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SEPP working paper

Japan's overseas oil development and a role of technology

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(This paper is based on *Koike et al. (Energy Policy, 2008)*.)

Introduction

Japan, both as a resource-poor country and as the world's third biggest oil consumer (British Petroleum, 2007), has depended on imported oil for almost 100% of its domestic demand (99.6% in 2006). In its modern history the Japanese economy and foreign policy have always been constrained by the security issues posed by oil supply. The outbreak of the Pacific War (1941–1945) and the subsequent defeat, and the first negative growth since the end of the War after high-flying growth (1974) were caused by a disruption of oil supply either directly or indirectly. These bitter episodes are firmly established in the mind of the Japanese nation.

As an alternative to colonizing oil producing countries to reduce its vulnerability of high dependence on foreign producers, Japan has long made efforts after the War to increase its self-developed oil production in overseas oil fields. Self-developed oil production means that Japan is directly involved in production and operation projects and takes risks on it. As a result, it is expected to contribute toward the long-term supply stability, timely prediction of changes in the market, understanding of global trends of exploration and development, and a wide-ranging and interdependent relationship with oil-producing countries. Also recently, reflecting a major structural change in the international energy market, the Japanese government announced the New National Energy Strategy of 2006 with a new numerical target of 40% of total oil import secured by the self-development.

This paper tries to indentify how Japan has struggled to achieve its national targets in securing overseas oil reserves and to what extent the development of technology meets the policy planners' expectations. It is widely understood that the expansion of financial support by the government is limited in Japan and cannot be a panacea in the current

harsh competitions with national companies of growing oil countries such as China and India. Then the effective use of Japan's competence, especially its technology came under review among experts. In the following chapters the paper first describes Japan's past efforts from both industrial and policy perspectives in chronological order, then focuses on identification of variables influencing Japan's overseas oil development, and finally evaluates the potential of technology to achieve its target or any obstacles to its development.

1. The brief history of Japan's overseas development

Japan's overseas oil development was initiated at the end of the 1910s when declining domestic production made it difficult to meet growing domestic demand mainly for military use. In addition to the development of North Sakhalin, Japan forged ahead in South East Asia to seek for oil supplies, in response to the breakdown of negotiations with the US and Netherlands over crude oil supply from the Dutch East Indies. Teikoku (Imperial) Resource Development, which had a 98% share of the domestic oil production, played the key role in this process. Teikoku was founded in 1940 as a private corporate venture, and later (in 1941), became Teikoku Oil Corporation, which was co-funded by private companies and the state government. At the end of the War, with the dissolution of North Sakhalin Oil, Teikoku was able to survive but lost almost all of its overseas assets and facilities. After the War, as a result of policies from General Headquarters of the Allied Forces (GHQ), the Japanese oil industry was clearly divided into two streams; the upstream industry consisted of one company which exclusively involved in oil production in domestic fields; and the downstream industry consisted of several companies which were highly depended on foreign partners for its oil supply.

The post-war overseas oil development started in 1965 when the amendment of the oil development law allowed Japan Petroleum Exploration (JAPEX) to explore foreign reserves. Japan's oil dependency expressed as a percentage of total energy use increased rapidly from 22.6% in 1956 to 58.2% in 1965. Most of Japan's growing oil demand was met by imports from the Middle East, which accounted for 90.4% of total imports (Kazuo Hoshino, 1968). In order to reduce the dependencies on imports and the Middle East for oil resources, Japan Petroleum Development Corporation (which changed its name to Japan National Oil Corporation in 1978 by adding the operation of oil stockpiles to its activities) was established as the national supporting organization for

private companies. Through the corporation, the Japanese government decided to push overseas activities by private companies, targeting 881 million barrels to be imported by domestic companies approximately one-third of total domestic oil consumption prospected in 1985.

These aspects of governmental support rapidly increased the volume of overseas projects. During the first 20 years, after the establishment of the Japan Petroleum Development Corporation, 119 projects were accepted by JNOC for support. Unfortunately, most of them ended up with a large amount of debt. In addition to the financial consequences, Japan's mixed effort, involving both the government and the private sector, failed to achieve any of the original targets of increasing the ratio of self-developed oil in terms of total imports and diversification of the source countries for oil imports from the Middle East (Table 1).

