ASEAN Energy Security Policies and Implications for Japan[1]

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Chapter 1 ASEAN Energy Supply and Demand Trends and the Growing Oil Imports

1-1. Steadily increasing energy demand

Since the late 1980s, most ASEAN countries have pursued economic growth by following the high economic growth of East Asian countries (such as South Korea, Taiwan, and Hong Kong). With a growth cycle of large-scale flows of direct investment, significant increases in exports and expansion of domestic demand, the so-called "flight of geese" form of economic growth continued in the 1990s, and many ASEAN countries achieved annual economic growth in the double digits.

In these circumstances, primary energy consumption within ASEAN recorded a strong, sustained increase. According to the BP Amoco Statistical Review of World Energy (hereafter abbreviated as BP Statistics), primary energy consumption[2] in the major five ASEAN countries (Indonesia, Singapore, Philippines, Malaysia, Thailand) increased 8.0% per annum, from 136 million ton in oil equivalent (hereafter abbreviated as TOE) in 1990, to reach 236 million TOE in 1997. (Fig. 1-1-1)

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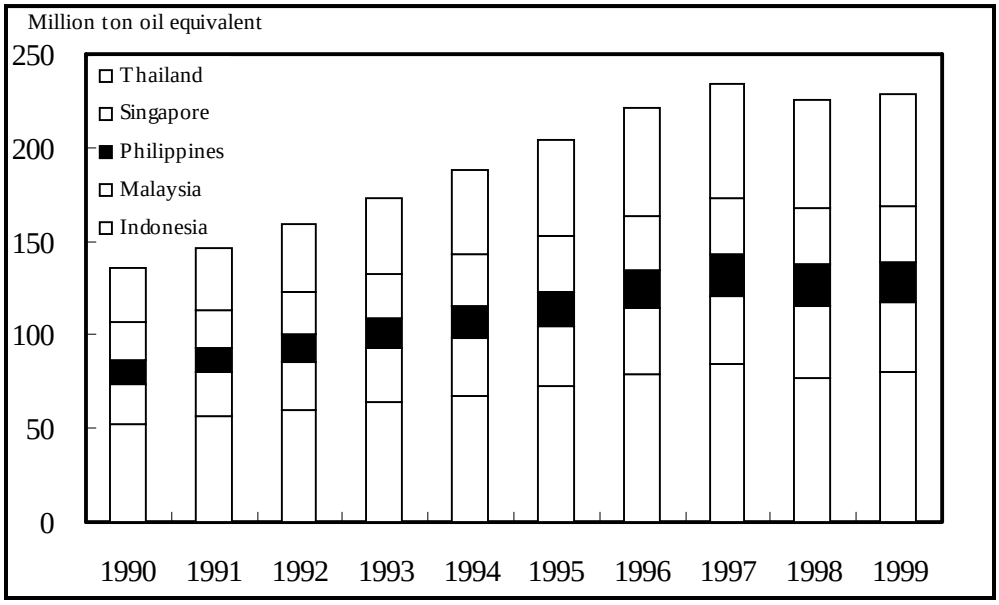
[2] According to the United Nations "Energy Statistics Yearbook 1997", primary energy consumption of the above five ASEAN countries in 1997 accounts 93% of that of all ten ASEAN countries (the above five countries, plus Vietnam,

