 below illustrates high presence of Chinese NOC's in oil&gas exploration and development projects worldwide.

Table 2.7 Countries with Overseas Exploration and Development Projects by Chinese NOCs, as of 2013

| Region | CNPC | SINOPEC | CNOOC |
|---|---|---|---|
| **Africa** | 8 | 7 | 6 |
| **Middle East** | 6 | 3 | 2 |
| **Former Soviet Union (FSU)** | 5 | 3 | 0 |
| **Asia Pacific** | 4 | 2 | 5 |
| **North America and Europe** | 1 | 2 | 2 |
| **Latin America** | 3 | 4 | 2 |

Source: various based on companies' information

*Africa*

China's involvement in African continent has grown substantially. Chinese NOCs have been investing in a number of African countries by building infrastructure, acquiring upstream assets and increasing their influence on the continent. By now Chinese NOCs operate and run exploration in a number of African countries. Apart from Angola, Sudan, Algeria, Chad, Niger, Nigeria, Uganda and Kenya, they also operate in several blocks in Equatorial Guinea, Libya, Egypt and the Republic of Congo (see Appendix I).

Angola is the second largest exporter of crude oil to China after Saudi Arabia (see Figure 2.3). With the production of 1.7 million b/d it counts as the second largest exporter of oil in Africa after Nigeria (OPEC 2014). Chinese NOCs have heavily invested in Angola and are operating on Angolan soil. In comparison to western International Oil Companies (IOCs), China's ventures in Angola are more welcomed since China has no ambition to openly criticize transparency, corruption, human rights, or promote democracy (Moran 2010: 15, Bracken et al. 2013: 13). In 2004, CNCP acquired Block 18 from Angolan government when Royal Dutch Shell exited Angola and sold its shares (IEA 2011). In 2009, CNOOC and Sinopec formed a joint venture and acquired 20 percent stakes in deep-water exploration Block 32 from Marathon Oil for $1.3 billion (IEA 2011).

Sudan has until recent events been the second largest African exporter of oil to China. Imports of crude oil from Sudan count around 5 percent of all imports to China (see Figure 2.3). As the second largest investor in the Sudanese oil industry China's involvement remains strong. Regarding the disputes between South Sudan and Sudan China is not interfering. Its only goal is to continue the business and protect oil investments. In addition, it is not expressing any ambition to act as a mediator in the conflict (Bracken et al. 2013: 13).

China has been also pouring investments in Algeria in order to secure its position in Algeria's oil market. In 2003, CNPC acquired 75 percent shares in block 350 located in the northwestern Oued Mya Basin in the north of Sahara Desert (IEA 2011).

Nigeria as the largest exporter of oil in Africa and the twelfth-largest oil producer in the world is obviously attractive to Chinese investors. Nowadays, China accounts for about 25 percent of Nigeria's FDI – $6.1 billion (Bracken et al. 2006: 13, EIA 2013a). China has invested in refineries, infrastructure, power plants, etc. In addition, as one of Nigeria's largest oil consumers, it is very likely that China will continue increasing its presence. In 2006,

CNOOC purchased 45 percent interests in the Akpo offshore oil field (OML 130) from privately owned Nigerian company South Atlantic Petroleum for $2.3 billion.

In 2003, CNPC signed an agreement with the Nigerian government on the exploration and development license for Block Blima. Today, CNPC holds 100 percent of Block Blima. In addition, in 2006 CNPC invested $480 million in Chad by acquiring Block H from Swiss company Cliveden. This acquisition enabled CNPC to do explorations in seven different depositional basins: Chad Lake, Madiago, Bongor, Doba, Doseo, Salamat and Erdis (CNPC 2013a).

In Uganda, CNOOC in 2011 acquired 66.6 percent of Tullow Oil's stake in the three blocks with Total (IEA 2011). According to the deal closed in February 2012 the CNOOC gained licenses to operate in blocks EA 3A, whereas, Tullow and Total will operate in EA 2 and EA 1 (CNOOC 2013b).

The West has been criticizing China for its indifference to the domestic political discord of African countries and ethical implications of the nature of China's involvement. China's driving ideological approach to international relations is classified as 'values of non-interference, solidarity and respect for state sovereignty' (Bracken et al. 2013: 17). Chinese increasing dominance in Africa is perfectly aligned with China's long-term strategy of achieving geographical diversification of oil&gas supply.

*Middle East*

China still imports most of its oil from the Middle East, with almost half of China's crude oil being imported from the region. China's biggest oil supplier is Saudi Arabia, followed by Iran, Oman, Iraq, Kuwait and UEA (see Figure 2.3). In order to secure its supply from Middle East China has made significant investments in the region. For the time of being Chinese NOCs have invested in oil fields in Iran, Iraq and most recently also UAE.

The Abu Dhabi National Oil Company (ADNOC) formed a joint venture with CNPC, with split of 60 percent and 40 percent, respectively. The fields in which the CNPC will be conducting exploration and production activities have not been disclosed yet. This recent agreement between ADNOC and CNPC indicates how leading crude producers are aware of the importance of securing emerging Asian market share. The previous concessions that have recently expired were dominated by western IOCs (BP, Shell, ExxonMobil and Total). This new agreement now eliminates the middleman for the Chinese company, ensuring them a

fixed daily volume of crude with the option to sell volumes on the international market (Financial Times 2014, Reuters 2014).

It is important to note that Iran has the fourth biggest crude oil reserves in the world. In addition, it has the second largest gas reserve after Russia (EIA 2013a). Since Iran is China's third-largest supplier of crude oil investing in Iran was of strategic importance for China. In 2007, Sinopec acquired 51 percent stake in Yadavaran and Hosseinieh oilfields from the National Iranian Oil Company (NIOC) for $2 billion. Sinopec agreed to develop Yaravaran oil filed in two stages. In the first stage the production was supposed to be at 85,000 b/d, whereas, in the second stage it reached 185,000 b/d (Moran 2010: 25-26).

In January 2009, CNPC invested $1.76 billion in the North Azadegan oilfields. Later that year the company also invested in Iran's upstream assets. This time, however, in Iranian natural gas reserves South Pars 14. In June 2009, CNPC signed an agreement with National Iranian Oil Company (NIOC) and invested $4.7 billion in the development of Phase 11 in the South Pars. It is expected that the development of the South Pars gasfiled[15] will make Iran the major gas exporter. Finally, in September 2009, the CNPC acquired 70 percent stake in Iran's South Azadegan oilfield again from the NIOC for $2.25 billion (Moran 2010: 27, CNPC 2013d).

Apart from Iran, Chinese NOCs have also invested in Iraq - the world's fifth-largest proven holder of oil reserves (IEA 2011: 20). The first project between Chinese NOC and Iraq's Ministry of Petroleum was signed in 2008 when CNPC invested in development of the Al-Ahdab oilfield. It was planned that under that agreement the CNPC would increase the oilfield's production capacity to 25,000 b/d within three years, and to 115,000 b/d within six years. In 2011, the first stage of the Al-Ahdab Oilfield became operational with a 60,000 b/d capacity (CNPC 2013d). In 2010, CNCP again invested in Iraq's upstream assets. This time the company formed a consortium with Total, Petronas and Iraq South Oil Company to develop Halafaya Oilfield (CNPC 2013d).

In 2010, another Chinese NOC, CNOOC, invested in development and production of the Missan Oil Fields within Iraq together with Turkish Petroleum Corporation (TPAO). CNOOC acts as the operator holding 63.75 percent of shares, TPAO holds 11.25 percent, and Iraqi Drilling Company holds 25 percent, respectively (CNOOC 2013b).

[14] South Pars in Iran's the world's largest gas reservoir, laying between Qatar and Iran. It accounts for 60 percent of Iran's gas reserves and 10 percent of the world's gas reserves (Moran 2010: 26).

15 Phase 11 development is expected to operate for about 52 months, producing 2 billion cubic meters of natural gas and 70,000 barrels of gas condensate per day (Moran 2010: 27).

The Middle East remains the pivot in China's energy supply. Beijing has recognized the importance of investing in the region and fostering diplomatic relations with its key energy suppliers. In addition, by opening talks with the Gulf Cooperation Council member countries towards establishing a free trade area, Beijing has also moved from a pure focus on energy supplies to enlarging the scope of economic exchanges with key oil-exporting countries (Zha 2006: 181). This deepening of economic ties and fostering relations with Middle Eastern countries has contributed to growing interdependence between China and Middle East.

*Former Soviet Union*

China has been developing close energy-driven relations with its neighbors. Russia as China's biggest neighbor and one of the countries with largest oil and gas reserves in the world will certainly continue increasing its role as China's energy exporter.

China's interest in Russia's resources started already in early 1990s. Sino-Russian political and economic cooperation emerged in 1993 when China became net oil energy importer. Russia, on the other hand, saw it as an opportunity to enter potentially lucrative energy markets in Asia and balance its overreliance on western hemisphere (Andrews-Speed and Dannreuther 2011: 118).

The first energy cooperation agreement was signed in 1996 that initiated the building of oil pipeline from Skovorodino, East Siberia to Daqing, China. The pipeline would connect Angarsk in Siberia with Daqing at the total length of 2,400 km with planned total annual capacity of 600,000 b/d. The negotiation between two countries was a long and complex process. Finally, in March 2003, Yukos and CNPC signed an agreement to start with construction. However, the political circumstances in Russia and reassertion of Russian state control over country's energy sector[16] put the project on hold until 2009. In February 2009, China and Russia signed a long-term oil supply deal worth $25 billion (IEA 2011: 31). With this agreement China gained access to Eastern Siberian oil. The East Siberia-Pacific Oil (ESPO) pipeline to the Daqing refinery currently has a capacity of around 340,000 b/d with plans to double it to 600,000b/d by 2018 (IEA 2011: 31). CNPC saw the start-up and increase of ESPO crude imports as a measure to offset declining output from the Daqing oilfields and

[16] Direct intervention of Russia's new president Vladimir Putin led to a radical restructuring and renationalization of the domestic energy industry. In 2003, the new 'Energy Strategy' Agenda emphasized increase in state control over oil and gas companies. The focus of mainly on the control over the export networks and grater consideration of the long-term domestic energy needs (Andrews-Speed and Dannreuther 2011: 121).

address China's growing crude oil import requirements, whereas, Russian companies, on the other side, were eager to access new markets in order to diversify its energy.

In addition, China has also interest in Russia's gas reserves. Russia and China have been discussing a deal to construct the pipeline to bring Russian vast gas East Siberian reserves for decades, and the announcement of the deal is expected in the near future, which should allow for gas to start flowing by the end of the decade. With vast oil and gas reserves and geographical proximity to China, it is expected that Russia will only move up the ranks of major fossil fuels suppliers to the Middle Kingdom.

China's interest in Central Asia has been rising, resulting in a number of projects. Increasing presence in the region provides China with an opportunity to diversify its energy sources and transportation routes. Furthermore, the concentration of oil, gas, and energy reserves in Central Asia, and in particular countries such as Kazakhstan and Turkmenistan are among the highest in the world. For China, therefore, having an access to this region enables to control a large amount of the world's oil and gas supply (Bracken et al. 2013: 7).

Both China and Kazakhstan have been fostering close bilateral relations. It is important to note that both economic and security interests shape relationship between two countries. Kazakhstan thus became China's key strategic and economic partner in Central Asia. In addition, Kazakhstan has played very important role in suppressing anti-Beijing Uyghur nationalists and terrorism and securing peace in the Chinese most western autonomous province Xinjiang.

The Kazakhstan-China Oil Pipeline (KCOP) links Caspian shore with China's most western province Xinjiang. China and Kazakhstan built a section from Atasu in Kazahkstan to Alashankou in Xinjiang. This pipeline has enabled China to import oil directly from its Central Asian neighbor. The KCOP is a joint venture between CNCP and Kazakhstan's KazTransOil (Andrews-Speed and Dannreuther 2011: 125, IEA 2011: 31, Bracken et al. 2013: 10). In 2013, CNPC acquired 8.5 percent participation stake in Kashagan oilfield in Caspian Sea for high $5 billion. According to data this represents the largest overseas acquisition by CNPC. Moreover, bearing in mind that Chinese NOCs already account for more than 25 percent of country's total oil production, this agreement additionally strengthens China's already dominant position in Kazakhstan's energy production (Financial Times 2013b, Reuters 2013b). Kazakhstan remains one of the most significant countries for China's foreign direct investment in the oil&gas sector (See Appendix I).

In 2007, China signed an agreement with Turkmenistan to import oil and gas from the Caspian country. This agreement was then followed by negotiations with Uzbekistan and Kazakhstan to construct 2000 km pipeline that would connect Turkmenistan with China. The Central Asia-China Gas Pipeline connects Turkmenistan with China via Uzbekistan and Kazakhstan. Since Turkmenistan is rich in resources – in particular natural gas, it is believed that its exports could be sufficient to satisfy substantial share of China's needs in the future. China's projected future gas needs are estimated at 200 million cubic meters per year by 2020, with 140 billion cubic meters being produced domestically and the rest imported (Andrews-Speed and Dannreuther 2011: 126).

China's rising presence in the Central Asia and the success of the pipeline projects implementations reflect China's government efforts in the region that have changed energy cooperation situation of the region. It is important to note that China is a founding member of SCO. As a permanent member of the SCO China has a more complex policy towards the region that emphasizes cooperation in solving the issues related to regional stability and cross-border security.

*Asia Pacific*

China has been also gradually increasing its dominance in Asia Pacific. China's impressive economic growth, its accumulation of foreign exchange reserves, and its 'going out' policy all speak in favor of China continuing to increase investment in overseas upstream assets.

In the Southeast Asia China is investing in Myanmar (Burma) as the country has extensive gas reserves and is located on the shores of the Indian Ocean. In 2007, CNCP signed deal with Myanmar Oil and Gas Enterprise (MOGE) acquiring oil and gas exploration licenses for three deep-water blocks in offshore field Rakhine (CNPC 2013e). In 2009, CNPC and Myanmar's Ministry of Energy signed an agreement to construct, operate and manage Sino-Myanmar Oil and Gas Pipelines. The pipeline will connect southwestern province Yunnan to the Indian Ocean and thus lessen reliance on Malacca straits when for its imports of hydrocarbons from Africa and the Middle East (CNPC 2013e, IEA 2011: 34). In addition, exporting gas to China could diversify Burma's gas export dependency on Thai consumers and boost Myanmar's government's revenue.

Chinese NOCs have also invested in other countries in the region. The most significant investments during the last decade were made in Indonesia. In 2002, CNPC purchased six

blocks from Devon Energy Cooperation for $580 million. Later that year CNOOC acquired upstream assets from YPF Repsol. In 2004, Sinopec acquired 17 percent interests from BP in Tangguh LNG project in Indonesia. The investments continued again in 2008 with CNOOC investing in Husky Energy and acquiring a 50 percent interests for $130 million. In 2010, Sinopec again invested in deep water project Gendalo-Gehem in Indonesia acquiring 18 percent interests from Chevron for $680 million. Finally, in 2012, another Chinese NOC, CNPC, signed the acquisition with Devon Energy Cooperation for $2.2 billion and underlying the trend of investments by Chinese NOCs in upstream assets in Indonesia (CNPCf 2013, CNOOC 2013b, IEA 2011).

Further on, Chinese NOCs also made significant investments in resources development projects in Australia. In 2002, CNOOC signed an agreement with North West Shelf Venture consortium acquiring 25 percent interests in the company. The North West Shelf Venture's six original participants, BHP Billiton, BP, Chevron, Japan Australia LNG, Shell, and Australian publicly traded oil company Woodside Energy (North West Shelf's operator) each have a 12.5 percent interest. The Venture promised to supply China with more that 3.3 million tons of LNG in the period of 25 years (Moran 2010: 13-14). Additionally, CNOOC and Sinopec also invested in Australia. In 2008, Sinopec acquired 60 percent stakes in Australian AED (IEA 2011). Two years later, in 2010, CNOOC acquired 50 percent assets from Exoma Energy in the central Queensland Galilee Basin (CNOOC 2013b).

*North America and Europe*

China's thirst for resources and deep pockets made China invest in energy resources all over the globe. During the last couple of years China has also made significant investments in the Western Hemisphere particularly investing in Canada and United States.

In 2009, Sinopec acquired Swiss Addax Petroleum[17] for $8.8 billion. Since the company has been operating internationally this acquisition opened new development opportunities in for China Western Africa (Nigeria and Gabon) and Kurdistan in Iraq (IEA 2011). Later the same year CNPC acquired 60 percent of equity in MacKay River and Dover oil sands assets of Athabasca Oil Sand Corporation in Alberta, Canada for $1.9 billion (CNPC 2013g).

[17] Addax Petroleum is a rapidly growing international oil and gas exploration and production company focusing on West Africa and the Middle East. It has properties in Nigeria and Gabon and development opportunities in West Africa and the Kurdistan region of Iraq (Moran 2010: 35).

Investment in sand assets in Alberta, Canada initiated a wave of further significant investments by Chinese NOCs in Canada.

In 2010, Sinopec invested $4.67 billion in oil sand project in Canada acquiring 9 percent in the project from ConocoPhilips. That was company's second acquisition of the oil sand project after oil sand project of Northern Lights in 2005 (Sinopec 2013). Following the trend of other two Chinese NOCs, CNOOC also invested in one of Canadian oil sand producers. In 2011, the company invested $2.1 billion acquiring 30 percent of OPTI Canada Inc. The major assets of OPTI includes a 35 percent interest in Long Lake plus interests in three other oil sands projects located in the Athabasca region of northeastern Alberta (CNOOC 2013b).

In 2012, CNPC entered a joint project with Shell Canada Ltd., Korea Gas Corporation (KOGAS), and Mitsubishi Corporation. They agreed to jointly develop a proposed LNG export facility near Kitimat in British Columbia, Canada. In the Joint Venture Shell holds 40 percent working interest, while KOGAS, Mitsubishi and CNPC hold 20 percent, respectively (CNPC 2013g). In addition, in 2012, Sinopec acquired 49 percent equity interest in Talisman's UK North Sea business by Talisman Energy (UK) Limited for $1.5 billion (Sinopec 2012).

After more than half a year of negotiation China's largest-ever acquisition was signed in February 2013. CNOOC acquired Canadian oil and gas company Nexen for $15.1 billion. This takeover provided CNOOC with new offshore opportunities in North Sea, the Gulf of Mexico, western Africa and Middle East. In Canada CNOOC gained control over Long Lake oil sands project in Alberta, Calgary together with great amount of reserves in the world's third-largest crude resource holder (Reuters 2013a). This acquisition is also important as it allowed CNOOC to take operational control of Buzzard field in UK's North Sea – a major source of supply for the Forties crude, which is normally setting the pricing for Brent[18].

Chinese NOCs have also made substantial investments in the United States. In 2010, CNOOC acquired 33.3 percent interest in Chesapeake's oil and gas leasehold acres in the Eagle Ford Shale project in South Texas for $1.08 billion (IEA 2011). In 2011, Sinopec invested $2.5 billion in the American energy company, Devon Energy. Through this acquisition the company gained 50 percent interest in Devon Energy and participation in development of several shale gas fields in Ohio and Michigan (IEA 2011). Since China's

[18] Brent is the pricing benchmark that according to many estimates accounts around 2/3 of crude traded globally.

shale oil and gas resources are among the largest in the world, China has been very eager to invest in American and Canadian shale projects (EIA 2013a). By investing in international oil companies and taking participation in oil and gas projects in the west, Chinese NOCs are gaining access to technological and operational know how allowing it to transfer knowledge and apply it at its domestic projects.

*Latin America*

Latin America is another region in which Chinese NOCs have made significant investments over the last decade, predominantly investing in Venezuela, Peru, Ecuador, Argentina and Brazil.

In 2005, under the Andes Petroleum Corporation, CNPC and Sinopec jointly[19] acquired oil and gas assets of EnCana Corporation in Ecuador for $1.42 billion (IEA 2011). Under this agreement the Andes Petroleum Corporation acquired all of EnCana's shares in subsidiaries that owned oil and pipeline interests in Ecuador and became the largest foreign operator in Ecuador (Moran 2010: 36). Further on, in 2010 there was a new wave of investments made in Latin America. In March, CNOOC invested in Argentinean Bridas Corporation. CNOOC made an investment of $3.1 billion in Bridas Energy Holding creating a 50 – 50 percent joint venture (CNOOC 2013b). This deal gave CNOOC an opportunity to participate in oil and gas exploration and production activities in Argentina. Later in 2010, through Bridas Energy Holding the CNOOC acquired 60 percent stakes in Argentinian oil and gas group Pan American Energy from BP (Reuters 2011).

Venezuela has been China's major energy partner in Latin America. Since mid-1990s Chinese NOCs have operated in Venezuela and been involved in a number of projects on the Venezuelan soil. In 1997, CNPC invested in development project of Caracoles and Intercampo fields. These fields have been exploited for over 50 years. They are characteristic for their complicated structure and small scale. However, thanks to advanced technology and investment brought from CNPC, the production has increased almost eight times (CNPC 2013h).