Table 1. JNOC's financial support and crude oil import in Japan

	(Million Yen)				
	1970	1980	1990	2000	2003
JNOC's financial contribution					
Equity					
Cumulative total	28,073	241,420	596,669	999,521	1,195,123
Cumulative loss	—	37,444	126,811	451,064	810,662
Cumulative exchange loss	—	65	116	117	117
Loan					
Cumulative total	4,629	268,587	857,239	1,105,138	1,133,052
Cumulative loss	—	—	69,952	380,689	439,421
Cumulative exchange loss	—	565	4,258	17,749	17,892
Guarantee					
Cumulative total	11,228	328,489	891,002	1,157,365	1,372,457
Cumulative payment under guarante	—	—	11,454	50,165	63,146
Import dependence (%)	99.5	99.8	99.7	99.7	99.7
From Middle East	84.6	71.4	71.5	87.1	88.5
Japanese-developed oil in total import (%)	9.8	8.9	11.0	13.2	10.8

Sources: JNOC, Japan Petroleum Development Association, and METI

The period after 1998 can be seen as the time in which the role of the national government was publicly reconsidered. In November 1998, a former minister of METI, Mitsuo Horiuchi, accused JNOC of the ineffective management of tax money by reviewing a number of financial statements opposing government officials' explanations

that the JNOC remained in surplus. Bowing to public anger, JNOC was dismantled in 2002 as part of the structural reform carried out by the administration of the prime minister at the time, Junichiro Koizumi. As well as these efforts, the Japanese government withdrew the new numerical target of overseas oil development in 2000 as it promoted ineffective management.

The roles of the JNOC were taken over by a new organization, Japan Oil, Gas and Metals National Corporation (JOGMEC). JOGMEC was established to perform three main roles in supporting private companies: financial support, research and development for technology, and oil stockpiling. This time, JOGMEC's financial support covered not only projects in unexplored areas but also acquisition of existing fields. Yet, the extent of JOGMEC financial contributions is narrowed and scaled down to investment and guarantee in relation to borrowing up to 50% of the total exploration costs. In terms of its legal form, JOGMEC did not become a special public corporation as JNOC but was established as an incorporated administrative agency that did not enjoy the privilege of government guarantee for fundraising or exemption from tax liability. At this point, there was little voice asking for a stronger national commitment by taking more direct risks, in the debate over reviewing the role of the government in overseas oil development.

3. Reconsideration of Japan's past overseas oil development

The history of the Japanese government and oil industry with respect to overseas oil development provides some clues to the cause and effect of the present situation. Three intricately combined components can be put forward, based on the chronological research, and these will be verified by referring to quantitative data or specific policies. First, the ineffective institutional design of government support was responsible for causing confusion related to responsibilities and moral hazards in the projects, which resulted in extremely vulnerable project management. Second, the scope of Japan's overseas oil development was restricted by its position in the international political scenario and the government's policy of preferentially exploring undiscovered fields, which resulted in sticking to poor-potential area with regard to the distribution of the oil reserves. Finally, Japan's government-industry collaboration ceased due to drastic changes in the international exchange market, import oil price, and the corollary public mood placing a greater emphasis on economic efficiency rather than supply security.

These will be investigated in order in the subsequent parts of this section.

3.1 Nontransparent cooperative structure

In terms of the cooperative structure between the Japanese government and private companies, there were mixed outcomes toward the target of increasing overseas projects. Based on its merits, the involvement of JNOC attracted private money for exploration projects, which had been too risky for private investment. The reason for this was not only because exploration and development are not always successful, but also because the projects do not bring any profit at least for several years until the start of production. After the establishment of JNOC, the total amount of private money invested in exploration projects rapidly increased from 5,122 million yen in 1967 to 226,853 million yen in 1982 (JNOC, 1987).

On the other hand, this system of risk sharing between JNOC and private investors was detrimental to the original interior features. The system was called a "one-project, one-company structure" in which a project company was established for each project. In addition, the project companies were usually founded with the majority shares from JNOC and the rest from several, or sometimes, a few dozen private companies. As an example of risk sharing, Japan China Oil Development (JCOD) was established in 1980 for the purpose of an oil development project in the Bo-hai Sea, China. It received 64.5% of the investment funds from JNOC and the rest from 47 other companies. Usually, as a major shareholder of the projects, JNOC was originally intended to play a passive and supportive role for promoting independence of private companies. Yet, private companies, enjoying a large amount of risk-free investment and loans from JNOC, eschewed taking not only exploration risks but also management responsibilities of the projects. This type of risk-sharing structure inherently involved the nature of obscuring responsibility for the projects, thus creating a moral hazard.