Fig. 1-1-1 Primary Energy Consumption in the Five Major ASEAN Countries



(Source)Data from BP Statistical Review of World Energy

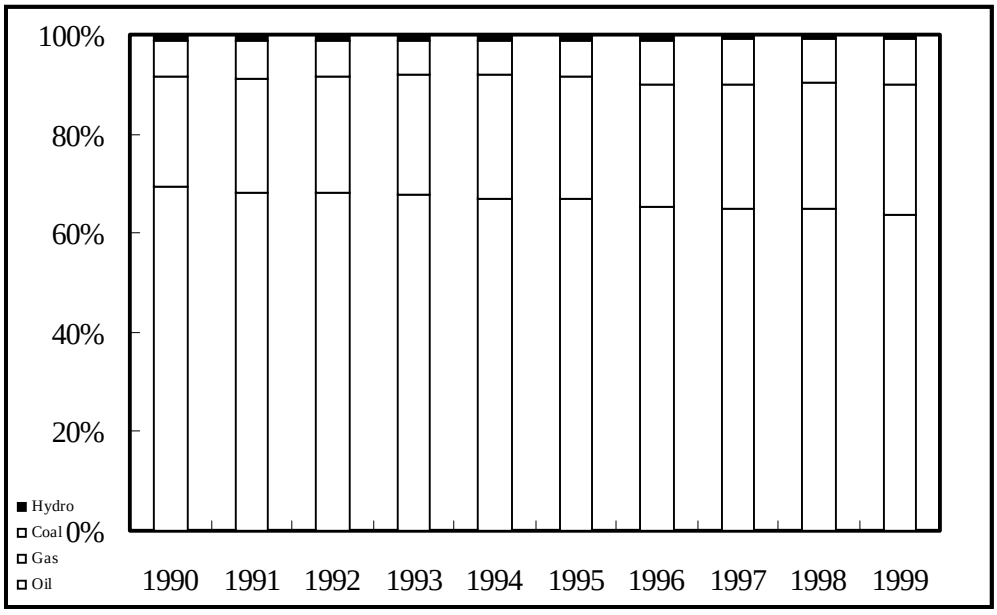
However, this brisk economic growth and the subsequent increase in energy consumption were greatly impacted by the Asian economic crisis that started in 1997. What had been high-growth economies contracted abruptly, and in 1998, headed by Indonesia with a 13% decline from the previous year, most ASEAN countries posted negative economic growth. That meant an end to the sustained growth in primary energy consumption, which now began to decrease. In 1998, primary energy consumption of the five major ASEAN countries fell to 225 million TOE, recording a 3.5% decrease from the previous year.

For many Asian countries caught in a grave economic crisis, the initial pessimistic view was that they would remain weak for a long time. But entering 1999, the Asian economy and the economies of ASEAN countries recovered more quickly than expected, driven mainly to the growth in IT and high-tech exports to the U.S. market, which was enjoying its own sustained economic expansion. Along with the economic recovery, primary energy consumption in the five major ASEAN countries began to rise again, albeit at a slow 1.2% from the previous year. As a result, in 1999, primary energy consumption in the five major ASEAN countries was 228 million TOE.

Myanmar, Brunei, Cambodia, and Laos).

In viewing energy consumption trends for each source of energy, the average rate of increase in oil consumption in the five major ASEAN countries was 4.9% in 1990-1999, showing a steady increase, but it is lower than the whole primary energy consumption rate of 5.9%. Meanwhile, natural gas and coal recorded fairly high rates of increase of 8.0% and 8.8%, respectively. Consequently, the structure of energy consumption in ASEAN countries saw a shift in the energy source from petroleum to natural gas and coal, and this has become a sustained, albeit gentle trend. (Fig. 1-1-2) However, petroleum has retained its position as the key source of energy, accounting for 63.7% of total consumption as of 1999.

Fig. 1-1-2 Primary Energy Consumption Mix in the Five Major ASEAN Countries



(Source)Data from BP Statistical Review of World Energy

In looking at future ASEAN energy demand, with economic growth as the key factor, downside risk is acknowledged, including the impact of the increasing slowdown of the U.S. economy starting in 2001. But the prevailing view is that the economy will basically continue to recover from the economic crisis and in the long term, robust economic growth will be attained. This should mean a steady increase in primary energy consumption, in line with economic growth. For example, the Asia Pacific Energy

Research Center (APERC) predicts[3] that the primary energy consumption of six ASEAN countries[4] will increase from 209 million TOE in 1995 to 279 million TOE in 2005, and 366 million TOE in 2010 (an average annual increase of 3.8% from 1995)[5].