[19] CNPC and Sinopec formed Andes Petroleum Corporation that conducts operations on the Latin American soil. In the consortium CNCP acquired 55 percent, while Sinopec acquired 45 percent of interests. In addition, CNPC focuses on the oilfields' operation, whereas Sinopec is responsible for refining (Moran 2010: 37).

In addition, CNPC has been also involved in development and join-venture operation of the Zumano oilfield in the East Venezuela Basin, Orimulsion Project and Junin 4 block in the Orinoco heavy oil belt. In 2001, CNPC and Petroleos de Venezuela S.A. (PDVSA) established a joint-venture to develop jointly MPE-3 oilfield and an emulsification plant, with shares split between CNPC and PDVSA, 70 percent and 30 percent, respectively. Further on, in 2006, CNPC signed a joint-venture agreement with PDVSA on cooperation in Zumano oilfield acquiring a 40 percent stake. In the same year the company also invested in Orinoco heavy oil belt located in southeastern Venezuela. CNPC and PDVSA signed an agreement for jointly explore the Orinoco Heavy Oil Belt's Junin-4 Block with total investment by CNPC projected to amount to $6 billion (CNPC 2013h).

Apart from Peru, Ecuador, Argentina and Venezuela, Chinese NOCs have also invested in Brazil. In 2010, Sinopec invested $7.1 billion into Brazilian subsidiary of Spanish energy group Repsol YPF. Through this acquisition the company acquired 40 percent stake Repsol Brazil (Reuters 2010). The closure of that deal and initiation of investment in Brazil's oil and gas resources is another stepping stone in China's recent strategy towards diversification of its supply. In 2011, Sinopec further invested in Brazil. This time the company acquired 30 percent stake in the Brazilian assets of the Portuguese energy company Gap Energia for $5.2 billion (Financial Times 2011). The deal was the latest string of China's investment in Brazil oil upstream assets. It is important to note that some further investments in offshore oil fields are still under the negotiation.

### *2.1.4 Securing Strategic Petroleum Reserves as a Strategy behind Oil&Gas Supply Security Policy in China*

China's rising interest in acquiring overseas upstream assets and accessing global oil and gas resources is not solely driven by its economic development but also great need for building strategic petroleum reserves (SPR). Concerns about energy security raised the awareness about the importance of strategic petroleum reserves among Chinese authorities.

This chapter of the empirical part examines securing SPRs as a strategy of oil&gas supply security in China. In order to understand the nature of this particular strategy behind China's oil&gas supply security policy, this paper looks into a number of indicators. Those indicators include: nature of property rights, infrastructure to support strategic reserves and transparency of strategic reserves levels.

Already in mid-1990s Chinese NOCs recognized the importance of having adequate strategic storage capacities. 'Insufficient commercial storage capacity prevented them from taking advantage of low world oil prices and forced them to cut the production for the same reason' (Xu 2007: 279). In addition, increasing middle class and improving purchasing power of its citizens also contributes to oil&gas supply vulnerability. Electricity shortages in urban areas in recent years raised the awareness of impacts and consequences of energy security.

China is one of the few major oil importers which does not have an adequate strategic oil reserves. Most OECD countries maintain mandatory stocks of oil equivalent to at least 90 days of net oil imports. Japan has strategic reserves equivalent to 169 days of oil net import requirements, while South Korea's for 75 days. Furthermore, Singapore and Thailand have reserves covering 44 and 36 days of oil net imports, respectively. Interestingly, the strategic reserves of two largest developing economies in Asia and worldwide, China and India, have reserves that could satisfy its domestic needs for only about two weeks (Cheng 2008: 303, Zhang 2011: 19-20). The construction and maintenance of an adequate strategic petroleum reserves network is thus of utmost priority.

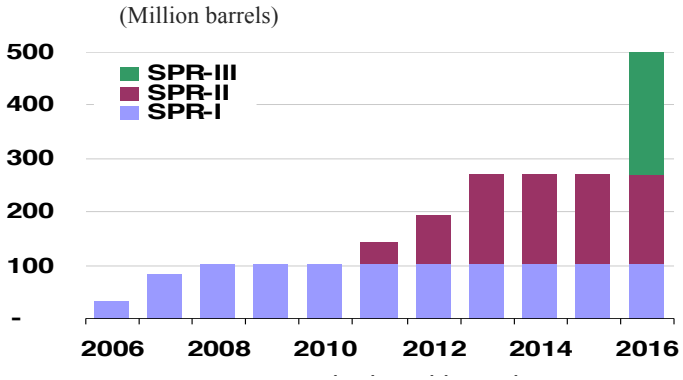
According to Erica Downs the establishment of SPRs enhances China's energy security in four different ways. Firstly, construction of strategic reserves would reduce China's vulnerability to short-term energy-supply interruptions. Data shows China's high dependency on Middle Eastern oil imports (see Figure 2.3). Although we have learned that China has been diversifying its oil&gas imports in order to diminish its over-dependency on imports form Middle East, it is important to note that China is still invulnerable to any instability that may occur in that already unstable region. Secondly, the strategic reserves could also stabilize China's domestic prices in the case of some abrupt disruptions and price increases in the international energy markets. Thirdly, strategic reserves could prevent negative effects on China's economy by imposing some politically or economically motivated embargos. Finally, strategic reserves could also increase China's diplomatic flexibility by untying Chinese leadership's hands and giving more room for maneuver while taking actions in the global diplomatic arena (Downs 2000: 29-30).

China's SPR Plan was initiated in 2001 as a part of China's Tenth Five-Year Plan (2001-2005) in order to enhance country's energy security. Strategic Petroleum Reserves are to be constructed in three phases. According to China's policy on implementation of Strategic Petroleum Reserves, it plans to maintain domestic reserves of 500 million barrels (mb) of oil

by 2020. It is believed that such capacity would be sufficient to cover about 100 days of oil net imports (Energy Tribune 2012, IEA 2012, Singh 2012).

According to the International Energy Agency (IEA), during the first phase of its domestic SPR Plan, China has completed four stockpiling facilities with a capacity of around 103 mb. The second phase, which counts eight storage sites and would have a capacity of 207 mb, has also been under construction. The third phase that is planned, however, has not started yet (see Figure 2.7).

Figure 2.7 China Security Petroleum Reserves Capacity




Source: IEA 2012

China's leadership has the most important role in determining the framework of strategic reserves regulatory system. By creating the Energy Bureau under the National Development and Reform Commission (NDRC), China's top leaders centralized control over the energy projects related to strategic petroleum reserves. Development projects of China's strategic petroleum reserves has been thus administered by the National Oil Reserve Center that directly reports to China's NDRC and the National Energy Administration (IEA 2012, Ma & Oxley 2012: 127). The strategic petroleum reserves are expected to include government stocks and obligatory industry stocks.

It is important to note that both strategic and industry stocks are held by Chinese NOCs. Sinopec, CNPC and CNOOC do not only provide services for operation of strategic oil reserves but also hold the reserves. This again proves us that in spite of a number of relaxation policies that have been introduced in recent years to China's oil&gas industry, the government, directly or indirectly, still plays a big role in the sector.

Figure 2.8 below shows us current oil infrastructure map in China. We observe developments in construction of crude oil and oil product pipelines that connect economically

underdeveloped but resources rich western part of the country with economically developed and energy hungry eastern coastline regions.

Figure 2.8 Oil Infrastructure Map in China, 2012


Source: IEA 2012

During the first phase of Strategic Petroleum Reserves Plan (SPR-I) four storage facility sites are built in Zhenhai, Zhoushan, Huangdao and Dalian located near refining centers on the east coast (see Figure 2.8). These storage sites hold a total capacity of 103.2 mb and were filled with crude oil by 2010 (see Table 2.8) (IEA 2012: 12). It is important to note that China used the advantage of the global financial downturn filling its strategic reserves with an averaged price of $58 per barrel, which was much lower than the averaged price during that period (Singh 2012: 2).

The second phase of Strategic Petroleum Reserves Plan (SPR-II) is still under construction (see Figure 2.8). In this phase eight storage sights are planned to be constructed with the total capacity of 169 mb. Dushanzi and Lanzhou have been completed in 2011 and filled with crude oil over the course of 2012 (IEA 2012, Reuters 2012a, WSJ 2012). According to the head of the China National Energy Administration, Liu Tienan, China continues building storage sites for the second phase. The constructions of other six storage sites in Jinzhou, Jintan, Shanshan, Tianjin, Huizhou and Zhanjiang were expected to be completed over the

course of 2013, and filled with crude over the course of 2014 (see Table 9) (Financial Times 2012).[20]

The levels of China's SPR remain unknown. The data has not been reported neither by the NOCs nor by the government's agencies that administer development projects of SPRs. In late 2012, International Energy Agency (IEA) reported that China had stopped filling its newly constructed SPR system. Although China does not reveal official information[21] about its strategic oil reserves filling, data calculated by the IEA suggest that the crude oil buying levels had significantly diminished after September 2012 (Financial Times 2012). From the table 9 below we observe that the construction of SPR Phase II has been completed. However, the status of reserves' sites still remains unknown.

Table 2.8 Chinese Strategic Petroleum Reserve Sites, in 2012

(Million barrels)

| Phase | NOC | Location | Capacity | Status |
|---|---|---|---|---|
| **SPR-I** | Sinopec | Zhenhai, Zhejiang | 32.7 | Filled |
| | Sinochem | Zhoushan, Zhejiang | 31.4 | Filled |
| | Sinopec | Huangdao, Shandong | 20.1 | Filled |
| | CNPC | Dalian, Liaoning | 18.9 | Filled |
| **Total** | | | 103.2 | |
| **SPR-II** | CNPC | Dushanzi, Xinjiang | 18.9 | Filled |
| | CNPC | Lanzhou,Gansu | 18.9 | Filled |
| | CNPC | Jinzhou, Liaoning | 18.9 | Completed and ready to be filled |
| | CNOOC | Huizhou, Guangdong | 31.4 | Completed and ready to be filled |
| | CNPC | Jintan, Jiangsu | 15.7 | Completed and ready to be filled |
| | Sinopec | Zhanjiang, Guangdong | 44.0 | Completed and ready to be filled |
| | CNPC | Shanshan, Xinjiang | 39.0 | Completed and ready to be filled |
| | Sinopec | Tianjin | 20.1 | Completed and ready to be filled |
| **Total** | | | 206.9 | |
| **SPR–III** | | | 189.9 | To be announced |
| **Total** | | | 500.0 | |

Source: IEA: 2012 and various companies' data

[20] As already mentioned above China's strategic reserves are maintained by its four largest state-owned oil companies. Therefore, while estimating the capacity of China's strategic petroleum reserves it is difficult to distinguish what is considered strategic and what commercial. In addition, since 2009 due to national geostrategic reasons China has been reluctant to provide regular data about its strategic and commercial oil inventories (WSJ 2013)

[21] The International Energy Agency (IEA) measures China's stockpiling activity by analyzing the gap between oil consumption (measured by refinery throughputs) and total oil supply (sum of domestic crude oil output and net imports) (Financial Times 2012).

The third phase of Strategic Petroleum Reserves Plan (SPR-III) counts four storage facility sites and was scheduled for construction between 2015 and 2018, becoming operational by 2020. During that phase China plans to construct a total capacity of 189.9 mb (IEA 2012). According to Platts's energy analyst China's increasing crude imports indicate that the third phase might also expand to 310 mb bringing total SPR capacity to 500 mb, what would be equivalent to 90 days of China's net imports (Platts 2013a).

### *2.1.5 Expansion of Refining Capacity as a Strategy behind Oil&Gas Supply Security Policy in China*

As the second largest oil consumer in the world, the booming Chinese petroleum market and expansion of refining capacity play important role in country's oil&gas supply security policy formation and implementation. In order to assess expansion of refining capacity as a strategy behind oil&gas supply security policy in China, this paper looks into a number of indicators. Those indicators include: ownership of refineries in China, domestic prices of petroleum products, market concentration of domestic refining production and China's domestic refining production cover.

The construction of transnational and national pipelines, national petroleum refineries and natural gas refineries play crucial role in country's oil&gas supply security enhancement (Vivoda 2009: 4620).

> 'Construction of such facilities is necessitated not only by China's growing reliance on oil imports from the Middle East but also by the recent decision of China's energy planners to meet the country's oil needs by processing crude imports instead of importing refined products' (Downs 2000: 31).

This suggests that Chinese leadership views imports of crude oil strategically more important for county's long-term oil&gas supply security. We observe that the construction of a modern national refinery sector is the top-priority of the Chinese government to secure constant supply of oil products in order to satisfy the long-term domestic oil demand.

In order to build a modern domestic refinery network that is able to satisfy county's rising demand, it was essential for the leadership to identify and find solutions to overcome county's traditional domestic refineries' challenges. Chinese traditional refineries are designed to

process crude oil low in sulfur ('sweet' crude oil[22]) characteristic for its domestic production. Many such refineries thus cannot process crude oil with high sulfur content ('sour' crude oil[23]) imported from Middle East and Venezuela (Zha 2005, Downs 2000: 31, Wu and Fesharaki 2007: 45). Therefore, this so called 'technological mismatch' between the Chinese refineries and crude oil imported to China was a key consideration for Chinese energy policy-makers (Zha and Hu 2007: 110). This implies that with increasing imports of 'sour' crude oil, Chinese domestic refineries were required to modernize their facilities in order to be able to refine those barrels, otherwise in the long-run the country would be forced to diminish its imports from some strategic regions and readjust its domestic oil supply policy.

As already mentioned in previous chapters China's energy sector is dominated by three 'big' NOCs: China National Petroleum Corporation (CNPC), China Petroleum and Chemical Corporation (Sinopec) and China National Offshore Oil Corporation (CNOOC). Sinopec and CNPC, however, are two dominant players in China's oil refining sector, holding 58 and 42 percent of the refining capacity, respectively (EIA 2013).

Sinopec, China's largest petroleum refiner and oil product producer, holds refineries in China's southern costal areas, middle and lower reaches of the Yangtze River and the North China (Sinopec 2014). In addition, the company has also invested in overseas refining assets in Saudi Arabia. Saudi Armco and Sinopec have formed a joint venture Yanbu Armaco Sinopec Refining Company (YASREF). Under the contracts it has been agreed that upon the construction completion in June 2014 and production takes off in September 2014, the refinery would use 400,000 b/d of crude oil to produce high-value fuels and refined products for international and domestic markets (Saudi Aramco 2013).

CNPC, the 'newcomer' to China's downstream business, has been building refineries in southern China. The company has built eight 200,000 b/d refining bases — Dalian Petrochemical, Dalian West Pacific Petrochemical, Fushun Petrochemical, Jilin Petrochemical, Lanzhou Petrochemical, Dushanzi Petrochemical, Guangxi Petrochemical and Liaoyang Petrochemical. In addition, CNPC has been also involved in a number of overseas joint venture refineries in Sudan, Kazakhstan, Algeria, Chad, and Niger (CNPC 2013c).

Domestic prices for petroleum products in China are regulated. Price regulations had negative impact on Chinese refiners during the past few years when international oil prices were raising. This price differential that occurred as a result of asymmetry between domestic

[22] 'Sweet' crude oil, low in sulfur, is known for Angola, Oman, Yemen, China
[23] 'Sour' crude oil, rich in sulfur, is known for Iran, Iraq, Saudi Arabia, Kuwait

and international prices squeezed refineries' profit margins and also resulted with shutting of some smaller independent refineries (EIA 2013a).

The old pricing system implemented in 2009 allowed the NDRC to 'to adjust retail prices when the moving average of imported crude prices fluctuated outside of a 4 percent range around the established price within 22 consecutive working days for diesel and gasoline' (EIA 2013a). This policy, however, did not prove to be efficient one since international oil prices increased at faster rate than domestic price revisions expected to be made by NDRC. Such a development had negative repercussions for Chinese refineries leading to financial losses in refining activities.

In the Third Plenary Session of the 18th Central Committee of the Chinese Communist Party (CCP) liberalization of the domestic energy market was a hot-topic on the agenda. The leadership recognized the importance of a new and more transparent and accountable pricing system that would be in line with international energy markets and that would lead to a more efficient usage of oil&gas (China Briefing 2013, Bloomberg 2013a).

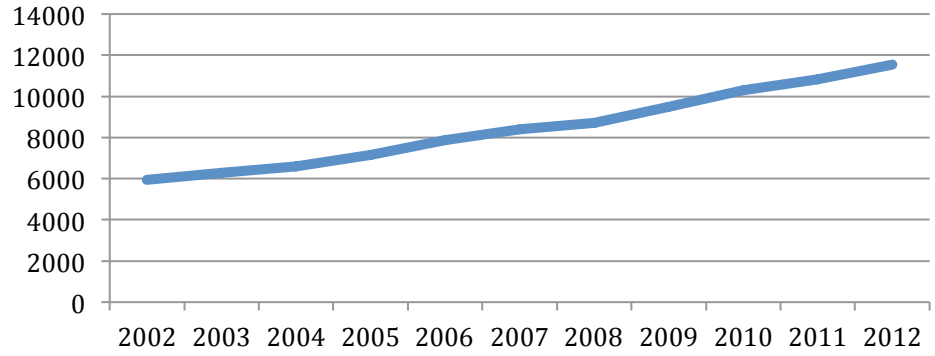
Since March 2013 NDRC relies on new adapted pricing regime while modifying retail prices for gasoline and diesel. Under the new pricing system the retail fuel price adjustment period is shorten from 22 to 10 working days (Bloomberg 2013b). This updated version of oil&gas pricing system that better reflects movements in the global energy markets is a step forward towards a more liberalized refining sector in China.

The data shows that China has been steadily modernizing and increasing its oil refining capacity in order to process higher amounts of imported crude oil. According to the data, in 2012 China's crude refining capacity reached 11.5 million b/d, exceeding volumes in 2012 by 6.6 percent, thus effectively doubling domestic refining capacity since 2000 (EIA 2013a, BP 2013).

As the second largest oil consumer in the world, the booming Chinese petroleum market and expansion of refining capacity play important role for country's oil&gas supply security. The leadership has recognized the importance of a developed refining sector and has made vast investments in order to meet increasing domestic demand for derivates. Construction of expanded refining capacities with facilities capable of processing imported crude oil is still on-going, however, we already observe astonishing improvements (see Figure 2.9 below).

Figure 2.9 China Refinery Capacity, 1980 – 2012

(Thousand barrels per day)




Source: BP 2013

In recent years, the refining sector in China has been modernizing and restructuring. In 2011, the National Development and Reform Commission (NDRC) issued guidelines with requirements to shut down all refineries with capacity smaller than 40,000 b/d by 2013. Those efforts were implemented in order to improve efficiency of domestic downstream sector (EIA 2013a). Modernization of refining sector in China is an on-going process. Below table 2.9 summarizes major proposed new refinery projects in China.

Table 2.9 China's Major Proposed Refinery Projects

| Location | Status | NOC | Capacity (b/d) |
|---|---|---|---|
| Caofeidian, Tianjin | Under construction started in 2013 | Sinopec | 200,000 |
| Huabei | Expansion started in 2013 | CNPC | 100,000 |
| Anning, Yunan | Construction planned to begin in 2014 | CNPC | 260,000 |
| Guangdong, Jieyang | Construction planned to begin in 2014 | CNPC | 400,000 |
| Huludao | Construction planned to begin in 2014 | CNPC | 200,000 |
| Guangdong, Zhanjiang | Construction planned to begin in 2015 | Sinopec | 300,000 |
| Zhenhai Zhejiang | Expansion planned to begin in 2015 | Sinopec | 300,000 |
| Qinzhou | Expansion planned to begin in 2015 | CNPC | 200,000 |
| Lianyungan, Jiangsu | Expansion planned to begin in 2016 | Sinopec | 240,000 |
| Huizhou | Expansion planned to begin in 2017 | CNOOC | 200,000 |
| Fujian | Expansion planned to begin in 2018 | Sinopec | 240,000 |

Source: EIA 2013, CNPC 2013c, Sinopec 2014

Similar to the domestic oil and gas production where we observed dominance of so called China's 'big' three: CNPC, Sinopec and CNOOC, in refining we observe more or less similar

occurrence. As already presented at the beginning of this chapter, refining sector in China is dominated by two biggest Chinese NOCs, CNPC and Sinopec, which hold 42 percent and 58 percent of total country's refining capacity, respectively. By applying the formula to measure the level market concentration (1.6.5.1) derived from Herfindahl-Hirschman Index we got the value 5,128. This relatively high value of level of market concentration implies that China's energy market is far from the perfectly competitive market.