Questions still remain as to why questionable structures could survive even with disappointing performance. One of the main reasons came from the fact that the system of "one-project, one-company" was developed as a product of the mutual interest of the private and government sectors with their high incentives to secure the system. On the private side, the project companies benefited not only from lowering the risk of investment but also from separating the project accounts from the parent companies' financial statements. The oil companies were reluctant to consolidate project accounts because they were usually in the red at least for several years until the production

began, irrespective of whether it succeeded. In addition, in many cases, even after the start of production, project companies remained in red since the parent companies purchased the produced oil from project companies at the international market price while imposing large deficits on subsidiaries (Horiuchi interview, 1999a and 1999b). An old Japanese accounting system supported their interests by investing little faith in the consolidated accounting, which then rendered the relationship between parent and affiliated companies unclear. It was not until the year ended March 31, 2001 that all companies were required to consolidate all significant investees which were controlled through substantial ownership of majority voting rights or existence of certain conditions. In addition, separation of the project accounts from the parent ones was beneficial for private companies, since companies could then limit liabilities and prevent creditors from laying claim to their properties retroactively.

On the government side, the departments secured administrative control for industries and pleasant new posts for the retired officials. By the end of 1997, 15 project companies were chaired by retired or former MITI officials. These ex-government officials often migrated to other project companies, and received retirement bonuses on each move. A former administrative vice minister of MITI served as the president of more than ten project companies. Although all these companies became bankrupt later, he was never accused of mismanagement (Horiuchi, 1998). These examples were the tip of the iceberg, and the organizational form of JNOC left or even increased the moral hazard of project management rather than monitoring the extravagant expenditure of tax money. The accounts of the Japanese central government consist of general and special accounts, and the JNOC was funded by the latter. Special accounts are intended for carrying out specific projects, managing specific funds, and other purposes (MOF, 2006). On this topic, many issues have been raised, including the fact that the establishment of many special accounts made monitoring difficult, or that a lot of make-work projects were carried out to meet the built-in account budget (MOF, 2007). Masajyuro Shiokawa, a former minister of finance, also expressed concern that a substantial amount of tax money was being ineffectively spent in special accounts while savings accumulated in the general account (at the Financial Committee of the House of Representatives, February 25, 2003). In the 2007 appropriation, the net budget of the special account was 175 trillion yen, while that of general accounts was 34 trillion yen. Since the special accounts were under the administration of ministries and each of them held earmarked revenue sources, the wasteful expenditure was left unchecked. This is also because a number of retired officials descended into recipient companies founded by special

accounts and maintained close relationships with supervisory authorities. The case of JNOC was no exception. JNOC was under MITI's administration and maintained a close relationship through the involvement of former MITI officials (Matsumura, 2003). In addition, the management of JNOC was guaranteed by abundant revenue from gasoline tax and tariffs on petroleum products. Moreover, as a special public corporation, JNOC enjoyed the privilege of government guarantee for fund-raising and exemption from tax liabilities such as corporate income tax or fixed asset tax.

3.2 Limited accessible region

By the beginning of the 1960s, when Japan ventured into the overseas fields again for the first time since the end of the World War II, the concessions in the major oil-producing countries, not to mention US and European territories, were already dominated by international oil majors. According to an investigation by the Ministry of International Trade and Industry (MITI, reorganized as METI in 2001) on who owned the concessions area of 17.8 million km^2 of the world oil concession area surveyed in 1968–1970, 75% of the world oil concession area was held by U.S. or British companies, 18% by French CFP and ERAP, and 3.3% by Italian ENI. Japan held only 1.9% (MITI, 1971). The Japanese concession area consisted of AOC and NOSODECO. The area of AOC's concession in Middle East including Khafji field was small (3,400 km^2) but exceptionally profitable either before or after in the history of Japan's oil industry, producing almost all of Japan's self-developed oil production at that time. AOC won the Khafji contract by breaking the international standard of 50-50 basis profit sharing with oil producing countries. The ratios of profit sharing for AOC's Khafji contract are 44–56 between AOC and Saudi Arabia and 43–57 between AOC and Kuwait (Suzuki, 1981). It was a desperate measure of an undeveloped Japanese oil company and AOC was exposed to harsh international criticism.