1-2. Expected oil import expansion and energy security problem

In looking at supply side trend providing such energy consumption increase and supply/ demand balance, difference in each energy source is shown. That is, the region has sufficient production capacity when it comes to coal and natural gas, and production is expanding favorably.[6] Hence as far as gas and coal are concerned, self-sufficiency in the ASEAN region is possible and furthermore, the region is an exporter of natural gas. But for petroleum, although ASEAN has oil producing countries such as Indonesia, Malaysia and Vietnam, production has not increased since 1990 and cannot keep up with the surge in demand in the region, so that overall, ASEAN is a net importer. (Fig. 1-1-3)

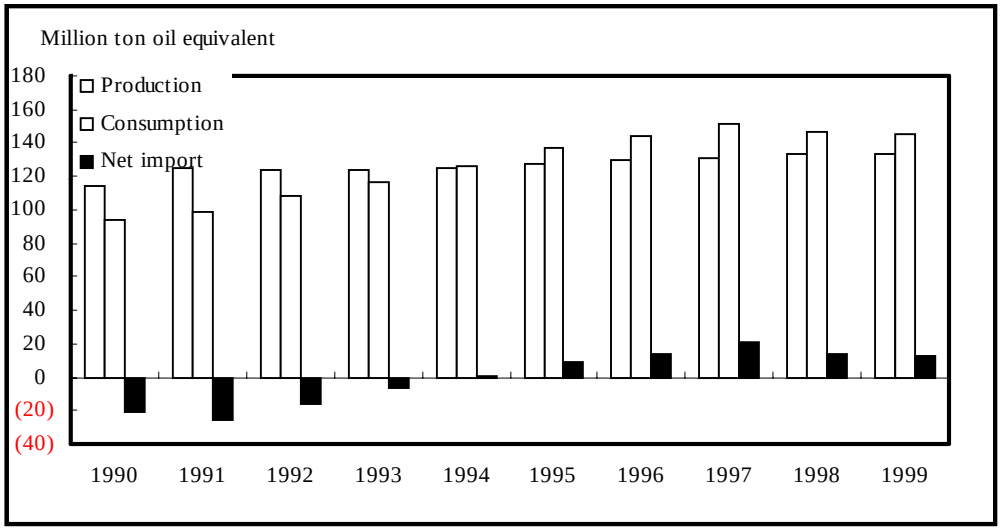
[3] APERC "APEC Energy Supply and Demand Outlook, updated September 1998".

[4] Five ASEAN countries shown above and Brunei

[5] APERC issues predictions in a scenario in which the economic crisis sustained a graver impact (Protracted Crisis Scenario, PCS). Even in this PCS case, however, primary energy consumption of the six ASEAN countries is likely to increase 2.9% per annum starting 1995, to reach 323 million TOE in 2010.

[6] For example, natural gas production in the major ASEAN gas producing countries (Indonesia, Malaysia, Brunei, Thailand) rose from 70 million TOE in 1990 to 124 million TOE in 1999, at the rate of 6.6% yearly. This output is far larger than the gas consumption of 60 million TOE in the five major ASEAN countries in 1999.