Table 2.10 Domestic refinery production by Chinese NOCs in 2012, in percentage

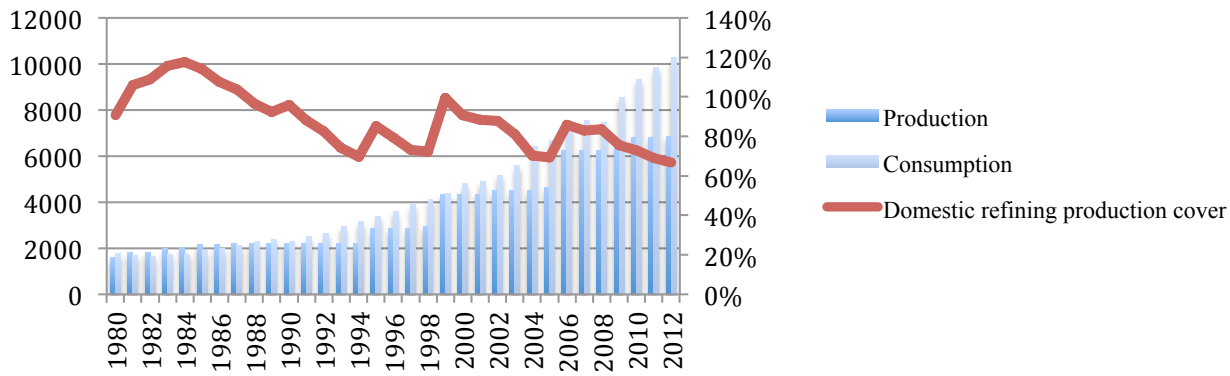
| Company | | 2012 |
|---|---|---|
| CNPC | Domestic refinery production (mmbbs) | 42% |
| SINOPEC | Domestic refinery production (mmbbs) | 58% |
| CNOOC | Under construction | 0% |
| Market Concentration | | 5,128 |

Source: Oil&Gas Journal 2013, CNPC 2013i, Sinopec 2013

The figure 2.10 below illustrates that in spite of expansion of China's refining capacity, its domestic refining still does not satisfy its increasing domestic demand. In 2012, domestic reefing production cover counted 67 percent. The data indicates that the leadership will continue pursuing expansion of domestic refinery capacity. The expansion as a strategy behind China's oil&gas supply security thus remains one of the top-priority to enhance country's oil&gas supply security.

Figure 2.10 China's Domestic Refining Production Cover, 1990-2011

(Thousand barrels per day)




Source: EIA 2013a

## 2.2 Oil&gas Supply Security Policy in Japan

Three years have passed since the Fukushima Daiichi nuclear power disaster[24] happened and forced Japanese authorities to close down nuclear reactors at least temporarily. Japan, as a resource-poor country that almost completely depends on energy imports, thus only increased its hunger for hydrocarbon imports. As the world's third largest oil consumer and world's largest LNG importer there is no doubt that the country's energy security is vulnerable to rapid changes in international energy markets (EIA 2013b, Soichi 2013).

The current situation in the energy market has created concerns regarding the increasing energy demand coming from rapidly developing China and India. The policymakers have recognized the vulnerability of country's oil&gas supply security and have been pursuing a number of strategies to increase the country's energy security and Japan's position in the global energy arena.

This section of the paper assesses oil&gas supply security policy in Japan by following five key criteria developed in the theoretical part of this paper and summarized in the oil&gas supply security policy conceptual framework. Those criteria include: domestic production, imports, overseas production, securing strategic petroleum reserves and expansion of refining capacity.

### *2.2.1 Domestic Production as a Strategy behind Oil&Gas Supply Security Policy in Japan*

This chapter of the paper assesses domestic production as a strategy behind oil&gas supply security policy in Japan by examining a number of indicators. Those indicators include: ownership of oil&gas companies in Japan, domestic prices of crude oil, market concentration of domestic oil&gas production in Japan and Japan's domestic oil&gas production cover.

Since its formation in 1967 and until 2004 Japan National Oil Company (JNOC) dominated Japan's energy sector. The company was mainly responsible for both domestic and overseas exploration and production activities. In 2004, the government reorganized the energy sector providing market forces a greater chance to steer domestic energy market. Gradually, greater

[24] In March 2011, Japan's pacific coast was hit by the 8.9 magnitudes on the Richter scale strong earthquake that caused a large tsunami. The tsunami devastated the Sendai costal area damaging nuclear reactors in Fukushima and causing environmental disaster that world had not experienced ever since Chernobyl. By May 2012 Japan shut down all of its nuclear capacity (EIA 2013b:1).

competition was introduced to Japan's energy sector. JNOC's activities were taken over by a state-run enterprise, Japan Oil, Gas and Metals National Corporation (JOGMEC) that ever since has assisted Japanese companies in increasing their oil&gas production levels both domestically and internationally (EIA 2013b: 4).

It is important to note that Japan's energy sector is more differentiated in comparison to Chinese energy sector dominated by only three giant national oil companies (CNPC, Sinopec and CNOOC). Japanese energy sector counts a number of small to medium-scale oil&gas companies, such as: Invention New Product Exposition (Inpex), Cosmo Oil Company, Idemitsu Kosan Co., Japan Petroleum Exploration Company (Japex), Mitsubishi, Mitsui, JX Nippon Oil and Gas Corporation (JX Nippon), Sekiyu Seisei, Cosmo Oil Company, Kashima Oil Co. Kyokuto Petroleum Industries etc. (EIA 2013b: 5).

Japanese oil&gas companies are privately owned. Nevertheless, while assessing oil&gas sector in Japan it is important to differentiate between two types of private-owned companies: *Kabushiki Kaisha*[25] and traditional private companies. Inpex, Idemitsu Kosan Co., Cosmo Oil Company, Nansei Sekiyu, Sekiyu Seisei, Toa Oil Co. Ltd., Seibu Oil Co., Japex and JX Nippon Oil and Gas Corporation belong to the so-called *Kabushiki Kaisha* companies, while Mitsubishi, Mitsui, Kashima Oil Co., Kyokuto Petroleum Industries count to traditional private companies. Both form of business enterprises are widely represented in country's domestic oil&gas production activities.

In Japan market mechanism gained the momentum also affecting its domestic oil&gas sector. According to Takeo Kikkawa a number of factors led to a more liberalized oil&gas sector in Japan. Firstly, energy market deregulation is one of the key necessities in times of globalization and integrated global oil&gas markets. Secondly, liberalized oil&gas prices benefit consumers. Thirdly, deregulation of the oil&gas sector increases efficiency and resources allocation (Kikkawa 2000: 21-22).

Deregulation of oil&gas sector in Japan was accomplished in three separate phases beginning in late 1980s. Since Japan's domestic oil&gas production is very low the deregulation policies were mainly focused on country's downstream sector. The leadership

[25] The Kabushiki Kaisha is one of the most common forms of business enterprises in Japan. Legally Kabushiki Kaisha is defined as a joint-stock limited liability corporation. According to its structure such an organization is positioned between partnership and corporation. Publicly traded company offers stocks on sale through a stock exchange. Therefore, Kabushiki Kaisha, similarly to the traditional form of public companies known in the West, are listed on a stock exchange depending on their size and local legislation. A privately held company is owned by relatively small number of shareholders or company members who do not trade their shares on public exchanges and are not issued through public offering (Investopedia 2014, Solid Japan 2014).

advocated for ‘oil&gas industry that should be free to compete domestically except during the emergencies, when government controls would apply’ (IEA 2000: 124).

Japan is very scarce in oil&gas resources. According to data by Energy Information Administration (EIA) the country meets less than 15 percent of its total primary energy demand from its domestic resources. In 2012, Japan's total oil production was about 16,500 b/d, while the country consumed over 4.7 million b/d, positioning itself as the third largest oil consumer in the world just after the United States and China (EIA 2013b). Similar scenario is observed in natural gas production. In 2012, Japan’s total natural gas production was about 3.2 billion cubic meter (bcm), whereas country’s natural gas consumption reached high 124 bcm (EIA 2013b).

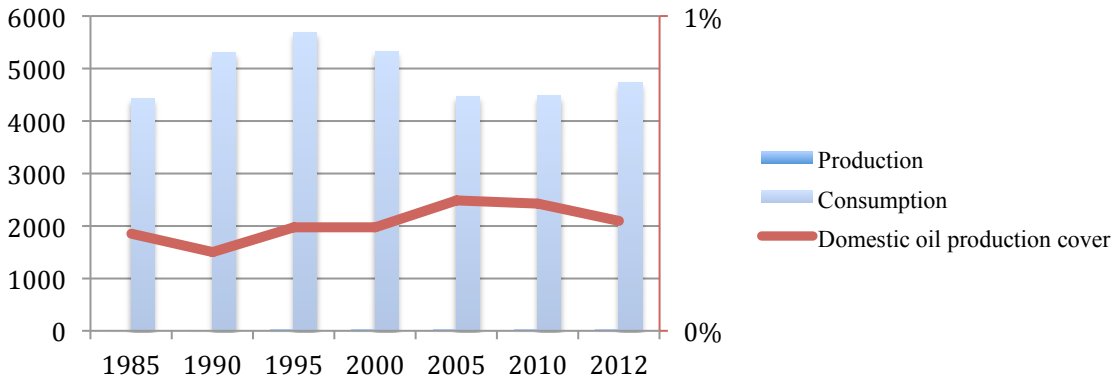
Since the country is very scarce in natural resources and almost fully depends on oil&gas imports, domestic production as a strategy behind Japan’s oil&gas supply security policy does not play significant role in country’s supply security enhancement. Country’s domestic oil&gas production volumes are marginal and thus irrelevant in comparison to the amount of energy that the economy requires in order to meet its domestic oil&gas demand. Therefore, the market concentration indicator that measures level of competition in domestic oil&gas market in the form of market concentration due to limited and vague information of production levels by each company cannot be analytically assessed and in fact is of little relevance due to very little output levels.

Figures 2.11 and 2.12 that illustrate Japan’s oil&gas production cover support the statement that the country almost completely relies on oil&gas imports. The figure below shows that the country oil production levels are extremely low and close to zero. In the figure 2.11 on the secondary axis we read that values calculated for domestic oil production cover count extremely low 0.4 percent.

Prior to the Fukushima disaster nuclear power accounted for about 25 percent of the country’s power generation (EIA 2013b). Due to its economical characteristics in comparison to other conventional and non-nonconventional resources it was used in both commercial and industrial facilities. However, since the Fukushima tragedy Japanese authorities have advocated ‘Zero Nuclear’ energy policies which resulted in a y-o-y increase in oil consumption observed in 2012 (Bloomberg 2012, Reuters 2012b) (see Figure 2.11).

Figure 2.11 Japan's Oil Production and Consumption

(Thousands barrels per day)

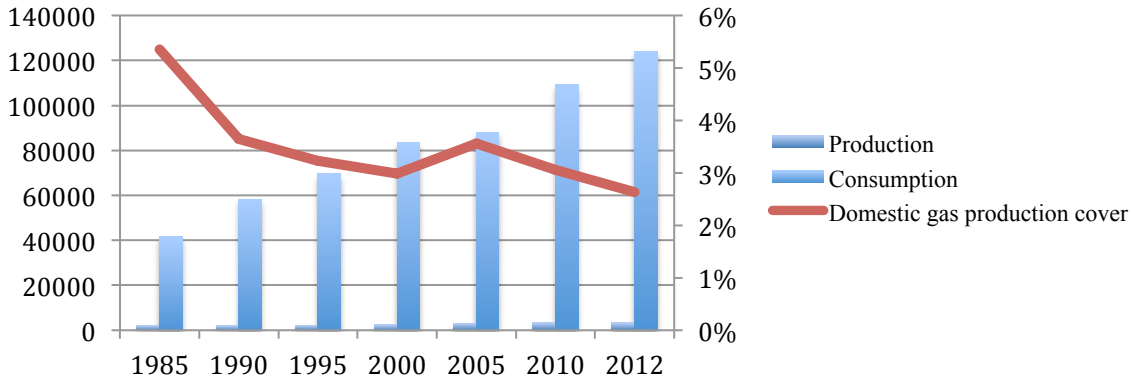



Source: IEA 2013a

Similarly to the oil production in Japan, country's gas production also records very low levels that are far below country's consumption levels. In the figure 2.12 below on the secondary axis we read that Japan's domestic gas production cover counts low 3 percent. However, in contrast to stagnating oil consumption, gas consumption in Japan has been steadily increasing during the last three decades (see Figure 2.12).

Figure 2.12 Japan's Natural Gas Production and Consumption

(Thousand cubic meter)




Source: IEA 2013a

*2.2.2 Imports as a Strategy behind Oil&Gas Supply Security Policy in Japan*

During the past five decades Japan has been very important player and has dominated Asia's energy market. In 1970s, Japan counted 60 percent share of Asia's total oil demand. During that period Japan's energy security policy advocated for: i) introduction of energy efficiency measures, ii) development of new sources of energy supply, and iii) engagement in 'energy diplomacy' to diversify and enhance its energy supply (Cheng 2008: 316).

The following decade, in 1980s, the country pursued energy diversification measures keeping an eye on China as its major oil and gas exporter. In the last two decades, however, the scenario has drastically changed. Japan has been gradually becoming much smaller oil&gas player, while China ceased its exports, due to China's rapid economic growth and increasing energy demand (Evans 2006: 5, IEA 2008: 23).

From the previous chapter we have learned that Japan is very scarce in natural resources which makes the whole economy almost fully depended on oil&gas imports from energy ample countries. Since imports of oil&gas play important role in enhancing Japan's oil&gas supply security policy, this chapter looks into a number of indicators that assess the nature of oil&gas imports in Japan. Those indicators include oil&gas import dependency, diversification of imports by origin, and political ties with key energy exporters.

High scarcity in natural resources, naturally results in high dependency on oil&gas imports. The table below shows calculated values for net oil import dependency (NOID) and net gas import dependency (NGID). High values[26] for NOID and NGID prove that the country strongly depends on oil&gas imports. However, we also note a decrease in net oil import dependency. The decrease in net oil import dependency shows that Japan has been successful in trying to diversify its primary energy sources and diminish economy's over-dependency on oil. In contrast to oil, gas import dependency has been increasing. This suggests that the role of natural gas in Japanese economy has gained greater share in country's primary energy mix.

[26] The final value calculated for net oil import dependency (NOID) and net gas import dependency (NGID) is a value between 0 and 100. A value close to zero implies that the economy relies on domestic sources to meet its primary energy demand, as a value close to 100 indicates that the economy is highly dependent on imports to meet its primary energy demand.

Table 2.11 Net Oil&gas Import Dependency in Japan

| | 2001 | 2011 |
|---|---|---|
| Net Oil Import Dependency (NOID) | 42.9 | 37.3 |
| Net Gas Import Dependency (NGID) | 12.4 | 16.5 |

Sources: EIA 2013b, IEA 2013a

Above we have noted that Japan heavily depends on imports from energy abundant countries. Similarly, the data in the table below show constant, however, high levels of foreign oil import dependency. Forecasts below published by International Energy Agency (IEA) and U.S. Energy Information Administration (EIA) indicate that Japan will remain almost completely dependent on foreign oil imports.

Table 2.12 Forecasts of Japan's Dependency on Foreign Oil

| Country | 2010 | 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|---|
| Japan | 98.5% | 99% | 99% | 98.5% | 98% |

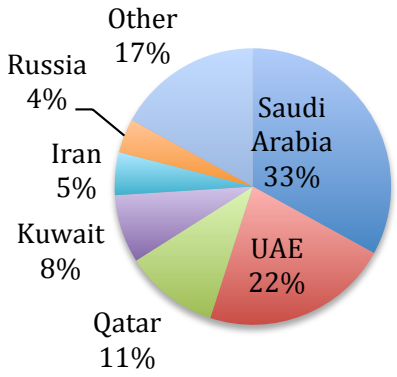
Source: IEA 2008, IEA 2013a, EIA 2013b

Japan's high import dependency makes the country vulnerable to possible disruptions in global oil&gas markets which further threatens country's constant oil&gas supply security. One of the key measures that import-dependent countries implement in order to enhance its oil&gas supply security focuses on geographic diversification of imports.

In spite of high oil&gas imports dependency we note that Japan's oil&gas supply security policy does not focus on geographic diversification of imports as one of the core strategies to diminish country's vulnerability to disturbances in global energy market. Figure 2.13 below illustrates Japan's low level of crude oil imports diversification. Around 80 percent of Japan's crude oil is imported from Middle Eastern countries implying an almost complete dependency on that region (see Figure 2.13). Figure 2.14 illustrates that Japan's natural gas imports[27] in comparison to crude oil imports are geographically more differentiated.

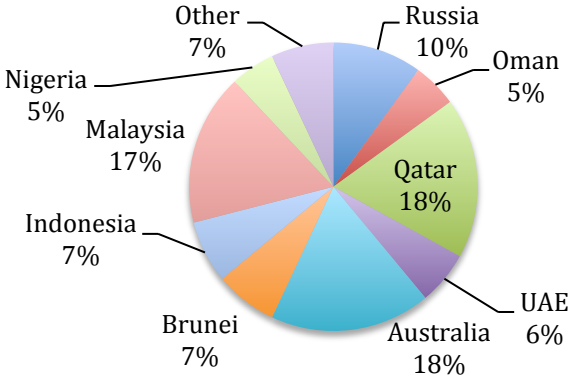
[27] Japan, being an island country, does not import any gas via pipelines. Therefore, country's natural gas imports exclusively focus on liquefied natural gas (LNG).

Figure 2.13 Japan's Crude Oil Imports by Origin, 2012




Source: EIA 2013b

Figure 2.14 Japan's Natural Gas Imports by Origin, 2012




Source: EIA 2013b

Japan's policy makers have recognized the threat that low level of oil imports diversification could pose to its oil&gas supply security. For a country such as Japan that holds only very limited oil and gas reserves over-dependency on one region is highly risky. The data in the table 2.13 below shows that Japan's oil import dependency from the Middle East has been decreasing, which further implies that the country has reshuffled its oil&gas supply policy putting thus more emphasize on diversification of oil imports by origin.

Table 2.13 Middle East Oil Import Dependency (MEOID) in Japan

| Country | 2000 | 2002 | 2004 | 2006 | 2008 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|
| Japan | 86% | 87% | 89% | 87% | 86% | 82% | 80% |

Source: IEA 2013a, EIA 2013b

Above we have observed that Japan has been refocusing its energy security policy towards a more diversified oil&gas supply, since a more geographically diversified oil&gas supply enhances country's energy security in a way that it diminishes the risks of possible embargos and diversifies energy supply routes. The following indicator measures Japan's oil&gas imports diversification with adjusted political risk, and assesses whether Japan is more exposed to imports from politically stable or unstable countries. Risk ratings for each country are taken from Political Stability Risk Index that ranges between 0 for high risk and 1 for low risk (Economist's Intelligence Unit Economist 2013). The table below shows an increasing trend in figures implying that Japan has been increasing oil&gas imports from politically

more stable countries. In spite of high demand for oil and gas, the policy makers have been still advocating the policy of avoiding entering new countries that are disposed to instability and volatility.

Table 2.14 Japan's Oil&gas Imports Diversification Index with adjusted political risk

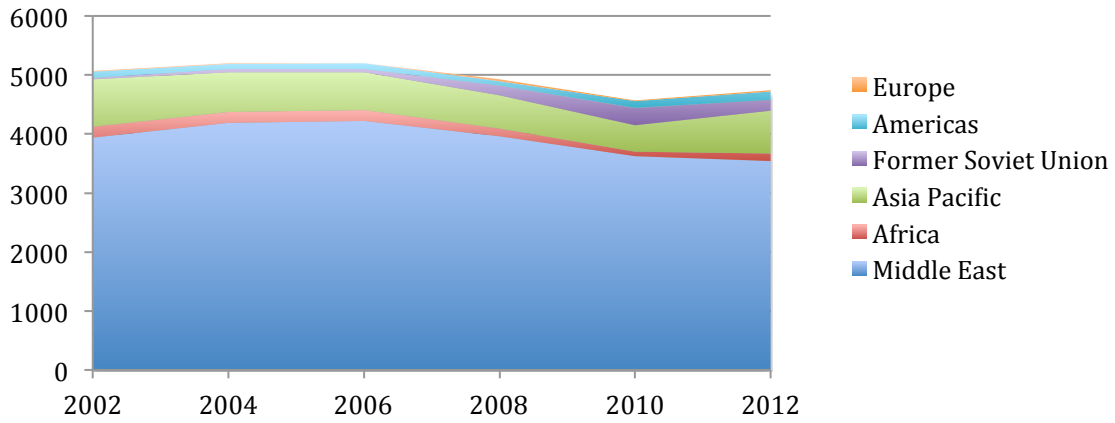
| | 2002 | 2004 | 2006 | 2008 | 2010 | 2012 |
|---|---|---|---|---|---|---|
| Oil Imports | 0.32 | 0.51 | 0.60 | 0.61 | 0.60 | 0.58 |
| Gas Imports | 0.08 | 0.13 | 0.13 | 0.16 | 0.2 | 0.25 |

Source: BP Statistical Review data year collection, Economist Intelligence Unit 2013

The figure 2.15 below shows little degree of geographical diversification of oil imports. Middle East remains by far the greatest exporter of oil to Japan. Asia Pacific holds the second place with more or less constant import volumes for the past decade. Additionally, we observe slight increase in imports from Former Soviet Union (FSU) and North and South America. Of all the regions, Africa exports the smallest volumes of oil to Japan.