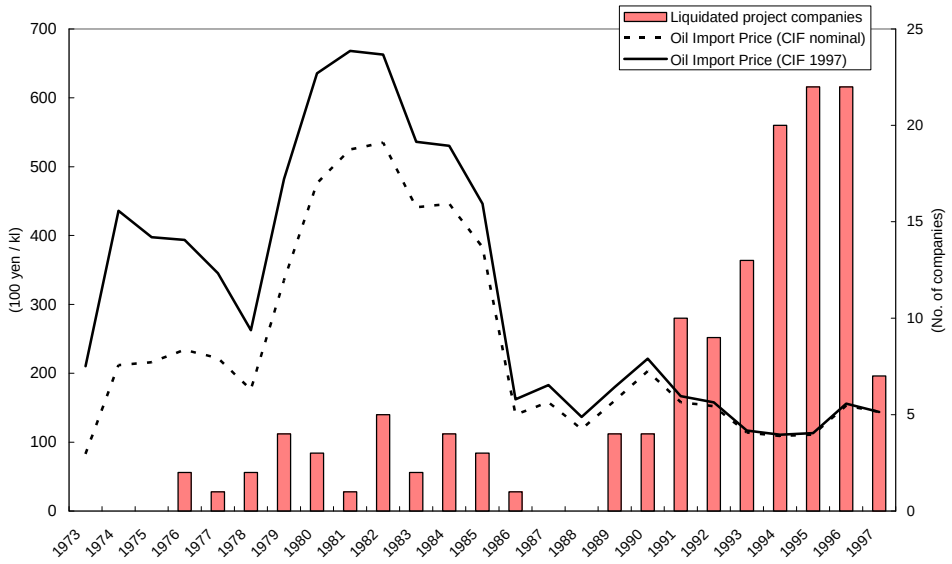
Later, resource control intensified in the Middle East, starting with oil reserve nationalization by Iran in 1951. The field condemnation of Iraq occurred in 1960, followed by the formation of OPEC by the major oil-producing countries in the same year. Thus, global exploration and production (E&P) companies were forced to shift their target fields from the oil-rich regions and areas in which operations were straightforward from a geological viewpoint to untapped regions and environmentally severe areas. The undeveloped Japanese E&P industry lagged far behind in the face of intensifying global competition.

In addition to the external environment at that time, there were some other political or economic constraints on Japan, which narrowed the scope to advance into the global E&P competition. In terms of transportation cost, import from Africa and Latin America was not feasible because of the long distance to Japan and the limited passage capacity of Panama Canal preventing the scale merit. In addition, during the Cold War, along with other members of the Free World, Japan had little access to Communist but resource-rich countries such as the Soviet Union and Central Asian countries. As a result, relatively open but not so favorable areas in Asia Pacific remained accessible to Japanese oil companies. The Asia Pacific region remained low and even gradually declined in the share of the world's total oil discovery (sum of cumulative production and proven reserves) from 3.5 % in 1960 to 3.2% in 2000 (calculated by Oil & Gas Journal and World Oil).

Why did the Japanese stick to unexplored areas? Would it have been equally valuable for them to get into the existing fields by acquiring shares without running the exploration risks? The geological spread of E&P activities by Japanese companies reflects the government's rather slavish target since 1967 of increasing self-developed oil, both as reducing dependence on the international oil companies and as diversifying supply resource of oil imports. Based on the government policy, JNOC's contributions to domestic companies were defined only for the projects conducted in unexplored areas. However, it is doubtful whether the policy was based on Japan's position in the global oil market, which limited her access to overseas oil exploration. Hattori (2002), an executive director of JAPEX, specified spending most of the investment into the relatively risky exploration projects rather than acquisitions as one of the reasons why JAPEX was not able to build overseas properties. Surrey (1974) also expressed considerable skepticism on the effectiveness of the policy "given the large risks involved in exploring relatively unknown areas, and the fact that the international oil companies controlled many of the most favorable areas." It was not until June 2001 that the JNOC law was amended to allow a further support also for acquisition of existing oil fields. Consequently, the regional composition of Japan's overseas oil development were not as much as expected since 1967 but kept relying on a few old fields in Middle East such as the Khafji Field, which was discovered in 1960.