Fig. 1-1-3 Major ASEAN Countries Oil Supply/Demand Balance

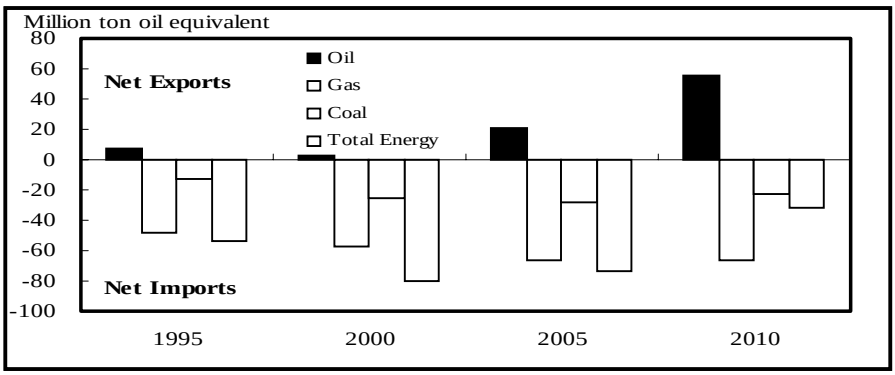


(Note) Consumption is based on data of the five ASEAN countries stated above. Production is based on data of the five main oil producers (Indonesia, Malaysia, Vietnam, Brunei, Thailand)

(Source) Prepared by BP statistics

Furthermore, in considering the future steady increase in energy demand described above, further rises in ASEAN oil imports is very likely. It is presumed that ASEAN will continue to meet its own natural gas and coal needs and will remain net exporters given ample production, but for petroleum the region will clearly import more, given the rising imports of oil consuming and importing countries in the region (Thailand, Philippines) and the decrease in oil export availability in Indonesia and Malaysia, presently the main oil exporting countries. (Fig. 1-1-4)

Fig. 1-1-4 Outlook for Net Imports of Oil, Gas and Coal in the ASEAN 6



(Note)ASEAN6 include Indonesia, Malaysia, Singapore, Philippines, Thailand and Brunei.

(Source)Data from APERC "APEC Energy Demand and Supply Outlook updated September 1998"

Given these circumstances, led by the efforts of countries that are already in an oil import position, ASEAN is focusing on measures to tackle with the growing reliance on oil imports and measures to achieve energy security.

In addition, the sharp rise in crude oil price starting in early 1999 raised concerns about energy security. Specifically, those ASEAN countries that are oil importers have seen several problems emerge with the oil price increase in the international market,[7] including: (1) An increase in oil import payments (income transfer to oil producing countries); (2) An increase in energy costs in the industrial sector; (3) A rise of prices that directly impact civil life, such as gasoline prices; and (4) Consequent adverse affects on economic growth[8]. Under these conditions, in the ASEAN region, oil importers initially and then other countries are likely to recognize anew the importance of policies to limit their future reliance on oil imports and to achieve energy security.

At present, the future outlook suggests that even in the major ASEAN oil exporters, namely Indonesia and Malaysia, domestic production will not be able to keep up with the increase in oil demand driven by economic growth, and these countries will ultimately become net oil importers. Particularly, although Indonesia is the largest oil producing and exporting country in Asia, exporting approx. 690,000 barrels of crude oil a day (hereafter abbreviated as B/D) as of 1999 there is a feeling that Indonesia may become a net oil importer earlier than previously expected (around 2010), for the following reasons: (1) Crude oil production has remained almost flat since the 1990s. (2) Oil demand has been increasing after the recovery from the economic crisis. (3) The possibility of an

[7] According to the IEEJ estimate, the GDP loss generated by a 10-dollar rise in the per-barrel crude oil price is -1.9% in Thailand and -1.8% in Philippines. For details, refer to "Short-term Energy Supply/Demand Outlook," by Hiroyuki Ishida and Yoshiki Takasuga (No. 365 Regular Study Report Meeting, Institute of Energy Economics, Japan, 2000/12/21).

[8] On this point, many government personnel, etc. cited various problems, during our interviews survey conducted in ASEAN countries for this study. Actually, the Philippines took steps to remedy a price increase by temporarily repealing the petroleum tariff (3%) in November 2000.

adverse effect on foreign investment in oil upstream sectors due to the political problems and social unrest[9] generated since 2000 has arisen. So when main oil-exporting countries become net importers (earlier than expected), measures to cope with the increasing reliance on oil imports and measures to achieve energy security will be even more critical for the ASEAN region.