Figure 2.15 Japan's Oil Import Diversification

(Thousand barrel per day)

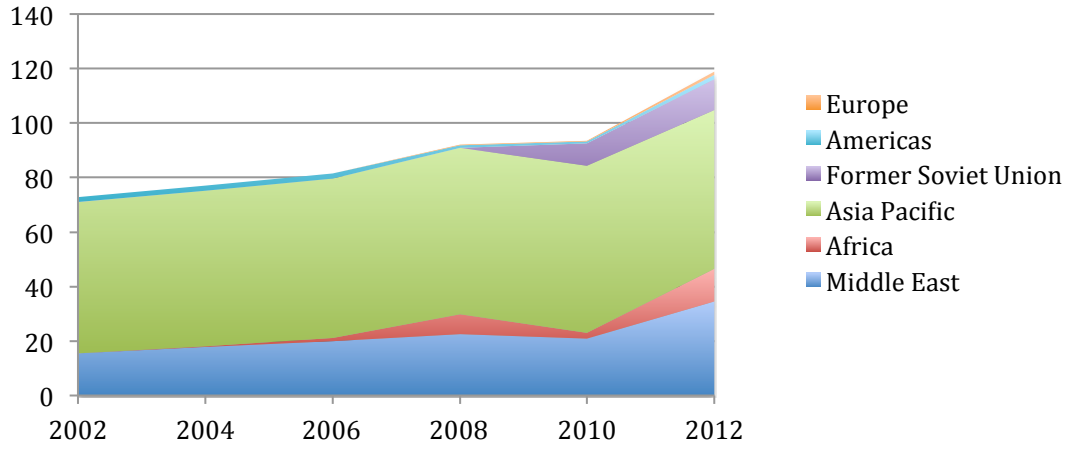



Source: BP Statistical data of various years

Since the consumption of natural gas in Japan has been steadily increasing and the economy is gradually becoming more dependent on natural gas, the policy behind gas imports has been reconsidered. In the case of Japan's natural gas imports we observe geographically more diversified scenario compared to oil imports (see Figure 2.16). Although Asia Pacific and Middle East still hold the greatest share, in the past years natural gas imports have become more diversified thanks to imports from FSU and Africa.

Figure 2.16 Japan's Natural Gas Import Diversification

(Billion cubic meter)




Source: BP Statistical data of various years

Although Japan is considered as one of the latecomers to global oil&gas markets, however, in comparison to China or India the country already has established network with key energy exporters. Japan is well positioned in global oil&gas markets enjoying close ties with major energy exporters. The table 2.15 below shows that Japanese government has been actively encouraging the fostering of strategic partnership with country's leading energy oil&gas suppliers. The results below show us that Tokyo has been entering energy strategic partnerships with countries known for political stability. An exception, however, seems to be strategic partnership with Iran signed in 2008. Nevertheless, although major oil&gas exporters might seem appealing to Japan, it is very unlikely that Tokyo would continue penciling agreements with countries whose pariah regimes are at odds with United States, Japan's most important political ally.

Table 2.15 Japan Energy Strategic Partnership

| Country | Nature of Partnership | Year |
|---|---|---|
| Saudi Arabia | Strategic oil partnership | 1956 |
| ASEAN | Energy security partnership | 2002 |
| Indonesia | Strategic partnership | 2002 |
| Iran | Strategic oil partnership | 2008 |
| Qatar | Strategic partnership for peace and prosperity | 2009 |
| Australia | Strategic partnership | 2009 |
| United Arab Emirates | Strengthening strategic partnership between two countries | 2013 |

Source: Ministry of Foreign Affairs, Japan: 2014

### *2.2.3 Overseas Production as a Strategy behind Oil&Gas Supply Security Policy in Japan*

Japan has been pursuing a number of strategies to enhance it energy security. In the previous chapter we have noted country's overreliance on the resources imported from the Middle East. In the times of rapidly rising oil&gas demand in China and India, rethinking its national oil&gas supply security policy is an imperative for Japan's policymakers.

In order to diminish its vulnerability to threats in global energy market caused by oil&gas supply disruptions, the government favors development of overseas oil&gas production. According to the Japanese Ministry of Economy, Trade and Industry (METI) 'New National Energy Strategy Report' released on May 31, 2006 overseas production by Japanese firms is considered as one of the key strategies towards improvement of Japan's position in the changing global energy markets (METI 2006, Vivoda and Manicom 2011). The revisited Japan's Energy Strategy, also known as the 'Hinomaru[28] Oil Policy', advocates for an increase in oil volumes developed and imported through Japanese oil&gas companies that operate overseas. The leadership has pushed this strategy as a priority on the road-map towards a more sustainable imports of oil&gas. However, in order to successfully implement this strategy Japanese energy companies have to raise their competitiveness to be on equal footing with their international counterparts (Masaki 2006).

This chapter examines overseas production as a strategy behind oil&gas supply security policy in Japan by looking into a number of key indicators that shape Japan's 'going out' or 'Hinomaru Oil Policy'. Those indicators include: incentives structure behind overseas upstream acquisitions, development of close political ties with countries where investments have been made and geographic diversification of overseas production.

Country's natural resources scarcity and need to secure constant energy imports motivated the authorities to support overseas projects by Japanese oil&gas companies. Japan's government strategic energy plan encourages Japanese companies to increase energy exploration and development projects overseas in order to secure a stable supply of oil and natural gas.

Oil&gas exploration projects require huge amount of investment and modern technologies to be competitive on the global energy market. Since Japanese oil&gas development companies are latecomers to oil&gas energy sector and thus also inferior to western

[28] The national flag of Japan, is officially called *Nisshōki* in Japanese, but is more commonly known as *Hinomaru.*

counterparts, they have been sponsored by Japanese government through Japan Oil, Gas and Metals National Corporation (JOGMEC) when entering oil&gas exploration and production projects and operating overseas (PAJ 2012: 25). In addition to JOGMEC, Japan Bank of International Cooperation also supports domestic upstream companies by offering loans at favorable rates allowing Japanese companies to bid effectively for upstream projects in energy producing countries (EIA 2013b: 5).

According to 'Strategic Energy Plan' issued in 2010 the government set up a target to become a more energy independent economy by 2030. The METI's ambitious energy blueprint from 2010 advocates for an increase in energy self-sufficiency from 18 percent to 36 percent, as well as, an increase of self-developed fossil fuel supply ratio from 26 percent to 52, respectively. Moreover, the leadership plans to boost country's independence ratio[29] from present 38 percent to relatively high 70 percent (METI 2010).

Japanese oil&gas companies have been implementing the strategy of access to global oil and gas resources in order to enhance country's energy security. It is important to note, however, that country's role in the development of overseas oil and gas assets remains rather limited. Relatively easily accessible reserves are already occupied and developed by western oil and gas giants or host NOCs. Assets that still have potential or proven resources reserves require risk-taking accompanied by higher production costs, and thus remain unattractive to Japan's investment (Atsumi 2007: 37, Vivoda and Manicom 2011: 232). In line with that, nowadays, Japan's overseas upstream oil projects are mostly located in the Middle East and Southeast Asia (see Appendix II.)

According to Japan's Ministry of Foreign Affairs (MOFA) and Japan's Ministry of Economy, Trade and Industry (METI) the leadership is strengthening political relations and advocating building strategic partnership with country's key oil&gas exporters (METI 2010, MOFA 2014). This strategy creates a suitable environment for domestic energy companies to produce oil&gas overseas and foster political ties with energy exporting countries. However, although the government has been supporting oil&gas companies to go abroad and enter new energy ample regions, the implications of this strategy have been rather limited due to concerns about high political risk and high exploration and production costs. Japan has been reluctant to acquire assets from so-called *rouge* countries (i.e. Sudan, Iraq, Iran, Venezuela),

[29] 'The "energy independence ratio" is an indicator that combines the self-sufficiency energy with the self-developed energy supply divided by total primary energy sources. An average energy self- sufficiency rate among the OECD countries is almost 70 percent' (METI 2010).

focusing thus traditionally on the Middle East, Asia Pacific and North America (Masaki 2006, Vivoda and Manicom 2011, PAJ 2012). Apart from the risks associated with political-instability and high production costs or lack of infrastructure, another reason why Japan has been avoiding to put foot in oil&gas exploration activities in new energy markets is also due to political regimes in some countries which are not considered democratic. Japan being a United States' ally is reluctant to challenge its friendship with US by entering into exploration and production projects in any of so-called rouge regimes.

Although Japan's oil imports will stagnate if not even keep decreasing due to ageing population and diversification in country's primary energy mix, from the data above we have noticed that gas imports will continue increasing. In order to enhance Japan's oil&gas supply security the policy makers have been reexamining country's oil&gas supply security policy putting an emphasis on overseas production. According to data published by Petroleum Association of Japan (PAJ) for 2012, Japanese firms have been involved in more than hundred oil and gas development projects around the world. Regions in which the companies operate include: Middle East, South-east Asia, Africa, South and North America, and the Former Soviet Union. Additionally, in 2012 the share of crude oil and natural gas from development projects conducted by Japanese oil&gas companies accounted for about 24 percent of the total domestic demand (PAJ 2012: 25).

Japan's 'going out' policy, known as 'Hinomaru policy', is a continuous process. In spite of its recognized global presence we observe that Japanese oil&gas companies are entering less aggressively potential new energy markets (see Appendix II). The table 2.16 below illustrates presence of Japanese oil&gas companies in oil&gas exploration and production projects worldwide.

Table 2.16 Countries with Overseas Exploration and Development Projects by major Japanese Companies, 2013

| Region | Inpex | Japex | Idemitsu | JX Nippon | Mitsui | Mitsubishi | Cosmo Oil |
|---|---|---|---|---|---|---|---|
| **Africa** | 3 | 1 | - | 1 | 2 | 2 | - |
| **Middle East** | 3 | 2 | - | - | 3 | 2 | 2 |
| **Former Soviet Union (FSU)** | 2 | 1 | - | - | 1 | 1 | - |
| **Asia Pacific** | 2 | 3 | 3 | 6 | 5 | 5 | 1 |
| **North America and Europe** | 2 | 2 | 3 | 3 | 4 | 3 | - |
| **Latin America** | 3 | - | - | - | - | 1 | - |

Source: various based on companies' information

*Africa*

Although Africa is a new energy market rich in natural resources attractive to latecomers such as China or India, Japanese companies, however, are still reluctant to fully put foot on African continent in order to start exploiting resources. High-risk political systems and underdeveloped infrastructure are some of the key reasons why is Africa still less attractive to Japanese oil&gas investors.

However, in spite of high risk some of Japanese oil&gas companies are already involved in exploration and production projects in some African countries, such as Congo, Algeria, Angola, Libya, Ghana and Mozambique.

In Congo, Inpex has been participating in exploration and development projects since 1970. In 2010, the company increased its dominance in exploration activities in Congo by acquiring 20 percent participating interest in the Nganzi block in western Congo. The project was backed up by JOGMEC that provides the company with an equity capital that covers 75 percent of the total exploration expenditures by Inpex West Congo Petroleum (JOGMEC 2010a). It was expected that this project will generate energy exploration and production activities by Japanese energy companies in Central Africa and thus long-term have positive impact on Japan's oil&gas supply security.

In addition, in 2012 the company also acquired 10 percent share in offshore oilfield in Angola by participating in a joint venture with TOTAL (Inpex 2014e). The block started with production in 1999 and currently produces more than 160,000 b/d of medium-light crude attractive for Japanese refineries (Oil&Gas Journal 2012).

In Libya, Japanese companies were operating in an offshore joint oil&gas production project in Mediterranean Sea. Japex, Nippon Oil and Mitsubishi Corporation hold 42%, 38% and 20%, respectively. The project started in 2008, however, after a few evaluation studies conducted between 2008 and 2010 the wells were closed and abandoned due to lack of commercially sufficient oil and gas (Japex 2014a).

Apart from Inpex, Japex and Nippon, Mitsui and Mitsubishi Corporation also started with oil&gas exploration projects in Africa. By now Mitsui has been operating in Ghana and Mozambique, while Mitsubishi has been involved in exploration and production projects in Angola and Gabon. It is important to note that most of the projects are still at initial phase and rather small in volumes to have a significant impact on oil&gas supply security in Japan. However, we observe that Africa is gradually becoming more important region for Japanese

energy operations and that already a number of Japanese oil&gas have put foot on African soil.

*Middle East*

Previously, we have noted that Middle East is the main region from where Japan imports its oil requirements. Due to high oil&gas import dependency on Middle East, Japanese oil&gas companies have been eager to start exploration and production activities in this particular region. Since the beginning of 2000s Japanese oil and gas companies have been investing in exploration and production projects in Middle East.

In 2004, Japanese-owned Arabian Oil Company[30] (AOC) acquired 40 percent exploration participating interest in Khafji and Hout oilfields in Kuwait and Saudi Arabia Neutral Zone. This project secured Japan stable purchase of 100,000 barrels of oil per day for ten years (EIA 2013). In addition, in 2004 Japan improved its position in Middle East, in particular in United Arab Emirates (UAE) and Qatar. By acquiring Japan Oil Development Co. operating in Middle East, Inpex gained exploration interests in a number of oilfields in UAE offshore fields and Qatar (Inpex 2014e). Inpex's moves in Middle East were then followed by another Japanese oil&gas company, Cosmo Oil, which also acquired some blocks in oil&gas fields in UAE and Qatar. Additionally, Mitsui Corporation has been engaged in a number of oil development and production projects in Oman and Yemen. Those events contributed to building strong and lasting relationship of trust and cooperation with key oil producers for Japan and positioning Japanese oil&gas companies in the Gulf region.

Apart from the Gulf countries, Japanese oil&gas companies have made some investments in other parts of Middle East. Recent strategic investments have been made in Iran and Iraq. In 2009, Japex acquired 30 percent share in Garraf oilfield in Southern Iraq and the company successfully took off with production in 2013 producing 230,000 b/d (EIA 2013b). Japex also operates in Iran. The company entered the country by forming a joint venture with Shell and Iranian Oil Industries and Engineering and Construction Company and operating in offshore oilfields in Persian Gulf (Japex 2014b). In addition, Japex is not the only Japanese company that operates in highly politically risky Iraq. In 2013, Mitsubishi Corporation has also entered

[30] AOC's concession in the Middle East has been producing almost all of Japan's self-developed oil production. Khafji contract was based on the 44-56 production profit sharing between AOC and Saudi Arabia, and 43-57 between AOC and Kuwait (Koike et al. 2008: 1770).

the country through the joint venture established between Mitsubishi, Shell and South Gas Company[31] for development of energy projects in southern Iraq (Mitsubishi 2013).

*Former Soviet Union*

As one of the leading oil&gas exporting regions in the world, Russia and Central Asian countries have been very attractive for Japanese oil&gas companies.

Since late 1990s Japanese oil&gas company Inpex has been participating in energy exploration and production in Kazakhstan. In 1998, the company has acquired 7.5 percent interest in the offshore North Caspian Sea area, namely the giant Kashagan field. In addition, apart from Kashagan field the Inpex has been also conducting projects in a few other fields, such as: Kalamkas, Aktote, Kairan and Kashagan Southwest (Inpex: 2014a).

In 2002, Japanese Prime Minister Koizumi initiated a plan, the "Silk Road Energy Mission", with a focus on developing oil&gas projects between Japan and Central Asian countries. The project was lead by Mr. Sugiura, a senior vice minister for foreign affairs, who paid visits to a number of official to Kazakhstan, Uzbekistan, Azerbaijan, and Turkmenistan in order to build political connections that would further lead to potential energy cooperation in region. These initiatives further continued through the "Central Asia plus Japan" Dialogue, initiated in 2004, which has sought to promote stability and development in Central Asia (Evans 2006: 14-15).

As a result of gradual deepening diplomatic relations with Central Asian countries Japan initiated new energy projects in the region. Apart from Kazakhstan, Inpex also made some significant investments in Azerbaijan. In 2003, the company acquired 11 percent of participating interest of the Azeri-Chirag-Gunshli oilfield in the South Caspian Sea region. Similar to Kazakhstan case, the project in Azerbaijan was also joint-project with energy multinational corporations (Inpex 11%, BP 36%, Chevron 11%, SOCAR 11%, Statoil 9%, ExxonMobil 8%, TPAO 7%, Itochu 4% and ONGC 3%) (Inpex 2014a).

Although Japan has initiated a number of energy projects in Central Asia, the country however faces increasing competition from other players active in the region. Chinese companies have taken majority stakes in a growing number of energy projects and now dominate the region's energy landscape.

[31] South Gas Company is Iraq's state-owned company.

In Russia, Japanese oil&gas companies have been in particular focusing on East Siberia. In 2005, Japex started with oil production in the Chayvo and Odopu offshore oilfields, in Sakhalin. The production reached high levels making it thus one of the most successful Japanese oil&gas developments overseas (Japex 2014c). In 2006, Gazprom, Shell, Mitsubishi and Mitsui signed a joint project to cooperate in development of oil and gas fields in East Siberia. Gazprom took a 50% share, Shell 22.5%, Mitsubishi 12.5% and Mitsui 10% stake, respectively. Key goal is to develop project that would allow LNG to be delivered to existing customers in Japan, Korea and North America (Mitsubishi 2006).

*Asia Pacific*

Due to geographical proximity and energy variety the greatest number of Japanese oil&gas projects are located in Asia Pacific. Ever since the early 1990s Japanese oil and gas companies have been engaged in energy exploration and production projects.

In 1992, Japanese oil and gas company JX Nippon has invested in Vietnam's energy projects. The company acquired 46.5 percent share positioning itself as the major partner. Petrovietnam Exploration Production Corporation (PVEP) and ConocoPhillips hold the remaining 17.5 percent and 36 percent stakes, respectively. Starting with production already in late 1990s the development of Rang Dong oilfield and Phuong Dong oilfield secured energy supply in a relatively short period of time. In addition, in 2000s the company continued investing in Vietnam. In 2004, JX Nippon, Idemitsu Kosan and Teikoku Oil (Operating Subsidiary of Inpex) acquired exploration interests in Southern Vietnam offshore block[32] (Idemitsu Kosan 2014c, JX Nippon 2014d). In addition, three years later JX Nippon decided to invest again in Southern Vietnam's offshore oilfield and acquired 40 percent interest in exploration block in cooperation with PVEP (JX Nippon 2014d).

In addition to Vietnam, Japanese oil and gas companies have been operating in Malaysia for more than two decades. In 1987, JX Nippon made its first acquisition in Malaysia and ever since has been involved in country's exploration and development projects. Japan as world's largest LNG importer was particularly interested in investing to Malaysia's LNG development projects. In last five years JX Nippon closed a number of new acquisition projects. In 2007, the company gained 75 percent exploration interest in onshore Sarawak block. In addition, in

[32] JX Nippon gained 35% share, Idemitsu Kosan 35% share and Teikoku Oil 30% share (Idemitsu Kosan 2014c).

2008 and 2012 JX Nippon invested in two offshore oilfields. In 2008, the company acquired 40 percent share in offshore territory of Malay Peninsula and in 2012, it acquired 37.5 percent share in deep-water offshore oilfield Sabah (JX Nippon 2014e).

In early 1990s Japan also invested in Myanmar Yetagun offshore gas fields. In 1992 and 1993 JX Nippon acquired 19 percent operational interest in two Yetagun blocks. The project proved as successful starting with LNG production in 2000 (JX Nippon 2014f). However, although Japan claimed to be interested in Myanmar's resources, ever since the beginning of 1990s no further investments have been made.

On paper Japanese oil and gas companies have been operating in Thailand ever since the beginning of 1970s. In 1972, Idemitsu Kosan acquired 50 percent share from Amoco Thailand Petroleum Company in offshore oilfields in Thailand northern Gulf area. However, currently due to border disputes between Thailand and Cambodia all the exploration activities have been on hold (Idemitsu Kosan 2014d). JX Nippon has been more successful in conducting operations in Thailand. In 2007, the company invested in offshore fields in the southern Gulf area acquiring 40 percent participation interests (JX Nippon 2014g). Apart from Idemitsu and JX Nippon, Mitsui Corporation has been also involved in energy exploration and production projects in Thailand. The company has been exploiting natural gas and crude oil from four blocks based in offshore field in Thailand Gulf (Mitsui 2014).