3.3 Changing mood

The ineffective project management exposed its vulnerability when the exchange rate of the U.S. dollar to the yen changed drastically after the mid 1980s. The companies invested for project operation and obtained revenue from oil production in U.S. dollars, without considering the exchange risks. Thus, the rapid appreciation of the yen caused by the Plaza Accord of 1985 diminished the value of cash returns and production revenue on a Japanese yen basis. The U.S. dollar, which stood at around 240 yen just before the Plaza Accord, was being traded below 90 yen in April 1995. Most of the JNOC's exchange loss from the loan was also recorded in this period. Unfortunately, the decline of world crude oil price started in 1985 and made things worse. Saudi Arabia's increase in oil production, despite the sluggish international demand, led to the price collapse of 1985–86, with prices plummeting from 28 dollar per barrel to 8 dollar per barrel before stabilizing at 18 dollar per barrel in the fall of 1986 (Griffin and Neilson, 1994). This was followed by the days of plentiful and cheap oil for 13 years, interrupted only by a brief price spike at the time of the Gulf War 1991. These solid transformations, both in the exchange rate and in the global oil prices, dealt the accounts of project companies with a double hit by compounding huge deficits for the companies' accounts (Fig. 1).



Data sources: Research and Statistics Department, Bank of Japan, JNOC (1987, 1997, 2005), Ministry

Fig. 1. Liquidation of project companies in relation to the change in yen-based crude oil import price

The drastic movement in the global oil market also helped in changing the people's view

of oil as a market commodity, rather than a strategic resource. The ample production and high liquidity of oil in the developed international oil market in those days led to oil being treated as a general commodity like wheat, which was relatively easy to procure from the market. This means that public and policy leaders in Japan might not have considered the priority of oil security as a serious matter. Moreover, a serious and longstanding post-bubble stagnation in 1990s left the public opinion keen to the extravagant use of tax money, thus prioritizing economic efficiency. In particular, debate over ineffective fiscal investment and loans to public corporations along with the vested-interest structures attracted public attention leading to the reform or restructure of cloning systems. JNOC and the policy of promoting Japanese-developed oil supply also became subjects under reconsideration and a number of project companies were liquidated in the same period. This might be the first time that Japan faced the dilemma of a resource-poor country caught between supply security and economic efficiency.

4. Technology development and the significance in oil development

In contracts for oil and gas exploration and development involving multiple participants, the company which executes and manages the actual oil work is called an operator. Japanese companies were involved as non-operators in 359 projects of the 401 E&P projects during 1967–1997, which were supported by JNOC. In addition, among the 359 projects, Japanese companies gave up the opportunity of becoming an operator in 57 projects, even while holding the largest share of the projects. Yet, there were only four projects in which Japanese companies could become operators when they collaborated with foreign companies for the largest shareholder of the projects (JNOC, 1997).

It is essential to expand the operator project to acquire experience in the operation site for improving the E&P technology, since upstream oil technology, which involves integration of numerical elemental technologies, requires special experience in the operation site. This is because resource possession influences the superiority of technological development. Also inversely, “operator qualification” can be acquired by evaluating past activity records, technology, operational ability, and safety management. Therefore the less operatorship projects, the less chance to develop the expertise and technology in upstream oil industry.

In Japan's case, what hampered the country's involvement of projects with operatorship came from the mixed factors mentioned in the previous chapter such as the limited accessibility to foreign reserves or the establishment of too many but too small project companies. These resulted in the lack of the experiences and capital sizes of the project companies. In addition to the involvement of a number of private companies in each project, the shareholder compositions of project companies worsened these structural problems. The upstream oil projects were financially sustained by non-petroleum industries and the structure prevented the building-up of experience and cultivation of technology in Japan's upstream oil industry (Table 2). As a result, in many cases, Japanese consortia relied on foreign partners for project operation and were entitled to only a proportion of any oil discovered (Surrey, 1974). The "one-project, one-company" structure resulted in increasing dependence on foreign partners of the projects, contrary to the original target of securing independence for the domestic industry.