ASEAN countries therefore have the critical task of achieving the stable supply of energy needed to support economic growth and social development, given the future growth in energy and oil imports in the ASEAN region. It is natural that attitudes toward this problem and the status of action actually taken differ greatly in each country, under conditions of: (1) Present energy import/export position (net importer or net exporter); (2) Energy resources, reserve potential; and (3) Stage of economic development and economic capacity for action. However, achieving energy supply security itself remains one of the most important problems for all ASEAN countries, since energy is fundamental to national economies, people's lives and social stability.

In ASEAN countries today, it is often necessary to pursue a energy supply security while coordinating with other important tasks such as reducing the burden on the environment of energy development and use, achieving energy industry effectiveness and rationalization and improving international competitiveness. In taking these points into consideration, the following part analyzes the characteristics and issues with respect to the energy security policies being adopted in ASEAN countries.

[9] Starting in 2000, anxiety over Indonesia's political social system has arisen again, with allegations of corruption involving President Wahid, and the intensification of regional separation and independence movements, etc. In January 2001, a disturbance occurred in East Karimantan, with many fatalities. Another disturbance occurred in Acche in March 2001, with a serious impact on production and delivery at the Arun LNG Plant.

Chapter 2 Deployment of the ASEAN Energy Security Policy

2-1. Promotion of the development and use of natural gas

At present, the promotion of natural gas development and use is commonly the most important energy security policy in ASEAN countries.

The reasons for this are as follows:

(1) ASEAN has ample natural gas reserves[10] (compared with reserves of oil), and actual production has increased continually.

(2) In line with the rise in income levels achieved in ASEAN countries, it is necessary to shift to a more convenient energy use (electric power, gas, etc.).

(3) Highly efficient technologies such as the combined cycle gas turbine (CCGT) can be used.

(4) Reduced reliance on imported energy can be achieved with the development and use of ample domestic (or regional) gas.

(5) Natural gas has an advantage over other fossil fuels in terms of the burden on the environment (SOx, NOx or global warming gas emissions, etc.).

But natural gas has several other characteristics, as follows:

Since natural gas is a form of gas energy, maintenance of the infrastructure connecting the production site to the place of consumption is necessary for development and use to advance. And since the cost of development is large, including investment in infrastructure, to secure a long-term contract with customers is often required at the early stage of a gas development project.

Nonetheless, given the many advantages described above, many projects are underway in ASEAN countries, incorporating natural gas field development, infrastructure construction (pipelines), planning of power generation business, etc.

[10] For example, according to BP Statistics, in four ASEAN countries (Indonesia, Malaysia, Brunei, Thailand), reserve per production ratio for oil was 11.7 and that for gas was 37.0 as at the end of 1999.

Major projects executed or advancing in the countries:

- **Philippines:** Gas supply project by pipeline from Malanpaya gas field (reserve 2.5 trillion cubic meter, TCM) to three power generation plants in the South Luzon area (0.4 billion cubic feet per day CFD). Starting power generation plants in 2002 planned.
- **Thailand, Myanmar:** Gas supply by a pipeline from the Myanmar Yadana gas field (reserve 5.7 TCM) to Thailand Rachabri power generation plant (0.525 billion CFD). Production started in 1998[11].
- **Thailand, Myanmar:** Gas supply by a pipeline from the Myanmar Yetagun gas field (reserve 1.8 TCM) to Thailand Rachabri power generation plant, etc. (0.2 billion CFD). Production started in May 2000.
- **Thailand, Malaysia:** Gas supply plan for Malaysia in the first phase from the gas field in Thailand/Malaysia joint development area (JDA) (0.39 billion CFD). Planned to start in mid-2002.
- **Singapore, Indonesia:** Gas supply by a pipeline from the gas field of Indonesia West Natuna (reserve 2.75 TCM) to Singapore SembGas Company (0.325 billion CFD). Supply started in January 2001.
- **Singapore, Indonesia:** Gas supply planned by a pipeline from the gas field of Indonesia South Sumatra (reserve 2.36 TCM) to Singapore PowerGas Company (0.15 billion CFD in 2003, 0.35 billion CFD in 2009). Supply planned to start in 2003.
- **Indonesia, Malaysia:** Gas supply plan from the gas field of Indonesia West Natuna to Malaysia being studied (0.15 billion CFD at first, 0.25 billion CFD in the second year and later.
- **Vietnam:** Gas supply plan by a pipeline from the gas field of Nam Con Son's Ran Tay and Ran Do (reserve 2 TCM) to Phu My power plant (0.29 billion CFD). Planned to start in 2002.
- **Malaysia:** Project for gas use in the Malay Peninsula (PGU). Pipelines were built in three stages from the gas field of peninsula offshore to inland power plant, etc. The construction started in 1984m and the third phase completed. Presently the work is in