Indonesia was one of the first countries Japanese oil and gas companies invested in. Already in 1966 Inpex entered Indonesia's energy market by signing production sharing contract with Indonesian Government and gaining 100 percent participating interest in offshore Mahakam oilfield[33]. The oilfield started with the production already in early 1970s. The acquisition of Mahakam block was followed by a number of further oil and gas discoveries (Inpex 2014c). It is important to note that most of the produced crude oil has been shipped to oil refineries in Japan. This field has been considered as one of the most profitable ones and thus the most strategic one for Japanese energy security.

In 1977, Inpex invested in an additional project, the South Natuna Sea Block. According to the first deal the company acquired 17.5 percent share, increasing it, however, to 35 percent by renewing the deal in 1994. In addition, it is important to note that leading international oil and gas companies hold the remaining shares in the field. These are ConocoFhillips 40

[33] In July 1970 Inpex sold 50 percent of participating interest shares of offshore Mahakam Block to TOTAL (Inpex 2014c).

percent and Chevron 25 percent (Inpex 2014c). This again illustrates the close interaction between Japanese and western multinationals.

Finally, through an open bid by Indonesian Government in 1998, the Inpex acquired 100 percent participating interest in the Masela Block. In 2000, exploration successfully started. According to experts upon the completion of Stage-I the production capacity would reach the capacity of 2.5 million tons per year of LNG (Inpex 2014c). JX Nippon also relatively early entered Indonesian energy market. The company has been operating in Indonesia since 1989 when it acquired 17 percent interest in Berau block (JX Nippon 2014h). Apart from Inpex and JX Nippon, Japex, Mitsui and Mitsubishi all have acquired assets in Indonesia and have been involved in a number of exploration and production projects. Japex, for instance, holds participating interests in 4 different oilfields in East Kalimantan and East Java. In 2012, the production volumes in the offshore gasfield in East Java reached 8.5 million cubic meter per day making it thus one of the Japanese key production assets overseas (Japex 2014d). Additionally, Mitsui Corporation has been conducting exploration activities in three onshore and one offshore oilfield in Indonesia. The two onshore oilfields are based on West Papua and Sumatra, whereas the offshore field is located northeast from Sumatra. All projects are still at exploration phase and thus the potential production levels are still unknown (Mitsui 2014).

Japan started expanding its dominance all around Asia Pacific already in the beginning of 1990s. In 1990, JX Nippon made its first investment in Papua New Guinea. By purchasing Merlin Petroleum Company, JX Nippon acquired various interests in a number of onshore blocks. This purchase was followed by a number of successful production projects. In addition, in 2008 the company acquired LNG and oilfield equity assets by AGL Energy (JX Nippon 2014i).

Furthermore, the company made further investments in East Timor strategically positioning itself in that region. In 2009, JX Nippon acquired 15 percent shares in new exploration field in East Timor (JX Nippon 2014j).

Australia has been one of the pivots in Asia Pacific due to its ample natural gas resources Japan has been very eager for. Since the beginning of 1990s Japanese companies have been participating in oil and gas development projects in Australia. Inpex was the first Japanese oil and gas company to enter Australian energy market. In 1993, the company acquired 19 percent exploration participation shares in joint petroleum development area, Kitan offshore oilfield, in Timor Sea. Other partners in this production field are ConocoPhillips and Santos with 61 percent and 20 percent shares (Inpex 2014d). In 1998, the company acquired 66

percent participating interest in exploration activities of offshore oil and gas fields in Western Australia. The exploration activities proved as successful and soon Inpex initiated large-scale Ichthys LNG project (Inpex 2014d). Bearing in mind that Japan is world's biggest LNG importer and Australia its biggest LNG exporter this on-going project plays very important role in Japan's energy supply portfolio. In 1999, Inpex again invested in Australia's oilfields. The company acquired 47 percent exploration interests in VanGogh oilfield and 28.5 percent interests in Ravensworth oilfield. Development phase is under construction targeting the production take-off in 2014. According to analysts the average crude oil production for the first year could reach 21,500 b/d (Inpex 2014d). Lastly, in 2012 the company acquired 17.5 percent participating interest from Shell in Prelude LNG project in offshore Western Australia. The production targeted for 2017 is expected to reach 3.6 millions of tons per year (Inpex 2014d).

JX Nippon also observes Australia's energy market as one of the core markets to invest in. The company first entered the market in 1997 when it acquired 25 percent participation interest in the exploration of Western Australian offshore oilfields. In 2005, the company started with production reaching the volumes of 1,500 b/d. Moreover, in 2005 the company made further investment and gained additional 15 percent stake in Block WA-290-P. Finally, in 2008 JX Nippon acquired 100 percent participating interest in Block WA-412-P (JX Nippon 2014k).

*North America and Europe*

Oil and gas exploration territories in Europe and North America attract foreign investment since they are known for low political risks, flexible tax regime, and stable laws and regulations. Such appealing oil&gas exploration and production conditions also have attracted other Japanese energy companies to invest in these regions. For the past three decades the companies have been acquiring upstream assets in North Sea oilfields, Canada and United States.

Since late 1980s Japanese companies have been operating in the North Sea territorial waters of Norway. The acquisition of 9.6 percent participation interest by Japanese company Idemitsu Kosan in Snorre filed in Norwegian North Sea in 1990, marked the start of Japanese investment to Norway. Ever since the company has been operating in North Sea offshore oilfields. Nowadays, the company counts 7 different production fields. The latest acquisition

by Idemitsu Kosan was signed in 2002 when the company acquired 15 percent share of Fram fields (Idemitsu 2014a).

Apart from the Norwegian territorial waters, British North Sea oil and gas exploration territories also attract foreign investment since they are known for low operational risks, flexible tax regime, and stable laws and regulations. Such appealing oil and gas exploration and production circumstances soon attracted other Japanese energy companies to invest in the region. JX Nippon initiated its investment to the region in 1994 when the company gained exploration licenses by Petrofina. Ever since JX Nippon has been very active in the UK North Sea offshore fields producing oil and gas in over 10 fields. Recent investment the company made includes the acquisition of the 6.27 percent participating interest in Kinnoul field made in 2010 (JX Nippon 2014a). In addition, Mitsui also gained 13 percent participating interest in producing activities of two offshore UK North Sea oilfields (Mitsui 2014).

Additionally, the company has been also operating in 9 British North Shore offshore fields. Idemitsu initiated activities in 2007, and this it could be said is a latecomer to the region. However, ever since the company has been investing in the region. By today it has completed two acquisitions and gained a number of exploration licenses (Idemitsu 2014b). In 2012, the company acquired 100 percent share of British oil developer Petro Summit Investment Co. Acquisition of British company that owns interest in 17 oil fields increased Japanese 'self-produced' oil supply by 5,000 barrel of crude oil per day. In addition, the company is planning to double the production from these assets in the next several years (Sumitomo 2012).

In the Western Hemisphere Japan has extensively invested in Canada and United States. Since early 1990s Japanese companies have been conducting exploration and operational projects in Canada. In 1992, Japanese oil and gas company JX Nippon acquired 5 percent interest in Canadian Syncrude Project. The company has been participating in a number of projects gaining know-how and experience in oil sands exploration and production (JX Nippon 2014b). In 2007, Japanese oil and gas company Inpex acquired the 10 percent share in the Joslyn Oil sands Upstream Project in Alberta, Canada. According to the experts the completion of project's development Phase I would create an output of 100,000 b/d by the beginning of next decade (Inpex 2014b). In 2012, the company acquired 40 percent participating interest in the shale gas project in the Horn River fields from Canadian energy giant Nexen Inc. The experts project that the peak production from at this project could reach

as much as 200,000 b/d (Inpex 2014b). Participation in these projects would certainly boost Japan's energy supply and to some extent enhance country's energy security.

In 2010, Mitsubishi acquired 50 percent interest in Cordova Embayment shale gas project partnering with Penn West Energy (Mitsubishi 2010b). In 2012, Mitsubishi invested in 40 percent participation interest in Cutbank Ridge shale gas project in the Montney Ridge formation partnering with Canadian energy company Penn West Energy (Mitsubishi 2012). According to Mitsubishi R&D department, the company intends to invest in expertise in the shale gas business with the long-term goal of acquiring more upstream assets in Canada and United State (Mitsubishi 2012).

Apart from Canada, Japanese companies have also invested in a number of projects in United States. JX Nippon started with series of investments in 1990 when the company acquired 50 percent share in Orchard North gas field in US Gulf of Mexico. In 2005, the company acquired assets by American company Devon expanding its dominance in Mexican Gulf. Finally, in 2007, the company acquired 12 percent assets in US Gulf of Mexico from Andarko (JX Nippon 2014c).

Inpex has been also participating in oil and gas projects in the United States. In 2006, the company acquired 25 percent share in the exploration blocks in West Cameron and Louisiana. In 2011, Inpex invested in an offshore field Walker Ridge and acquired a 15 percent participation interest (Inpex 2014b).

Exploration and development projects in US Gulf of Mexico have been dating ever since 1940s. Developed infrastructure that enables smooth transport of produced oil and gas, as well as stable legal regulations and taxation system contribute to the ease doing business in the region.

*Latin America*

Latin America still seems to be unattractive region for Japanese investment in oil&gas exploration and production activities. So far only Inpex and Mitsubishi Corporation have started with activities on that continent.

Inpex has been involved in a couple of small onshore projects in Peru and Venezuela, and one offshore exploration project in Brazil together with Petrobras and Chevron. In 2010, the company entered Peru by acquiring 25 percent participation interest in the onshore block

located in north western Peru from Petrobras which then owned 75 percent share (Inpex 2010). In addition, since 2006 Inpex has participated in oil&gas field rehabilitation project in Venezuela. The company signed a joint venture agreement with Petroleos de Venezuela S.A. (PDVSA) and gained 30 percent participation interest in Guarico Oriental and 70 percent participation interest in Copa Macoya (Inpex 2014f).

Apart from Inpex, Mitsubishi also recently got involved into oil development projects in Venezuela. In 2010, the company signed a joint venture agreement with Chevron and PDVSA on development of Orinoco extra-heavy crude oil produced in the Carabobo blocks situated along Orinoco River. In the joint venture Mitsubishi holds 5 percent, while Chevron and PDVSA hold 35 percent and 60 precent, respectively (Mitsubishi 2010a).

### *2.2.4 Securing Strategic Petroleum Reserves as a Strategy of Oil&Gas Supply Security Policy in Japan*

We have noted above that Japan imports almost all of its energy resources. Developed domestic stockpiling system that secures stable supply of resources in case of unexpected disruptions is thus crucial for a country such as Japan with very high dependency on oil&gas imports.

This chapter of the empirical part examines the policy behind securing strategic petroleum reserves as strategy behind Japan's oil&gas supply security policy. In order to understand the nature of this particular strategy behind Japan's oil&gas supply security policy, this section looks into a number of indicators. Those indicators include: nature of property rights, infrastructure to support strategic reserves and transparency of oil and gas reserves levels.

The Petroleum Refining and Reserve Division of Natural Resources and Fuel Department coordinate the Japanese National Emergency Strategy Organization (NESO) that is responsible for implementation of actions in case unforeseen oil supply disruptions occur. Measures in the domain of NESO include: information transparency regarding national energy distribution, energy saving campaigns, special restrictions and regulations on oil usage in specific industrial sectors, allocation of oil and gas, etc. (IEA 2013a: 9, 12).

International Energy Agency (IEA) member states are determined to establish energy safety guarantees and stable SPR system on international level (JOGMEC 2012). As an OECD

country[34], Japan is required to have a minimum of 90 stockpiling days. In 2012, Japan Oil, Gas and Metals National Company[35] (JOGMEC) issued an updated version of 'Oil Stockpiling Act' that emphasized the importance of oil and gas supply structure in case of supply disruptions (IEA 2013a: 9, MITI 2012). The 'Oil Stockpiling Act' was based on the experience of the Fukushima disaster and advocated for further strengthening of the domestic oil stockpiling system and structure of supplying oil in the case of disaster (METI 2012). In addition, according to the Act 'the refineries are obliged to hold from 70 days to 90 days of their daily refined production based on the average of previous 12 months' (IEA 2013a:9). The strategy of securing strategic petroleum reserves could be observed as the pivot of Japan's oil&gas supply security enhancement. Nowadays, Japan holds one of the world's largest strategic petroleum reserves.

Japan's oil and gas reserves system has been implemented as a dual project. Firstly, as a national stockpiling project that has been mainly promoted by the government and created for strategic usage. It counts 10 national oil bases. Secondly, as a private sector stockpiling project that has been built by private companies and thus created for commercial usage.

National SPR holds about 258 million barrels (mb), while private petroleum reserves storage holds 225 mb. The total oil stockpiling capacity is adequate for almost 200 days of Japan's consumption (METI 2012: 24, Platts 2011). National reserves holding locations include tanks of national stockpiling bases and private sector tanks. The composition of national reserves is divided between 99.5 percent of crude oil and 0.5 percent of oil products. Private petroleum reserves, by contrast, are stored in private sector tanks in refineries and oil terminals. The structure of private petroleum reserves is divided in 50 percent of crude oil and 50 percent of oil product. Moreover, there is also a significant difference in private and national stockpiling financing. Private reserves are financed through subsidies for oil purchasing costs, while national reserves are funded through the government budget (PAJ 2013: 22). As an OECD country and a member of IEA Japan is required to have high level of strategic reserves. In 2013, Japan's strategic oil reserves reached almost 500 mb of oil. Divided in national and private reserves, with capacity of 258 mb and 225 mb, respectively.

[34] Japan is a OECD country and thus engaged in maintaining collaborative relation with IEA. Since Japan almost fully depends on the import of oil from oil-producing countries, close cooperation with the IEA in the event of unforeseen disruptions in the global energy markets is extremely important (JOGMEC 2012: 24).

[35] JOGMEC is responsible for the safe and efficient operation of petroleum and LNG stockpiling programs, construction of national LNG stockpiling bases, and securing financial support for private-sector stockpiling programs. In addition, it maintains a system that enables stockpiles to operate safely and efficiently. In event of an emergency JOGMEC coordinates stable supply of resources in national economy (JOGMEC 2013).

Table 2.17 Japan's Strategic Petroleum Reserves

| OIL | Capacity | Coverage |
|---|---|---|
| National Stockpiling | 258 million barrels | 113 days consumption |
| Private Stockpiling | 225 million barrels | 85 days consumption |

Source: JOGMEC 2012: 25

Oil is the most significant energy source in Japan counting 45 percent of total domestic energy consumption in 2012 (EIA 2013b). Strategic oil reserves are thus of great importance in order to increase country's energy security. As an island country surrounded by sea, Japan has five main oil ports Chiba, Yokohama, Yokkaichi, Shibushi and Okinawa through which the country receives crude oil. The imported crude oil is then further distributed to stockpiling tankers and refineries.

Japan has been developing its petroleum strategic reserves for more than two decades. Enhancement of oil&gas supply security was one of the top priorities on government's agenda. The leadership has made great investments in order to construct a sustainable domestic strategic reserve infrastructure that would meet country's needs in case of disruptions in the global energy markets. Nowadays, we observe a well-developed modern oil infrastructure network that could back up the economy for almost 200 days.

Figure 2.17 Oil Infrastructure Map in Japan, 2013


Source: IEA 2013a

As already mentioned above, strategic petroleum reserves in Japan are divided in national and private reserves. As can be seen from above, national petroleum reserves count 53 percent of total SPR capacity and are stored in ten different bases with different storage capacities all over the country. Private petroleum reserves count 47 percent of total SPR capacity and are stored by private Japanese oil companies in line with their obligations to Japan's strategic reserves law (JOGMEC 2013). While the capacities of individual state-owned bases and tanks are known and reported for each base, the same is not the case for private ones. Table 19 below summarizes Japanese SPR dividing them in national and private sites and indicating for each location, capacity and status.

Table 2.18 Japanese Strategic Petroleum Reserves Sites, 2013

(in million barrels)

| | Operator | Location | Capacity | Status |
|---|---|---|---|---|
| | National | Eastern Tomakomai | 40.3 | Filled |
| | National | Mutsu Ogawara | 35.9 | Filled |
| | National | Akita | 28.3 | Filled |
| | National | Kuji | 11.0 | Filled |
| | National | Fukui | 21.4 | Filled |
| | National | Kikuma | 9.4 | Filled |
| | National | Shirashima | 35.2 | Filled |
| | National | Kamigoto | 27.7 | Filled |
| | National | Kushikino | 11.0 | Filled |
| | National | Shibushi | 31.4 | Filled |
| **Total** | | | **257.6** | |
| | Private | Onahama, Kashima, Kawasaki, Sodegaura, Aichi, Chita, Sakai, Wakayama, Yamaguchi, Tokuyama, Kokkaido, Niigata, Kirie, Okinawa | 225.1 | Filled |
| **Total** | | | **225.1** | |
| **TOTAL** | | | **482.7** | |

Source: JOGMEC 2013

From this analysis we note that strategic petroleum stockpiling system has been of great importance for Japanese oil&gas supply security. Today Japan enjoys well-developed strategic petroleum reserves system that can meet country's energy needs and support the economy for almost 200 consecutive days. This shows us that owing to the advanced strategic petroleum system the country has more than successfully diminished its vulnerability to unforeseen disruptions in the global oil and gas market.

### *2.2.5 Expansion of Refining Capacity as a Strategy behind Oil&Gas Supply Security Policy in Japan*

An adequate refining sector that meets domestic demand for refined products by processing crude imports instead of importing petroleum products plays crucial role in country's oil&gas supply security. Construction of advanced refining facilities capable to process imported crude oil is the key of a sufficient domestic refining sector.

In order to assess expansion of refining capacity as a strategy behind oil&gas supply security policy in Japan, this chapter examines a number of indicators. Those indicators include: ownership of refineries in Japan, domestic prices of petroleum products, market concentration of domestic refining production and Japan's domestic refining production cover.

Construction of domestic downstream facilities that meet country's needs for petroleum products is a top priority for a country that relies on imports of fossil fuels from countries rich in oil&gas (Downs 2000: 31, Vivoda 2009: 4620). A refining sector that has the capacity to process crudes and meet country's demand for derivates is thus one of the key requirements for country's oil&gas supply security enhancement.

Japan's refining sector is run by Japanese private oil&gas enterprises. In contrast to China where state-ownership dominates the sector, in Japan, the government is completely excluded from ownership of any refinery (IEA 2008: 120). In line with that, Japanese refining sector is very differentiated and dominated by a number of smaller oil&gas companies.

Nowadays, a number of Japanese energy companies are involved in domestic production of refining products. Those companies include: Cosmo Oil Co., Fuji Oil Co., Idemitsu Kosan Co., JX Nippon Oil & Energy, Kashima Oil Co., Kyokuto Petroleum Industries, Nansei Sekiyu, Okinawa Sekiyu Seisei, Seibu Oil Co., Taiyo Oil Co., Toa Oil Co. etc.

Deregulation of refining sector in Japan was introduced in 1987 and carried out in three phases. The first phase, initiated in 1987 by the Japan's National Petroleum Council, advocated for liberalization of oil&gas sector. A number of measures that increase deregulation of Japan's oil&gas industry were implemented, such as: abolition of gasoline production quota, abolition of the guidance on kerosene stockpiling, abolition of guidance on crude oil treatment, and abolition of the fuel oil tariff quota system (Eastcott 2004, Kikkawa 2008: 34-35). Additionally, regulations to specific petroleum-product production quotas and

crude oil refinery inputs were gradually completely removed allowing market mechanism to steer the industry.

The second phase that lasted from 1996 until 1998 was mainly focused on the deregulation of domestic refining sector. The core of this phase was the abolishment of quotas for import of specific petroleum refined products. It was then followed by a number of further deregulation measures such as: liberalization petroleum refined products export, abolition of primary oil supplier verification, deregulation of petrol stations, etc. (IEA 2000, Kikkawa 2000: 35).

Finally, the third phase was directed by the Petroleum Council that in 1998 published report on the future of the petroleum policy in Japan (Kikkawa 2000: 35). The report called for

> i) abolition of supply and demand adjustment regulations such as the need for approval for business commencement and facility investments
> ii) abolition of regulations on pricing based on setting standard prices (PEJ 2013: 27).

Nowadays, in Japan we observe a deregulated refining industry with improved transparency and accountability in which market mechanisms coordinate the sector. However, as a result of a number of external factors that have occurred during the past decades, such as, diversification of resource that led to diminished usage of oil, falling population, growing awareness of environmental protection and rising oil prices, the surplus capacity of petroleum refining sector became an issue (PAJ 2013: 27).

Japan possesses the second largest refining capacity in Asia Pacific after China. However, in spite of country's developed domestic refinery system, domestic refining capacities in Japan have significantly diminished. In 2000, Japan's total refining capacity counted 5.3 million b/d. In about a decade the total capacity has diminished for about 1 million b/d, as inefficient refineries have been closing. Today, Japan holds capacity of 4.3 million b/d and total of 25 facilities all over the country (EIA 2013b, PAJ 2013).