Table 2. Investment in oil exploration projects by sector

	1970		1980		1990	
	Cumulative Amt. in Mill. Yen	In %	Cumulative Amt. in Mill. Yen	In %	Cumulative Amt. in Mill. Yen	In %
Electricity	3,705	6.4	13,022	2.3	19,072	1.5
Gas	505	0.9	1,390	0.2	2,179	0.2
Steel	3,223	5.6	14,397	2.6	18,179	1.4
Petroleum refining, sale	9,802	17.1	75,496	13.4	188,982	14.8
Trading	9,068	15.8	55,742	9.9	71,016	5.5
Banking	823	1.4	24,838	4.4	29,626	2.3
Nonlife insurance	724	1.3	4,894	0.9	5,593	0.4
Life insurance	68	0.1	2,128	0.4	2,428	0.2
Shipbuilding	1,790	3.1	20,447	3.6	22,564	1.8
Chemical, fiber	1,371	2.4	19,019	3.4	20,438	1.6
Shipping	686	1.2	3,561	0.6	3,674	0.3
Nonferrous, mining	2,658	4.6	4,271	0.8	11,813	0.9
Petroleum development	3,010	5.2	72,594	12.9	275,479	21.5
Others	1,338	2.3	20,060	3.6	21,257	1.7
Total private sectors	38,771	67.5	331,859	58.9	692,300	54.1
JNOC	18,679	32.5	232,027	41.1	587,275	45.9
Grand Total	57,450	100.0	563,886	100.0	1,279,575	100.0

Sources : JNOC (1987), Japan Petroleum Development Association ed. (2005).

The size of capital spending and human resources for R&D shows Japanese industry's

attitude to the technology development. In 2006 two of the Japanese largest upstream oil companies, JAPEX and INPEX Holdings spent 3,195 thousand dollars and 434 thousand dollars for R&D while ExxonMobil, which produced petroleum liquids over ten times of these two Japanese companies, spent approximately 200 million dollars annually for upstream R&D (Cassiani et al., 2006). In terms of human resources, the number of domestic petroleum engineer is decreasing. According to the 2007 research by Japan Petroleum Development Association, there are approximately 2,500 engineers in Japan. In the demographic structure, more than 60% of them are over 40 years old and the share of younger engineers is getting smaller. The research assumed four reasons remaining under the situation: a reduction of new recruits reflected by the past difficult business condition; shrinking petroleum exploration and development from the reduction of Japanese government support; diminishing number of related departments in domestic universities; an inadequacy of public relations by petroleum industry. This situation is pessimistic when competing with other growing petroleum consumers such as China, which has a number of graduates from petroleum departments every year almost the same or even larger than Japan's total petroleum engineers.

On the other hand it is also true that the chances of overseas development are limited by many oil-producing countries, since they shut off foreign access to their fields. Thus, it is necessary to develop expertise for entering into projects in open but economically or geologically difficult fields, such as small ones or those with heavy oil. JAPEX's development of Canada's oil sands is one of the promising examples. These examples also raise necessity of technology development and further experiences in project management. Most private companies expect JOGMEC to act as a research center for fundamental technology and human resource development, which was difficult to achieve in the previous structure. In addition, as in the case of development projects of ultra heavy oil in oil sands, the cooperation with domestic downstream industries for smooth delivery of the oil supplies will be required. And this is expected to be the next step in further integration of Japan's oil industries, which were long divided.

5. Conclusion

The paper identifies the structural and policy issues and how they lead to long difficulties for Japan to achieve the target of increasing overseas oil development. Energy security as well as economic efficiency both became crucial not only for Japan but also for any other countries, especially capitalists and resource importers. It means

that the competition for access to resources will be even more severe in next decades. In this aspect it is essential to continue reform of Japan's overseas oil development focusing its attention on establishing a transparent system of the government-industry partnership to clarify the responsibility of the projects, to reconsider locations for exploration, to build an environment for cultivation of expertise, and to offer a consistent emphasis on energy security. It will not be easy, but it will only become more difficult for Japan to secure oil supplies amidst heated international competition without such efforts.

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