[11] In this project, however, receiving gas from Thailand was significantly delayed due to economic crisis, etc. in Thailand. Thailand was obliged to pay an indemnity according to a take-or-pay article. For details, refer to "ASEAN Energy Market and Energy Security Policy Trends (individual country section)," (Thailand 1-4-2) by Masayuki Fujita.

the looping stage. Gas throughput in 1998 fiscal year: 1.16 billion CFD (including supply for Singapore).

- **Malaysia, Singapore:** Gas supply by a pipeline from the gas field of Malaysia, Malay Peninsula offshore to Singapore PUB (0.155 billion DFD). The gas supply started in 1992.

As described above, many plans and projects are underway in major ASEAN countries for domestic gas field development and use, as well as for the import and use of gas from other ASEAN countries. These projects are being advanced individually, some pipeline networks connecting main gas fields and consumption areas in the ASEAN region are being formed[12]. With rapid expansion in power demand expected from now on, it is presumed that natural gas demand will increase steadily and construction of infrastructure such as pipelines will advance on the basis of individual projects. As a result, when the broad networks connecting the region inside are formed over the long term, the use of gas use may be encouraged even more.

2-2. The importance of coal: an ample and low cost domestic energy

As measures to cope with the increasing reliance on energy imports, the effective use of the ample coal resources in ASEAN countries is also significant. In ASEAN, coal resources exist primarily in Indonesia, Thailand, Philippines, Myanmar, Laos and Vietnam. According to the ASEAN CENTRE FOR ENERGY (ACE), total reserves are estimated at approx. 9 billion tons[13]. In these coal-producing countries, domestic coal is being increasingly used, mainly for power generation, and low-sulfur coal is being exported from Indonesia and Vietnam, both within ASEAN and to other countries. Malaysia and Thailand use not only domestically produced coal but also imported coal for power generation.

The ASEAN region is likely to see a surge in power demand in response to economic

[12] As described below, ASEAN has established a regional trunk pipeline plan called the Trans ASEAN Gas Pipeline (TAGP) plan, and is going to continue to promote gas resource development and use in the region through the TAGP plan.

[13] 5.8 billion tons - more than 60% of this reserve - exists in Indonesia.

growth, and as a fuel for power generation, coal is drawing attention along with natural gas, described above. The primary reason is that coal is a low-cost form of domestic and regional energy, assuring two advantages in reducing the reliance on energy imports and competitiveness in energy supply costs. As another case, Malaysia is encouraging the use of coal for power generation as a means to lower what has become an excessive natural gas share[14] in the power generation sector and to diversify power sources.

At present, in the power generation sectors of the Philippines, Malaysia, Vietnam, Indonesia and Thailand, priority is placed on building coal thermal power plants. Plans are being drafted to construct large-scale coal thermal power plants, based on expectations of a broad expansion in coal consumption[15].