A number of factors led to such circumstances in Japan's downstream sector. According to Japanese scholar Takeo Kikkawa the disproportionate competition among too many too small oil&gas companies involved in Japan's domestic refining resulted with:

> i) surplus capacity for oil refining, ii) production and sales gap, since oil refining exceeded sales capabilities, iii) distortion of the oil pricing system, due to high gasoline prices in comparison to other petroleum products, iv) too many independent petroleum stations (Kikkawa 2000: 30).

The refining products surplus that occurred in the domestic refining market created imbalances (as the refineries were not competitive enough to become a major regional exporters) and called for reforms in order to increase industry's efficiency. Additionally, Japanese private refineries were required to maintain refined product stocks equivalent to at least 70 days of consumption (EIA 2013b). This policy resulted with additional costs to domestic refineries that also have to compete with their counterparts in very dynamic and constantly changing Asian energy markets.

The table 2.19 below illustrates diminishing total refining capacity in Japan. The data shows that in the recent years the total capacity has decreased from 4.9 million b/d in 2009 to low 4.3 million b/d. This is a result of cut in capacities of a number of domestic refineries, but also as a result of closure of four refining plants (see Table 2.19 below).

Table 2.19 Japan's Capacity, 2009 – 2013

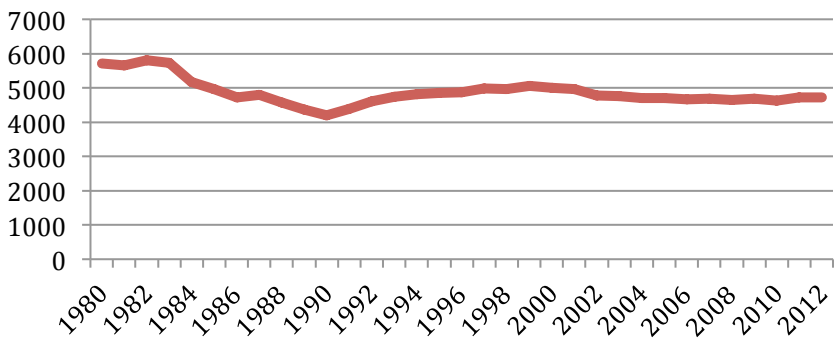
| Year | Refineries | Total Capacity (million barrel per day) |
|---|---|---|
| 2009 | 29 | 4.9 |
| 2010 | 28 | 4.8 |
| 2011 | 27 | 4.6 |
| 2012 | 27 | 4.5 |
| 2013 | 25 | 4.3 |

Source: IEA 2013b, PAJ 2013, Platts 2013b

All those factors have shaped Japan's downstream sector during the last decades and resulted with a stagnant and slightly diminishing refinery capacity in Japan (see Figure 2.18 below).

Figure 2.18 Japan's Refinery Capacity, 1980 – 2012

(Thousand barrels per day)




Source: IEA 2013a

As already mentioned, Japan's downstream sector is very diversified. A number of oil&gas companies are present in Japans' refining sector. From the table 2.20 below we note that JX Nippon Oil & Energy Corporation enjoys the greatest share in Japan's domestic refining production. In 2012, 1.4 million barrels per day of crude oil, equivalent to 30 percent of total domestic refinery production was processed at JX Nippon Oil & Energy Corporation refineries. JX Nippon is followed by Idemitsu Kosan, Tonnen/General Sekiyu KK and Cosmo Oil Company, that processed 13%, 13% and 12% of total Japan's refining production, respectively. Those companies are then further followed by a number of refineries whose individual share of total domestic refinery production does not exceed 5 percent (see Table 2.20).

Table 2.20 Domestic refinery production by Japanese oil&gas companies, in percentage

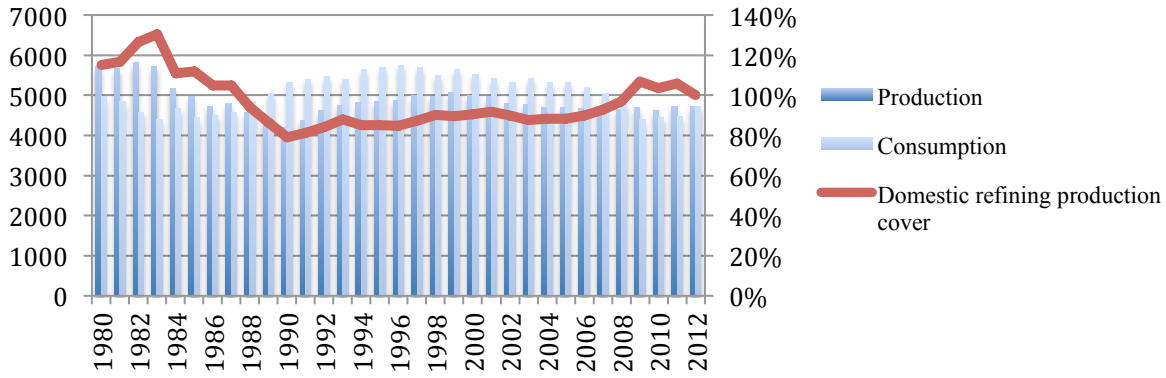
| Company | 2012 |
|---|---|
| JX Nippon Oil & Energy Corp. | 30% |
| Idemitsu Kosan Co. Ltd. | 13% |
| Tonen/General Sekiyu Seisei KK | 13% |
| Cosmo Oil Co. Ltd | 12% |
| Fuji Oil Co. Ltd. | 4% |
| Japan Energy Corp. | 4% |
| Kashima Oil Co. Ltd. | 4% |
| Kyokuto Petroleum Industries. Ltd. | 4% |
| Showa Yokkaichi Sekiyu Co. Ltd. | 4% |
| Toa Oil Co. Ltd. | 4% |
| Nansei Sekiyu KK | 2% |
| Okinawa Sekiyu Seisei | 2% |
| Seibu Oil Co. Ltd. | 2% |
| Other | 2% |
| **Market Concentration** | 1,499 |

Source: Oil&Gas Journal 2013

Due to declining consumption of oil as a result of greater diversification of resources, growing environmental awareness and aging population we observe decrease in consumption of oil products in Japan. From the figure 2.19 below we observe that in recent years domestic refining capacity has met domestic demand for petroleum products and the country has actually been a net exporter of products. From the values calculated for domestic refining production cover, that could be read from the secondary axis in the figure 2.19 below, we conclude that Japan is self-sufficient in oil product

Figure 2.19 Japan's Refining Domestic Production Cover, 1990 – 2012

(Thousand barrels per day)




Source: IEA 2013a

## III. Analytical Framework

In this final section of the paper we discuss findings presented in the empirical part and draw conclusions. The following chapters analyze and compare the nature behind five key oil&gas supply security strategies in China and Japan, while seeking an answer to the research question: *what are similarities and differences between oil&gas supply security policy in China and Japan*.

China has been witnessing an astonishing economic growth and standards of living over the last three decades. Continuous economic development, expanding middle class, as well as increase in domestic urbanization and motorization contributed to the rising demand for natural resources. China thus became the crucial player and the fastest growing demand center in global oil&gas markets. Its hunger for oil&gas to fuel the economy in order to sustain growth will continue increasing and shape strategies behind its domestic oil&gas supply security policy.

With expanding economic power of China, Japan's importance in regional and global energy markets partly diminished. Nevertheless, it is still a key demand center, remaining the world's largest importer of gas and third largest importer of oil. Still, Japan, witnessing rapidly increasing energy demand from fast growing regional powerhouses such as China and India, became even more wary about its own oil&gas supplies. As a resource-poor country that almost fully depends on energy imports from natural resources rich counties Japan had to rethink its oil&gas supply security policy.

### 3.1 Findings and Analysis on Domestic Production as a Strategy behind Oil&Gas Supply Security Policy in China and Japan

Maximization of domestic oil&gas production in order to become energy self-sufficient is an aspiration of every economy. Therefore, countries always put emphasize and prioritize exploitation of their domestic natural resources rather than hydrocarbon imports from the exporters.

The remainder of this chapter compares domestic production as a strategy behind oil&gas supply security policy in China and Japan by analyzing indicators such as: nature of property

rights, nature of coordination and motivation structure and domestic oil&gas production cover.

One of the main differences between Chinese and Japanese oil&gas sector is determined in the nature of ownership of their oil&gas companies. Chinese oil&gas sector is dominated by three big NOCs: CNPC, Sinopec and CNOOC. The means of production are thus owned by the state and decision-making apparatus is centralized. In Japan, on the contrary, ever since 2004 and implementation of a set of energy sector deregulation policies, market forces fully steer Japanese oil&gas industry. Japanese oil&gas sector, therefore, is run by a number of privately owned companies making thus the nature of the decision-making in the industry decentralized.

Further on, in order to examine the nature of coordination and motivation structure in China and Japan, we look into degree of crude oil and natural gas prices liberalization and level of competition in domestic oil&gas production.

Since the implementation of the market-oriented growth model in China, market mechanisms have been gradually introduced. With that regard, measures regulating domestic crude oil and natural gas prices were step by step abandoned and prices for crude oil and natural gas were gradually liberalized. In 2009, the government implemented the reform on domestic pricing mechanism with the aim to connect oil prices to international energy markets. However, it is important to note that oil&gas prices in China are still not fully liberalized. The authorities are still to a certain extent trying to protect the economy from unfavorable effects coming from intensely fluctuating international energy markets. Although oil&gas prices have been at levels referenced to those of the international markets, the government regulates domestic oil&gas prices in order to avoid exuberant fluctuations and very high levels, but also not too low to discourage production of domestic crude oil and natural gas.

In Japan, by contrast, market forces have been steering its domestic oil&gas industry since late 1980s. Although the country is extremely scarce in natural resources and almost completely dependent on oil&gas imports, it is important to note that its domestic oil&gas sector is fully liberalized. Japan's oil&gas prices are linked with prices on global energy markets.

Japan's domestic oil&gas production volumes are marginal and thus irrelevant in comparison to the amount of energy that the economy requires in order to meet its domestic demand. Therefore, the market concentration indicator that measures level of competition in

domestic oil&gas market in the form of market concentration due to limited and vague information of production levels by each company cannot be analytically assessed and in fact is of little relevance due to very small output levels in Japan.

In China, on the contrary, domestic production of oil&gas plays important role. Nevertheless, Chinese NOCs are making significant investments in order to upgrade technology and increase production of country's already mature oil and gas fields and venture into new frontiers, such as shale oil and shale gas production. The indicator for market concentration shows relatively low level of competition. Dominance of CNPC, Sinopec and CNOOC within the Chinese oil&gas sector hinders entry to small or medium-size players. Moreover, we could conclude that due to a limited competition in China efficiency of its domestic production and resources allocation could be impeded and thus have negative effects on country's oil&gas sector development.

From the analysis on China's and Japan's domestic oil&gas production cover we have learned that neither China nor Japan is self-sufficient in oil or gas. Japan's domestic oil&gas production is very low and insignificant in comparison to country's oil&gas consumption. Values for Japan's domestic oil and gas production cover equal 0.4 percent and 3 percent respectively and imply that the country virtually fully depends on oil&gas imports. China's domestic oil&gas production, on the contrary, covers significant portion of its oil&gas demand. China's domestic oil and gas production cover equals 40 and 80 percent, respectively.

In 1993, China became net-importer of crude oil and in 2007, net importer of natural gas. Country's expanding economy, raising domestic urbanization and motorization imply that China's both oil and natural gas consumption levels will also keep increasing in the period to come. Although the leadership has recognized the importance of domestic production, and Chinese NOCs have been involved in a number of domestic oil&gas production projects, it is very unlikely that country's natural reserves will ever be able to satisfy its vast demand for energy. Expansion of the domestic oil&gas production in China is the top aim. The leadership is eager to gain the know-how and best practices from frontier projects and bring those back to China in order to increase country's hydrocarbons extraction.

As mentioned above, due to natural resources scarcity Japan was always dependent on energy imports from oil&gas rich countries in order to satisfy its domestic demand and fuel country's economic development and industrialization. In the empirical part on Japan we noted that country's oil imports have been slightly diminishing, however, still remain

relatively high. Such a scenario in Japan is a result of implementation of primary energy diversification policies and environment conservation policies. On the contrary to oil consumption, consumption of natural gas in Japan has been continuously increasing making the country world's largest natural gas importer.

Table 3.1 Comparison I – Oil&Gas Domestic Production in China and Japan

| Indicators | China | Japan |
|---|---|---|
| **Ownership** | • State-ownership | • Private-ownership |
| **Prices** | • Prices not fully liberalized | • Prices are liberalized |
| **Market Concentration** | • Three big national oil companies | • Not relevant due to marginal output |
| **Domestic oil&gas production cover** | • To a large extent relying on imports, increasing imports of both oil and gas | • Almost exclusively relying on imports, diminishing imports of oil and increasing imports of gas |

From the analysis above we have learned that the nature of domestic production in China and Japan have both similarities and differences. Similarities are observed in countries' domestic oil&gas production cover, since both countries' domestic production levels cannot satisfy their economies' needs. This implies that both economies heavily depend on oil&gas imports to support domestic industries. This could further challenge the status quo in East Asian and global oil&gas markets. The differences, on the contrary are observed in the structure of their oil&gas sectors. In China, the oil&gas prices are still to a certain extent regulated, a fact which challenges complete implementation of market mechanisms in the oil&gas sector. Additionally, the level of competition in domestic market is also low, since NOCs completely dominate China's oil&gas industry.

In conclusion, all the indicators imply that in China centralized decision-making structure still prevails in its oil&gas domestic production. In Japan, on the contrary, deregulation policies and market forces are imbedded in its oil&gas industry. Oil&gas prices are liberalized and domestic oil&gas companies are privately owned. Therefore, in contrast to China where we observe centralized decision-making, in Japan, the decision-making structure is decentralized.

## 3.2 Findings and Analysis on Imports as a Strategy behind Oil&Gas Supply Security Policy in China and Japan

For countries that are not self-sufficient in oil&gas import of fossil fuels is the most logical and only way to satisfy their domestic demand.

In the course of this chapter the paper examines similarities and differences in the strategies behind oil&gas imports in China and Japan. In order to rationally assess strategies behind oil&gas imports in two countries, the paper looks into three key indicators: oil&gas import dependency, geographical diversification of supply and foreign policy towards oil&gas exporters.

From the previous chapter we have learned that both China and Japan are self-insufficient in oil&gas and thus dependent on imports from energy exporting countries. Indices for oil&gas import dependency in China and Japan both imply high dependency on natural resources from energy rich countries.

In case of China we observe continuous increase in both oil and gas imports. However, although the oil&gas dependency has been increasing in China, it still remains much lower than in Japan. Two reasons shape this fact. Firstly, China is still capable of production of decent amounts of crude oil and natural gas to satisfy substantial share of its domestic demand. Secondly, in spite of its $CO_2$ emissions and negative environmental effects, coal still remains the most spread fossil fuel in country's total energy consumption. According to U.S. Energy Information Administration (EIA), coal accounted for 69 percent of total energy consumption, while the share of oil and natural gas accounted for 18 percent and 4 percent, respectively (EIA 2013a). Nevertheless, it is important to note that China's further economic development followed by rising middle class and motorization, as well as rising concerns about environmental issues will continue to boost demand for 'cleaner' fossil fuels rather than coal. Such developments will certainly contribute to a significant increase in oil&gas import levels during the next decades in China.

In Japan, on the contrary, oil remains the most dominant fossil fuel in the total domestic consumption. This explains country's relatively high dependency on oil imports. However, as already mentioned above, due to implementation of country's primary energy sources diversification policies and rising environmental awareness, oil consumption volumes in Japan have been gradually diminishing.

In the theoretical part of this paper we have learned that imports diversification is one of the key mechanisms to diminish countries vulnerability to disruption in imports. Diversifying number of importers and routes by which the resources are transported is thus one of the main strategies energy importers implement in order to enhance its oil&gas supply security.

Results for geographic diversification of oil&gas supply in China and Japan show us that countries have different approaches towards imports of oil&gas. Chinese authorities have recognized the importance of geographic diversification of oil&gas imports and have implemented it as a priority while fighting its oil&gas supply vulnerability. Although about half of China's oil imports still origin from Middle East, the country is trying to diminish its dependency on this relatively instable and US-interests dominant region by differentiating its oil&gas suppliers through imports from Africa, Asia Pacific, Former Soviet Union and Latin America. Similar scenario can be observed in imports of natural gas. China's natural gas imports mostly origin from the Former Soviet Union (FSU), Asia Pacific and Middle East. In the recent years FSU has become more important natural gas exporter to China due to completion of a number of pipeline and LNG projects that bring natural gas to China from Turkmenistan and Russia.

On the contrary, Japan's oil&gas imports are much less differentiated in comparison to China. More than 80 percent of total country's oil imports still origin from Middle East thus making Japan extremely dependent on that particular region. Regarding the natural gas imports, in contrast to China that imports both traditional natural gas, transported via pipelines, and liquefied natural gas (LNG), Japan being an island economy import its natural gas requirements exclusively via LNG.

Moreover, Beijing is strongly pushing for the diversification of oil&gas imports. China's oil diplomacy tactics could also be observed in the country's oil&gas imports diversification mix. Relatively high level of diversification of oil&gas suppliers implies that Beijing has taken a geostrategic approach while tackling country's oil&gas supply vulnerability. Increasing imports and building close political relations with countries that are known for political instability suggest that China is eager to enter new markets and acquire long-term access to resources. Japan, by contrast, in spite of its natural resources scarcity and high dependency on oil&gas imports remains rather reluctant in diversifying its suppliers. Economic concerns and risk averseness, as well as, political risks in the potential energy suppliers, still shape Tokyo's oil diplomacy. In comparison to Beijing, Tokyo thus remains committed to the open market and global forces shaping international oil&gas markets.

Table 3.2 Comparison II – Oil&Gas Imports in China and Japan

| Indicators | China | Japan |
|---|---|---|
| **Index of oil&gas import dependency in the energy mix** | • Relatively low, however, increasing dependency on both oil and gas imports | • High, however, diminishing dependency on oil imports. Relatively low, but increasing dependency on natural gas imports |
| **Geographical diversification of supply** | • Relatively high level of diversification of oil&gas suppliers<br>• Geostrategic approach to diversification of oil&gas suppliers | • Relatively low level of diversification of oil&gas suppliers<br>• Market approach to diversification of oil&gas suppliers |
| **Foreign policy towards oil&gas exporters** | • Oil diplomacy: establishing long-term strategic partnership with new energy exporters | • Oil diplomacy: establishing long-term strategic partnership with already recognized energy exporters |

From the analysis in this chapter we have learned that China and Japan have different approaches towards diversification of oil&gas imports. China as a relative latecomer to international oil&gas global energy markets has been putting an emphasis on diversification of oil&gas suppliers and routes by which oil&gas is traded in order to enhance country's fossil fuels supply security. In Beijing's tactics we observe a geostrategic approach that stresses the importance of long-term strategic relationship with key energy exporters. In China thus oil&gas imports are not steered by market forces but rather by centralized decision makers that implement decisions through Chinese NOCs.

In Japan, however, the scenario is slightly different. Although the country almost fully depends on oil&gas imports, we observe that Japan's oil&gas supplies are modestly geographically diversified. This relatively low level of geographic diversification of oil&gas supply is a result of decentralized decision-making structure and market mechanism that steer country's oil&gas sector.

In conclusion, the results of the indicators discussed in the course of this chapter all argue that the locus of decision making in China and Japan shape different approaches towards oil&gas imports. While for Beijing the main aim is to establish long-term relations with energy exporter deemed strategic (even if it comes at a higher price and involves higher risks), Tokyo, in contrast, leaves the development to market forces which steer the country to the major and established fossil fuels exporters, and results in much lower levels of diversification.

## 3.3 Findings and Analysis on Overseas Production as a Strategy behind Oil&Gas Supply Security Policy in China and Japan

Establishing overseas production areas, controlled by domestic oil majors is a step further to strengthen oil importers' oil&gas supply security. This chapter analyzes similarities and differences in strategies towards overseas equity production in China and Japan.

In order to compare overseas production as a strategy behind oil&gas supply security in China and Japan, the paper again follows indicators form the oil&gas supply security policy conceptual framework. Those indicators are: incentive structure behind 'going out' policy, geographic diversification of overseas production and foreign policy towards countries where invested into.

For both China and Japan overseas production has played important role in tackling their increasing demand for resource. As discussed, neither China, nor Japan are self-sufficient in natural resources. Moreover, in the recent years, oil&gas imports in both countries have been increasing making them major global oil&gas importers. Recognizing the vulnerability of their oil&gas supply, both countries have been promoting 'going out'/'Hinomaru' policy and directing their oil&gas supply security policies towards increased overseas production.

As a result of such behavior, nowadays, we observe high presence of Chinese and Japanese oil&gas companies in exploration and production activities worldwide. However, similarly to the different approaches that countries had in implementation of their imports of oil&gas policies, we also note that countries have different approaches towards overseas oil&gas production.

Both Chinese and Japanese authorities have been advocating 'going out' policy and encouraging their domestic oil&gas companies to increase oil&gas exploration and production projects overseas. Export Import Bank of China and China Development Bank, as well as, Japan Bank of International Cooperation, have all been supporting domestic oil&gas companies by providing them with subsidies and offering loans at favorable rates allowing them to bid effectively for upstream projects in oil&gas rich countries. However, although the actions by both Chinese and Japanese oil&gas companies have been supported by the government, it is important to distinguish different approaches that countries take while acquiring overseas upstream assets and implementing 'going out' policy.

In China, similarly to the strategies behind imports, the state directs the activities of its NOCs. Beijing has recognized the importance of acquiring equity stakes making it the pivot

of country's oil&gas supply security policy. In the recent years, the quest for oil&gas upstream assets has significantly shaped China's oil diplomacy.

China as a latecomer to global energy markets was adversely positioned in comparison to its international counterparts. The Chinese NOCs, therefore, were required to follow Chinese government geostrategic approach of 'going out' policy in order to be able to survive in competition with international oil&gas giants, such as: ExxonMobil, BP, Shell, Total, Chevron, etc. Under the direction of the state, CNPC, Sinopec and CNOOC have all started conducting vast investments in overseas upstream assets and diversifying oil&gas supply before such opportunities became costlier. Consequently, Chinese deep pockets and desire to make its NOCs internationally competitive resulted in increasing presence of Chinese NOCs in oil&gas activities worldwide. As a result of such a behavior of Chinese NOCs, nowadays, China enjoys both high level of equity stake is international oil&gas projects, as well as high level of diversification between countries where it is present.

However, while entering emerging energy markets, Chinese NOCs have been facing a number of challenges. Diplomatic and financial costs imposed by the circumstances in the regions where Chinese NOCs have been operating are higher than in countries already dominated by western oil&gas international corporations. A number of countries in which China has made major investments during the last decade such as Sudan, Iraq, Iran, Venezuela, Nigeria or Syria are known for political instability and have been heavily criticized by the west for their so called *rouge* regimes.

In spite of high demand for oil&gas, Japan, on the contrary, has been implementing its 'going out' policy at a much lower scale. Limited number of countries where invested in due to political instability or remoteness had significant impact on Japan's overseas production diversification. Avoiding states that are rich in resources, yet known for political instability, resulted with relatively low level of diversification of country's oil&gas overseas production.

Two main factors have shaped Japan's oil diplomacy behind overseas production. Firstly, due to financial constraints Japanese oil&gas companies have been reluctant while entering exploration and production projects abroad. High production costs and questionable reserves in such countries are some of the reasons why Japanese oil&gas companies still have not been engaged in oil&gas production in Iran, Venezuela or some African countries rich in natural resources. Secondly, as one of the United States' key allies, Tokyo has always been by Washington's side while fighting pariah regimes and promoting democratization. Due to this fact, it is very unlikely that Tokyo's 'going out' policy would follow Beijing's strategy and

engage in oil&gas exploration and production projects in countries whose regimes are at odds with United States.

Table 3.3 – Comparison III - Oil&Gas Overseas Production in China and Japan

| Indicators | China | Japan |
|---|---|---|
| **Incentive structure behind 'going out' policy** | • State subsidizes NOCs oil&gas exploration and production overseas activities | • State subsidizes domestic companies oil&gas exploration and production overseas activities |
| **Geographic diversification of overseas production** | • Relatively high level of diversification of oil&gas overseas production<br>• Geostrategic approach while diversifying oil&gas overseas production | • Relatively low level of diversification of oil&gas overseas production<br>• Market approach while diversifying oil&gas suppliers |
| **Foreign policy towards countries where invested into** | • Oil diplomacy: investing in new energy exporters | • Oil diplomacy: mainly investing in politically stable regions |

The analysis of overseas production as a strategy behind oil&gas supply security policy in China and Japan, shows that two countries share same motivation, however, different approaches while implementing this strategy. Since both China and Japan are net oil and gas importers, increasing overseas production of their domestic oil&gas companies is of great importance to diminish their exposure to potential disruptions in oil&gas supply.

Although in both China and Japan the state subsidizes overseas activities of their domestic oil&gas countries, still, it is important to note that the countries target different regions for their investments. As in the case of hydrocarbon imports, China implements geostrategic approach directed by the state. Since Chinese NOCs are state-owned, companies' activities abroad are mirroring Party's strategic moves. Beijing's oil diplomacy, therefore, is oriented towards 'emerging' energy exporters that play increasingly important role in China's overseas oil&gas production map.

Similarly to China, in Japan, the overseas activities by its oil&gas companies are also financially sponsored by the state. It is important to note that in comparison to China where NOCs' activities are coordinated by the state, in Japan, however, market forces steer the decisions of Japanese oil&gas companies while acquiring upstream assets overseas. Due to price and availability concerns Japanese companies are reluctant to enter new 'rouge' countries that in the past years have recorded increased presence by Chinese NOCs. Financial constraints and 'cherry-picking' of potential countries to invest in from the side of Japanese

oil&gas companies have resulted in country's lower level of diversification of overseas production relative to China.

In conclusion, similar to imports, the results of the indicators on overseas production as a strategy behind country's oil&gas supply security policy imply that the nature of decision making shape China's and Japan's different approaches towards overseas production. China's centralized decision- making structure advocates geostrategic approach. As a result of such an approach Beijing has been establishing strategic relations with countries that are rich in natural resources and preparing favorable environment for NOCs to enter and conduct oil&gas exploration and production activities. Japan's decentralized decision-making structure left its domestic oil&gas companies to market forces and thus more obvious solutions from the market, but not necessarily geostrategic point of view. Japan's oil&gas companies are making independent decisions while acquiring oil&gas upstream assets overseas. Thus, as mentioned, Japanese oil&gas companies' decisions are mainly steered by market forces, in comparison to Chinese NOCs whose activities are directed by geostrategic approach.

### 3.4 Findings and Analysis on Strategic Petroleum Reserves as a Strategy behind Oil&Gas Supply Security Policy in China and Japan

Developed strategic petroleum reserves (SPR) system that secures stable supply of resources in case of unexpected disruptions in oil&gas energy markets plays important role in shaping oil&gas supply security policy in China and Japan.

Following lines of this chapter examine similarities and differences in strategies behind SPR systems in China and Japan. Indicators that assist us in the assessing the design of SPR system in China and Japan are: nature of property rights, domestic infrastructure that support SPRs and transparency in SPR levels.

Since both China and Japan are among world's top 3 oil importers, securing SPR remains one of the key strategies to enhance countries' oil&gas supply security. The concept of SPR has historically been strongly advocated by the IEA as a reaction to Arab-Israel War and oil embargo. Japan as an OECD country and member of IEA, was required to hold a minimum of amount of oil equivalent to 90 days of its oil net imports. Nowadays, Japan holds one of the greatest oil reserves in the world that could satisfy country's oil demand for almost 200 days.

China's SPR system is still underdeveloped and thus inadequate to satisfy economy's demand for oil for a prolonged period of time in case of supply disruption in global energy markets. However, ever since the early 2000s and the launch of China's SPR Plan, the construction of a sufficient domestic SPR system that could meet domestic demand remains one of the top-priorities on Chinese policymakers agenda.

In comparison to Japan, current capacity of China's SPRs are insufficient to satisfy country's needs in an event of prolonged supply disruption, however, one should acknowledge that significant improvements have already been made. China's increasing dependency on oil and gas imports made the leadership reconsider China's oil&gas supply security policy.

Prior to the start of the construction of China's modern SPR the country held reserves that could satisfy its domestic needs for only about two weeks. Nowadays, China's SPR capacity already reached about 300 mb. Nevertheless, one should note that with the completion of SPR Plan phase III, it is very likely that China's SPR capacity will overtake current Japanese SPR levels.

Another important factor to differentiate the nature of SPRs in China and Japan is related to the nature of property rights. China's SPR system has been constructed by Chinese NOCs. CNPC, Sinopec and CNOOC do not only provide services for construction of domestic SPRs but also hold country's reserves. With regards to that Chinese SPRs are fully under the auspices of the state. This again implies high level of centralization of China's domestic oil&gas sector.

In Japan, by contrast, the ownership of SPRs is divided between the state and Japanese oil&gas companies. According to data 53 percent of total SPR are state-held, while 47 percent are commercially-held. Therefore, in contrast to centralized oil&gas sector in China, in Japan we observe significant level of decentralization.

Furthermore, transparency as an indicator of SPR strategy also helps us distinguish differences between oil&gas supply security in China and Japan. In Japan, current levels of SPR are known and clearly divided between national and private sites. The locations, capacities and statuses of all Japanese SPR sites are known and reported. This level of transparency supports Japan's commitment to a functioning and efficient global energy markets. Japanese oil&gas supply security policy-makers advocate transparency and accountability of domestic oil&gas sector.

In China, by contrast, the overall level of SPRs remains unknown[36]. Neither Chinese government, nor the NOCs report official information about current SPR levels. China is still hesitant to fully reveal country's SPR capacity levels and announce by how much it is reducing its dependency and increasing supply security in case of supply disruptions. This implies that China will more likely continue to play on geostrategic and energy independency cards, than fully implement market forces in its oil&gas sector and embrace values of regional and international liberalism.

Table 3.4 – Comparison IV – Securing Strategic Petroleum Reserves in China and Japan

| Indicators | China | Japan |
|---|---|---|
| **Ownership** | • State-held 100%, under the Chinese NOCs | • State-held 53% and commercially-held 47% |
| **Infrastructure** | • Development of modern SPR system is still under way | • Developed SPR system that could meet country's needs for almost 200 days |
| **Transparency** | • Current level of filled SPRs is unknown | • Current level of filled SPRs is known |

The analysis on SPR as a strategy behind oil&gas supply security policy in China and Japan discusses a number of differences between SPR systems in two countries. From the study we have learned that both China and Japan emphasize the relevance of domestic SPR system. SPR holding is thus viewed as one of the crucial measures that energy importing countries implement in order to increase their ability to overcome shocks in the international energy markets.

Japan, as an OECD country, holds already developed and well-functioning SPR system. The reserves are proportionately divided between the state and private sector. Additionally, Japan's SPR capacity levels, as well as, stockpiling locations are known and reported, which implies that the country advocates increasing interdependence in times of globalization calling for increasing mutual trust and cooperation.

In China, on the contrary, the construction of domestic SPR system is still an on-going project. However, although China's SPR Plan has not been completed yet, the nature of country's SPR system is easy to identify. By contrast to Japan, in China SPRs are exclusively

[36] As a matter of fact, Chinese buying of significant amounts of oil on international markets to fill its SPRs are to a large extent influencing short-term oil price fundamentals and its developments and oil market analyst are all gauging to better understand the volume of oil stored and Chinese activity in filling SPRs in any moment to better understand (and predict) oil price movements, however due to lack of information, this tasks remains a daunting exercise.

state-held, current SPR capacity levels are not reported. This further indicates an increasing political impediments in the region and rising focus on country's energy independence.

In conclusion, similarly to conclusions in the previous chapters, the results of the indicators on SPRs suggest that the level of centralization or decentralization shapes the nature of SPR system in China and Japan. As a result of centralized decision-making structure in China, the SPR system is characterized by the state-ownership and low transparency levels. In Japan, on the contrary, the presence of decentralized decision-making structure led to division of SPR property right between the state and the private sector, and high transparency.

## 3.5 Findings and Analysis on Expansion of Refining Capacity as a Strategy behind Oil&Gas Supply Security Policy in China and Japan

In the previous chapters we have learned that an adequate domestic refining sector could significantly contribute to country's oil&gas supply security, since the upgraded refining facilities could meet country's demand for petroleum products. A sufficient refining capacity that can process crude oil into products and allow continuous functioning of the transportation system, production of electricity, heating, function of the military, etc. is crucial for every country.

In order to assess similarities and differences between expansion of refining capacity as a strategy behind oil&gas supply security policy in China and Japan, the paper assesses following indicators: nature of property rights, domestic prices of petroleum products, market concentration of domestic refining production and countries' domestic refining production cover.

Similarly to the strategy of maximization of domestic production, one of the main differences between Chinese and Japanese oil&gas sector is in the nature of property rights of their oil&gas companies engaged in domestic production of oil products. Chinese refining sector is dominated by two out of three big national oil companies: CNPC and Sinopec. Sinopec accounts for 58 percent of China's total petroleum derivates production, while CNPC accounts for 42 percent.

In Japan, on the contrary, ever since 2004 and implementation of a set of energy sector deregulation policies, market mechanisms fully steer Japanese oil&gas industry. Japanese oil&gas downstream sector is run by about fifteen private owned companies. JX Nippon

holds the greatest share of 30 percent of Japan's total oil products production. Shares of other fourteen companies that are engaged in Japan's refining sector range from 2 – 13 percent.

The levels of domestic refining market concentration in China and Japan reach different levels, which results in differences in the nature of decision making. In China, domestic refining market concentration reaches high value of 5,128. The means of production are thus owned by the state and decision-making apparatus is centralized. In Japan, by contrast, domestic refining concentration counts 1,499. This value implies that refining sector in Japan is much more decentralized than in China.

Domestic prices for petroleum products in China are regulated. Price regulation in China had negative impact on domestic refineries during the past years due to the fact that domestic refineries had to buy crude oil in international markets and were obliged to sell products under the subsidized prices (below international market levels) in domestic market, weighing on refinery margins. Although in the Third Plenary Session of the 18$^{th}$ Central Committee of Chinese Communist Party (CCP) the leadership has recognized the importance of a new and more transparent and accountable domestic pricing system that would be in line with international energy markets, domestic petroleum product prices in China still remain regulated.

In Japan, on the contrary, petroleum products prices have been liberalized ever since the 1980s and the implementation of a set of deregulation polices. Nowadays in Japan we observe a liberalized refining sector, which is a result of realization of a number of deregulation policies, such as: abolition of gasoline production quota, abolition of the guidance on kerosene stockpiling, abolition of guidance on crude oil treatment, abolition of the fuel oil tariff quota system, liberalization petroleum refined products export, abolition of primary oil supplier verification, deregulation of petrol stations, etc.

For both China and Japan a developed domestic refining sector plays important role. China has been steadily modernizing and increasing its oil refining capacity in order to process its imported crude oil and meet domestic demand for oil products. The construction of expanded refining capacities with facilities capable of processing imported crude oil is still on-going. China is still not self-sufficient in petroleum products since its domestic refining production cover is below 100 percent.

Japan, by contrast, already possesses fairly developed domestic refining sector. However, refining products surplus that occurred in Japan's domestic refining market created imbalances and called for reforms to increase industry's efficiency. If demand for petroleum

products in Japan continues to decline, it is very likely that policy-makers will have to reconsider the domestic refining plan and implement some restructuring measures in order to balance countries production with domestic demand for petroleum products.

Table 3.5 – Comparison V – Expansion of Refining Capacity in China and Japan

| Indicators | China | Japan |
|---|---|---|
| **Ownership** | • State-ownership | • Private-ownership |
| **Prices** | • Prices not fully liberalized | • Prices are liberalized |
| **Market Concentration** | • Three big national oil companies | • A number of refiners |
| **Domestic oil&gas refining production cover** | • Not self-sufficient, increasing consumption of petroleum products | • Self-sufficient, refining capacity surplus |

The analysis in this chapter proves a number of differences in refining sectors between China and Japan. Firstly, we observe difference in the nature of property rights. In China, refining actors are state-owned, while in Japan they are privately-owned. Secondly, in China the prices for petroleum products are regulated, whereas in Japan, they are fully liberalized. Thirdly, in China we observe highly concentrated refining market dominated by two NOCs: CNPC and Sinopec. In Japan, by contrast, refining sector is decentralized and divided among a number of small and medium-sized refineries. Lastly, we also observe differences in countries' domestic refining production cover. China is still self-insufficient in petroleum products and thus the construction of its domestic refining industry is an on-going project. Japan, on the contrary, is self-sufficient in domestic refining production. Moreover, recently the policy-makers have been calling for consolidation and reduction of domestic refining capacity.

In conclusion, all the indicators imply that in China centralized decision-making structure still prevails in its domestic refining sector. In Japan, by contrast, deregulation policies and market forces steer its oil&gas industry. Therefore, in contrast to China where the nature of decision-making is centralized, in Japin Japan, by contrast, decision-making structure is decentralized.

## 4. Concluding Remarks

The analysis in this paper discusses the importance of oil&gas supply security as a factor influencing both economic and political realities in China and Japan. Oil and gas are considered as strategic commodities since they are essential for core functions of any economy and country's national defense. China and Japan are two largest Asian economies with different economic systems and thus different approaches to oil&gas supply security policymaking.

China has been witnessing an astonishing economic growth over the last three decades. Continuous economic development followed by increase in domestic urbanization and motorization contributed to the rising demand for natural resources. China thus became the pivot and the fastest growing demand center in global oil&gas markets. Its quest for oil&gas to fuel the economy in order to sustain growth will continue increasing and shape strategies behind its domestic oil&gas supply security policy.

As result of expanding economic power of China, Japan's importance in regional and global energy markets has partly diminished. Nevertheless, its importance remains vast as it is one of the world's largest importers of oil&gas. As a resource-poor country that almost fully depends on energy imports from natural resources rich counties Japan had to reconsider its oil&gas supply security policy.

The analysis in this paper has proved that the nature of decision-making structure shapes differences and similarities in oil&gas supply security policy between China and Japan.

Table 4.1 Nature of decision-making behind oil&gas supply security policy-making

| **Centralized decision-making China** | **Decentralized decision-making Japan** |
|---|---|
| • State-ownership<br>• Regulated prices<br>• Relatively low level of competition<br>• Geostrategic approach to diversification of oil&gas supply<br>• Focus on independency in oil&gas supplies | • Private-ownership<br>• Deregulated prices<br>• High level of completion<br>• Market approach to diversification of oil&gas supply<br>• Focus on oil&gas markets interdependency |

We conclude that policymaking to improve China's oil&gas supply security is based on centralized decision-making. This can be observed in the nature of country's strategies

towards domestic production, imports, overseas oil&gas production, securing SPRs and expanding domestic refining sector.

In Japan, on the contrary, deregulation policies and market forces are imbedded in its oil&gas industry. Therefore, in contrast to China where we observe centralized decision-making, in Japan, the decision-making structure is decentralized. Such an approach is also to be seen in strategies that country takes while enhancing its domestic oil&gas supply security.

Thus, on the example of such an important policy goal as oil&gas supply security, we see how the nature of decision-making (centralized/decentralized) shapes the strategies and end outcomes responsible for achieving the goal of higher oil&gas supply security.

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## List of Abbreviations

| | |
|---|---|
| ADNOC | Abu Dhabi National Oil Company (ADNOC) |
| APERC | Asia Pacific Energy Research Center |
| bcm | billion cubic meter |
| b/d | barrels per day |
| CCP | Chinese Communist Party |
| CNOOC | China National Offshore Oil Corporation |
| CNPC | China National Petroleum Corporation |
| DGPC | Domestic Gas Production Cover |
| DOPC | Domestic Oil Production Cover |
| DRC | Domestic Refining Cover |
| EIA | U.S. Energy Information Administration |
| ESPO | East Siberia-Pacific Oil |
| FDI | Foreign Direct Investment |
| FSU | Former Soviet Union |
| HHI | Herfindahl – Hirschman Index |
| IDI | Import Diversification Index |
| IEA | International Energy Agency |
| IMF | International Monetary Fund |
| IOC | International Oil Company |
| JNOC | Japan National Oil Company |
| JOGMEC | Japan Oil, Gas and Metals National Corporation |
| KCOP | Kazakhstan-China Oil Pipeline |
| KOGAS | Korea Gas Corporation |
| LMC | Level of Market Concentration |
| LNG | Liquefied Natural Gas |
| LPG | Liquefied Petroleum Gas |
| mb | million barrels |
| MEOID | Middle East Oil Import Dependency |
| METI | Ministry of Economy, Trade and Industry (Japan) |
| MITI | Ministry of International Trade and Industry (Japan) |
| MOGE | Myanmar Oil and Gas Enterprise |

| | |
|---|---|
| NDRC | National Development and Reform Commission (China) |
| NESO | National Emergency Strategy Organization (Japan) |
| NGID | Net Gas Import Dependency |
| NIOC | National Iranian Oil Company |
| NOC | National Oil Company |
| NOID | Net Oil Import Dependency |
| OECD | Organization for Economic Co-operation and Development |
| ONGC | Oil and Natural Gas Corporation India |
| OPEC | Organization of the Petroleum Exporting Countries |
| PDVSA | Petroleos de Venezuela S.A. |
| PVEP | Petrovietnam Exploration Production Corporation |
| SCO | Shanghai Cooperation Organization |
| SDPC | State Development Planning Commission (China) |
| SECT | State Economic and Trade Commission (China) |
| SINOPEC | China Petroleum and Chemical Corporation |
| SOCAR | State Oil Company of Azerbaijan |
| SPR | Strategic Petroleum Reserves |
| SWI | Shannon – Wiener Index |
| TPAO | Turkish Petroleum Corporation |
| WTO | World Trade Organization |
| YASREF | Yanbu Armaco Sinopec Refining Co |

# Appendix

Appendix I - Chinese Foreign Oil&Gas Acquisition Deals by China's 'Big Three' since 2002

| Year | Chinese NOC | Assets | Country | Share |
|---|---|---|---|---|
| 2014 | CNPC | Acquired 40% interest in the development of three Abu Dhabi oilfields | UEA | 40% |
| 2013 | SINOPEC | Acquired 33% of Apach Corp. in oilfields | Egypt | 33% |
| | CNPC | Acquired 20% interest in the gas rich offshore are from ENI in Mozambique | Mozambique | 20% |
| | CNPC | Kashagan Oilfield (Kazakh.) | Kazakhstan | 8.33% |
| | CNOOC | Acquired Canadian oil and gas company Nexen | Canada | 100% |
| 2012 | CNPC | Acquired 100% of Devon Energy in Indonesia | Indonesia | 100% |
| | CNOOC | Acquired 33.3% interest in exploration areas by Tullow Oil at the Lake Alberta Basin in Uganda | Uganda | 33.3% |
| | SINOPEC | Joint Venture(JV) with Devon Energy to help develop shale fields in Ohio | USA | 50% |
| | SINOPEC | Acquisition of 49 % equity interest in Talisman's UK North Sea business by Talisman Energy (UK) | Canada | 49% |
| 2011 | CNOOC | Acquired 30% of OPTI Canada Inc. in Canada | Canada | 30% |
| | SINOPEC | Acquired 15% interest in APLNG, from ConocoPhillips and Origin Energy | USA | 15% |
| | SINOPEC | Acquired 100% of Daylight Energy Ltd. (DAY) gaining oil and shale-gas reserves (Canada) | Canada | 100% |
| | SINOPEC | Acquired 30% stakes in Galp Energia (Brazil) | Brazil | 30% |
| 2010 | SINOPEC | Acquired 18% of Chevron Gendalo-Gehem deep water project in Indonesia | Indonesia | 18% |
| | CNOOC | Acquired 60% of Pan America Energy from BP in Angola | Angola | 60% |
| | CNOOC | Acquired 33.3% interest in Chesapeake's shale gas assets in USA | USA | 33.3% |
| | CNOOC | Acquired 66.6% of Tullow Oil's stake in three blocks in Uganda with Total | Uganda | 66.6% |
| | SINOPEC | Acquired 45% of Canada's Penn West Energy Trust | Canada | 45% |
| | CNPC | Acquired 35% stake of Shell's wholly owned subsidiary – Syria Petroleum Development (SPD) | Syria | 35% |
| | CNOOC | Acquired 24.5% in South China Sea Block 15/34 by Devon Energy | China | 24.5% |
| | SINOPEC | Acquired 55% stake in deep-water oil assets in Angola by buying form Sonangol | Angola | 55% |
| | SINOPEC | Acquired 9.03% in Canadian oil sands company Syncrude from ConocoPhillips | Canada | 50% |
| | CNPC* | Acquired 100% of Arrow Energy, Australia-based coalbed methane (CBM) producer | Australia | NA |
| | CNOOC | Acquired 50% in the Argentinian oil company Bridas Corporation | Argentina | 50% |
| | CNOOC | Acquired 50% in the central Queensland Galilee Basin from Exoma Energy in Australia | Australia | 50% |
| | CNOOC | Acquired 50% stakes in the China National Coal Group | China | 50% |
| | SINOPEC | Acquired 45% stake value in Repsol Brazil | Brazil | 45% |
| | SINOPEC | Acquired 100% of Occidental Petroleum in Argentina | Argentina | 100% |
| | CNPC | Acquired 37.5% in a consortium with Total, Petronas and Iraq South Oil Company in Halfaya Oilfield | Iraq | 37.5% |
| | CNOOC | Acquired 63.75% of shares in production of the Missan Oil Fields | Iraq | 63.75% |
| 2009 | CNOOC | Acquired partial share of Norwegian's Statoil's US assets in Gulf of Mexico | USA | |
| | CNPC | Acquired 60% of Athabasca Oil Sands Corporation's in Alberta, Canada | Canada | 60% |

| | | | | |
|---|---|---|---|---|
| | SINOPEC | Acquired 10% interest in Total E&P Canada Ltd. ("Total Canada") | Canada | 10% |
| | CNPC | Acquired 45.5% of Singapore Petroleum Company (SPC) | Singapore | 45.5% |
| | SINOPEC | Acquired 100% of Addax in Nigeria and Kurdistan (Iraq) | Switzerland | 100% |
| | CNPC** | Acquired 100% Manigistaumunaigas (MMG) in Kazakhstan with Kazmunaigas (KMG) | Kazakhstan | |
| | CNOOC & SINOPEC | Acquired 20% stake for block 32 Angola from Marathon Oil | Angola | 20% |
| | CNPC | Acquisition of Phase 11 of the South Pars gasfiled between Iran and Qatar by the National Iranian Oil Company (NIOC) | Iran | 100% |
| | CNPC | Acquisition of the South Azadegan oilfield | Iran | 100% |
| 2008 | SINOPEC | Acquired 100% of Tanganyika assets in Syria | Syria | 100% |
| | CNOOC | Acquired 100% of Norwegian Oil Firm Awilco | Norway | 100% |
| | SINOPEC | Acquired 60% of Australia's AED oil for assets in Australia | Australia | 60% |
| | CNOOC | Acquired 50% interests in Husky (Madura) Energy's assets in Indonesia | Indonesia | 50% |
| 2007 | SINOPEC | Acquired 32% shares in a JV operating in the Posa exploration project in the eastern part of the Gulf of Paria | Venezuela | 32% |
| | SINOPEC | GABON Transworld | Gabon | NA |
| | CNPC | Acquired oil and gas exploration and exploitation licenses for three deep-water blocks -AD-1, AD-6 and AD-8 from Myanmar Oil and Gas Enterprise (MOGE) | Myanmar | 100% |
| | SINOPEC | Acquired 51% stakes in Yadavaran oilfields by the National Iranian Oil Company (NIOC) | Iran | 51% |
| 2006 | CNOOC | Acquired 45% interest OML 130 from South Atlantic Petroleum Ltd in Nigeria | Nigeria | 45% |
| | CNPC | Acquired 100% of Block H in Chad from Swiss company Cliveden | Chad | 100% |
| | CNPC | Acquired 100% EnCana for oil and pipeline interest in Ecuador | Ecuador | 100% |
| | CNPC | CNPC and Rosneft jointly established Vostok Energy Ltd., of which CNPC held 49% of stake | Russia | 49% |
| | SINOPEC | Acquired 97% of Udmurneft for assets in Russia | Russia | 46% |
| | SINOPEC | Acquired 50% of Ominex de Columbia with Oil and Natural Gas Corporation Limited of India (ONGC) | Columbia | 25% |
| 2005 | SINOPEC | Acquired 50% interest in Northern Lights oil sand projects northeastern Alberta in Canada | Canada | 40% |
| | CNPC & ONGC | Acquired 38% of Al Furat Production Company from PetroCanada (CNPC acquired 50%) | Canada | 38% |
| | CNOOC | Acquired 15% stake in MEG Energy for oil sand business | Canada | 16.69% |
| | CNPC & SINOPEC | Jointly acquired oil and gas owned by Encana in Ecuador established Andes Petroleum Ecuador Ltd, with CNPC holding a 55% share and SINOPEC 45% | Ecuador | 100% |
| | CNPC | Acquisition of PetroKazakhstan | Kazakhstan | 100% |
| 2004 | SINOPEC | Acquired petroleum assets from First International Oil Corporation in Kazakhstan | Kazakhstan | 100% |
| | CNPC | Acquired Block 18 Angola from the Angolan government when Shell sold its shares and exited Angola | Angola | 50% |
| | SINOPEC | Acquired 17% interest of Tangguh LNG project from BP and then sold 3.06% to Talisman | Indonesia | 14% |
| | CNPC | Acquisition of 75% of the MIS Oilfield in Persian Gulf (Iran) | Iran | 75% |
| | CNPC | Acquisition of NK exploration block and a 50% holding in the SLK Oilfield from Kuwait Foreign Petroleum Exploration Company (KUFPEC) | Kuwait | 50% |
| 2003 | CNPC | Acquired block 11 by International Mineral Res in Indonesia | Indonesia | 100% |
| | CNOOC | Acquired 100% Atlantis from Norwegian Petroleum Geo-Service | Norway | 100% |
| | CNPC | CNPC bought a 62.83% holding in Commonwealth | Azerbaijan | 50.26% |

| | | | | |
|---|---|---|---|---|
| | | Gobustan Limited and thereby acquired 50.26% equity of the Gobustan Oilfield in Azerbaijan | | |
| | CNOOC | Acquired 12.5% share of Indonesia's Tangguh liquefied natural gas (LNG) project from BP | Indonesia | 12.5% |
| | CNOOC | Acquired 51% in offshore fields in South China Sea from Burlington Resources and Devon Energy | China | 51% |
| | CNPC | Acquired 35% of Nimir Petroleum and 65% shares of Chevron Texaco North Buzachi Inc. (TNBI) in Kazakhstan | Kazakhstan | 100% |
| | CNPC | CNPC became 100% owner of the CNPC-Aktobemunaygaz Kazakh-Chinese joint venture after purchasing Kazakhstan's 25.12% stake | Kazakhstan | 100% |
| | CNOOC | Acquired equity interest in Qinhuangdao (QHD) 32-6 oil field 75.5% and in Liuhua (LH) 11-1 oil field 100% | China | 100% |
| | CNPC | Acquired 45% shares in Block 1-AB/8 by Pluspetrol (Peru) | Peru | 45% |
| | CNPC | Acquired 50 % of oil field assets in Amerada Hess Indonesia Holdings Ltd. in Indonesia | Indonesia | 50% |
| | CNPC | Acquisition of Block 11 located in Sucumbios province in eastern Ecuador | Ecuador | 100% |
| | CNOOC | Acquisition of 44% stakes in Muturi Production Sharing Contract (PSC) in West Papua in Indonesia | Indonesia | 44% |
| | CNPC | Acquisition of 75% stakes in Block 350 located in the northwestern Oued Mya Basin in the north of the Sahara Desert | Algeria | 75% |
| | CNPC | Acquired Block Bilma in Niger | Niger | 100% |
| 2002 | CNPC | Purchased Devon Energy Corporation for six blocks in Indonesia | Indonesia | 100% |
| | CNOOC | Acquired YPF Repsol's upstream assets in Indonesia | Indonesia | 100% |
| | CNPC | Acquired 50% from Delta Hess in onshore concession by Salyan Oil Ltd. in Azerbaijan | Azerbaijan | 50% |
| | CNOOC | Acquired 25% in the North Shelf Project in Australia | Australia | 25% |
| | CNPC | Acquired 30% in onshore concession operated by Salyan Oil (Azerbaijan) from European Bank for Reconstruction and Development (EBRD) | Azerbaijan | 30% |

* CNPC and Shell – Joint bid

** CNPC and Kazmunaigas (KMG)

Source: various based on companies' information

Appendix II Japanese Foreign Oil&Gas Acquisition Deals by Japanese oil&gas companies since 2002

| Year | Company | Assets | Country | Share |
|---|---|---|---|---|
| 2013 | Inpex | Acquired 10% indirect interest in offshore block through JV with Total S.A. | Angola | 10% |
| | Japex | Acquired 10% share from Petronas in Pacific Northwest LNG project | Canada | 10% |
| 2012 | JX Nippon | Acquired 10% share in the NW Shelf Australia offshore oilfield | Australia | 10% |
| | Inpex | acquired a 40% participating interest in the shale gas projects in the Horn River, Cordova and Liard basins from Nexen Inc. | Canada | 40% |
| | Japex | Acquired 75% assets in sand oilfields in athabasca regions of Alberta | Canada | 75% |
| | Inpex | Acquired 17.5% participating interest in the Prelude FLNG Project, which is under development in offshore Western Australia | Australia | 17.5% |
| | Mitsubishi and Mitsui | Acquired 14.7% share in LNG terminal in Browse Project | Australia | 14.7% |
| | Inpex | Acquired 67% participation interest in gas field, Ichthy's field, in Australia | Australia | 67% |
| | Mitsubishi | Acquired 20% participation interests in the LNG project | Canada | 20% |
| | Inpex | Acquired 17.5% interest from Shell in Prelude LNG project | Australia | 17.5% |
| | Mitsubishi | Acquired 40% stake in cutbank ridge shale gas project | Canada | 40% |
| | Inpex | Acquired 40% in upstream development of Cordova, Horn River, and Liard basins | Canada | 40% |
| | JX Nippon | Acquired 37.5% participation interest in offshore exploration block Sabah | Malaysia | 37.5% |
| | Mitsui | Acquired 32.5% interest from Andarko in the Marcellus Shale project | United States | 32.5% |
| 2011 | Mitsubishi | Acquired 45% share in Senoro LNG Plant in Sulawesi | Indonesia | 45% |
| 2010 | SODECO | Acquired 30% share in Sakhalin-I | Russia | 30% |
| | Mitsubishi | Acquired 50% share in cordova embayment shale gas project | Canada | 50% |
| | Inpex | Acquired 25% share in the block in Maranon Basin in north west Peru | Peru | 25% |
| | Inpex | Acquired 20% interest in Nganzi block in West Congo | Congo | 20% |
| | Mitsui | Acquired 20% interest in Oman onshore block | Oman | 20% |
| | Inpex | Acquired 15% of Walker Ridge deep water exploration site in Gulf of Mexico | United States | 15% |
| 2009 | Japex | Acquired 30% stake in Garraf oilfield in Southern Iraq | Iraq | 30% |
| | JV Nippon and Mitsubishi | Acquired 8% to 74% interests in onshore blocks at Kutubu and Moran | Papua New Guinea | 8%-74% |
| | Idemitsu Kosan | Acquired Petro Summit Investment UK Limited | United Kingdom | 100% |
| | Mitsui | Acquired 8.5% of interest in an onshore block | Yemen | 8.5% |
| 2008 | JX Nippon | Acquired 40% participation interest in offshore exploration block Malay Peninsula | Malaysia | 40% |
| 2007 | Inpex | INPEX acquired a 10% interest in the Joslyn Oil Sands Upstream Project in Alberta, Canada. | Canada | 10% |
| | JX Nippon | Acquired 75% participation interest in offshore exploration block Sarawak | Malaysia | 75% |

| | | | | |
|---|---|---|---|---|
| 2005 | Inpex | Acquired 50% share in gas fields (Mahakam Block and Attaka Unit) in Offshore Kalimantan Island | Indonesia | 50% |
| 2004 | Inpex | Acquired 12% stake in 4 fields and 40% stake in 1 field, Adma Block | United Arab Emirates (UEA) | 12% |
| | Idemtitsu Kosan | Acquired 15% interest in Nam Rong/Doi MOi offshore oilfields | Vietnam | 15% |
| 2003 | Arabian Oil Company* | Khafji offshore oil field in Kuwait and Saudi Arabia Neutral Zone | Kuwait | NA |
| | Inpex | Acquired 11% share in Azeri-Chirag-Guneshli Project in the South Caspian Sea region | Azerbaijan | 11% |
| 2002 | Idemitsu Kosan | Acquired 15% share in Fram oilfield | Norway | 15% |

Source: Various based on companies' information

Appendix III


## Abstract

This thesis analyzes similarities and differences in oil&gas supply security policy in China and Japan. Oil and gas are considered as strategic commodities since they are essential for core functions of any economy and country's national defense. Therefore, this paper in particular focuses on oil&gas and presents a comparative analysis of two different approaches in oil&gas supply security policy-making in China and Japan. First we analyze theoretical and empirical literature on energy security and develop oil&gas supply security policy conceptual framework upon five key strategies that steer formation and implementation of a country's oil&gas supply security policy: i) domestic production; ii) imports; iii) overseas production; iv) securing strategic petroleum reserves; and iv) expanding domestic refining sector. Consequently, we show specifics of oil&gas supply security policy in China and Japan. Furthermore, we look into similarities and differences in oil&gas supply security policy-making in two countries. Finally we conclude that policy-making to improve China's oil&gas supply security is based on centralized decision-making, whereas, in Japan it is based on decentralized decision-making. On the example of such an important policy goal as oil&gas supply security, we see how the nature of decision-making (centralized/decentralized) shapes the strategies and end outcomes responsible for achieving the goal of higher oil&gas supply security.

Appendix IV

## Zusammenfassung

Diese Masterarbeit beschäftigt sich mit der Frage, welche Gemeinsamkeiten und Unterschieden in der Erdöl- und Erdgasversorgung Sicherheitspolitik in China und Japan existieren. Erdöl und Erdgas sind strategische Energieträger und desto sind wesentlich für jedes Land Ökonomie und Landesverteidigung. Aus diesem Grund beschäftigt sich diese Arbeit mit diesem Thema und diskutiert unterschiedliche Eigenschaften in der Erdöl- und Erdgasversorgung Sicherheitspolitik in China und Japan. Zuerst analysieren wie die theoretische und die empirische Literatur über die Energiepolitik und erstellen ein Erdöl- und Erdgasversorgung Sicherheitspolitik Konzept. Das Konzept beruht auf fünf wesentliche Strategien, die die Entwicklung und Durchführung der Erdöl- und Erdgasversorgung Sicherheitspolitik beeinflussen: i) Inländische Produktion; ii) Import; iii) Ausländische Produktion; iv) Strategische Ölreserve; und v) Ausbau der Raffinerie-Industrie. Infolgedessen untersuchen wir die Besonderheiten der Erdöl- und Erdgasversorgung Sicherheitspolitik in China und Japan. Darüber hinaus diskutieren wir Gemeinsamkeiten und Unterschieden in der Erdöl- und Erdgasversorgung Sicherheitspolitik in zwei Ländern. Am Ende kommen wir zu dem Schluß, dass Erdöl- und Erdgasversorgung Sicherheitspolitik in China auf einer zentralisierten Entscheidungsfindung basiert ist, während in Japan beachten wir, dass eine dezentralisierte Entscheidungsfindung die Erdöl- und Erdgasversorgung Sicherheitspolitik in Japan gestaltet. Anhand dieser Beispiele der Erdöl- und Erdgasversorgung Sicherheitspolitik lässt sich beobachten wie die zentralisierte/dezentralisierte Entscheidungsfindung die notwendige Strategien für die Verbesserung der Erdöl- und Erdgasversorgung Sicherheitspolitik ausrichtet.

Appendix V

# Curriculum Vitae

Iva Brkic

## EDUCATION:

9.2013 – 2.2014 ***Communication University of China*** *(Beijing, China)*: Chinese Language and Culture

7.- 8.2012 ***Tsinghua University*** *(Beijing, China)*: Intensive Chinese Summer Language Course

3.2012 – 5.2014 ***University of Vienna*** *(Vienna, Austria)*: Master of Arts in East Asian Economy and Society - Department of East Asian Studies: Master Thesis on 'Oil&Gas Supply Security Policy in China and Japan'

2.2011 – 7.2011 ***Tsinghua University*** *(Beijing, China)*: Visiting Research Student, Joint Studies

10.2006 – 9.2011 ***Vienna University of Economics and Business Administration*** *(Vienna, Austria)*: Bachelor in Economics - Bachelor Thesis on 'Solow Model and Non-renewable Resources in China'

9.2002 – 7.2006 ***V Gymnasium of Natural Sciences*** *(Zagreb, Croatia)*: High School Degree

## WORK EXPERIENCE:

1.2014 – 3.2014 ***CNPC – Greatwall Drilling Company, Intern*** *(Beijing, China):*

9.2011 – 3.2012 ***United Nations - International Atomic Energy Agency ( IAEA ), Intern*** *(Vienna,Austria):*

7.2009 – 8.2009 ***Joint Project Fudan University and AIESEC, Intern*** *(Shanghai, China)*:

3.2008 – 5.2008 ***United Nations - Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization ( CTBTO), Intern*** *(Vienna, Austria):*

## LANGUAGE AND PROFESSIONAL SKILLS:

- Fluent in **English**, **German** and **Croatian**
- Intermediate in **Chinese** and **Italian**
- Basic knowledge of **Russian**
- Training on **IPSAS** (International Public Sector Accounting Standards) – Computer-based exam, United Nations

## EXTRACURRICULAR ACTIVITIES

2007 – 2010 ***AIESEC*** (Vienna, Austria)

9.2009 – 4.2010 ***National Model United Nations*** (New York, USA): Head of Delegation