The future task is how to reduce the burden on the environment (such as air pollution) caused by coal use. Major coal using or producing countries in ASEAN, such as Thailand and Indonesia, are interested in the development and application of clean coal technologies such as coal liquefaction and gasification, and are looking at taking advantage of the benefits of coal described above[16].

[14] In Malaysia, under four fuel policies starting in the 1980s, substitution for oil by natural gas in power generation sector has advanced rapidly. But the share of natural gas in power generation is now about 70 %, and the government is planning to diversify power supply. For coal, the expansion of a coal thermal power generation plant in the State of Kapal was planned (from 600MW to 4,700MW), but the project was suspended after the economic crisis.

[15] For example, it is predicted that in the Philippines coal demand will rise from 10.39 million tons in 2000 to 14.43 million tons in 2009, and in Thailand coal demand will increase from 22.06 million tons in 2000 to 35.46 million tons in 2010. In Vietnam, construction of coal thermal power generation plant of a total 2,170MW is being planned, to reduce the share of hydropower, which has the central role in the present power supply structure. In Indonesia, coal production is expected to rise from 73.6 million tons in 1999 to 109.6 million tons in 2003, to respond to growing domestic demand for power and increasing exports.

[16] To find effective use of coal, Indonesia is focusing on the development and use of coal base methane (CBM), of which it has reserves estimated at 336 TCM.

2-3. Hydropower, new/renewable energy with great potential

ASEAN boasts great potential in hydropower and new/renewable energy, and there are high hopes that this energy will be put to effective use. Actually, these energy sources are already in use, as the following examples show. In Vietnam and Laos, hydropower is playing a central role as a power source. In Indonesia and Philippines, the use of geothermal power generation has advanced[17]. In Vietnam, Laos and Cambodia, renewable energy such as biomass plays a central role in energy consumption, mainly in residential sector.

The development of hydropower and new/renewable energy is the subject of strong expectations, for the following reasons:

(1) These are basically domestic energies, and their effective use contributes to improve energy self-sufficiency.

(2) For hydropower, geothermal power, wind power and solar power, specifically at the stage of use, the environment load due to emissions, etc. is considered small[18].

(3) When these energy sources are developed as decentralized power sources, in rural areas without electricity and remote from the conventional electric power grid, these energies can be effective sources of power supply.

In the area of hydropower generation, many power generation construction plans are being examined or executed in ASEAN countries. According to ACE, the following construction plans for hydropower generation plants are being examined, with total incremental capacity reaching approx. 30GW.

- **Indonesia:** 6.0GW by 2004
- **Laos:** 3.8GW by 2004
- **Malaysia:** 2.6GW by 2004

[17] As of 2000, in the Philippines, geothermal power generation capacity is 1,909MW and in Indonesia it is 590MW, giving them the 2nd and 4th largest capacities in the world, respectively.

[18] These energy sources raise environment issues such as environment destruction with the development of large-scale hydropower generation plants, forest destruction due to excessive consumption of biomass such as firewood and air contamination caused by inefficient biomass burning.

- **Myanmar:** 3.0GW
- **Philippines:** 4.0GW by 2005
- **Thailand:** 5.3GW by 2011
- **Vietnam:** 4.8GW by 2000

It is uncertain whether these plans will be actually realized, but if major plans move forward in Laos, Myanmar, Vietnam, and other countries where the equipment capacity base for power generation is relatively small, electric power supply/demand balance in these countries will be greatly impacted[19].

2-4. Promotion of energy savings

ASEAN sees the promotion of energy-saving and efficiency improvement in energy use as the most important policy task in energy policies, since promoting energy-saving can produce complex effects through energy demand reductions, including: (1) Reduced reliance on energy imports and higher rates of self-sufficiency; (2) Reduced burden placed on the environment by energy consumption, etc.; (3) From a macroeconomic perspective, greater competitiveness through reduced energy costs.

Actually, most ASEAN countries are examining or executing concrete programs to promote energy savings. Some examples are as follows:

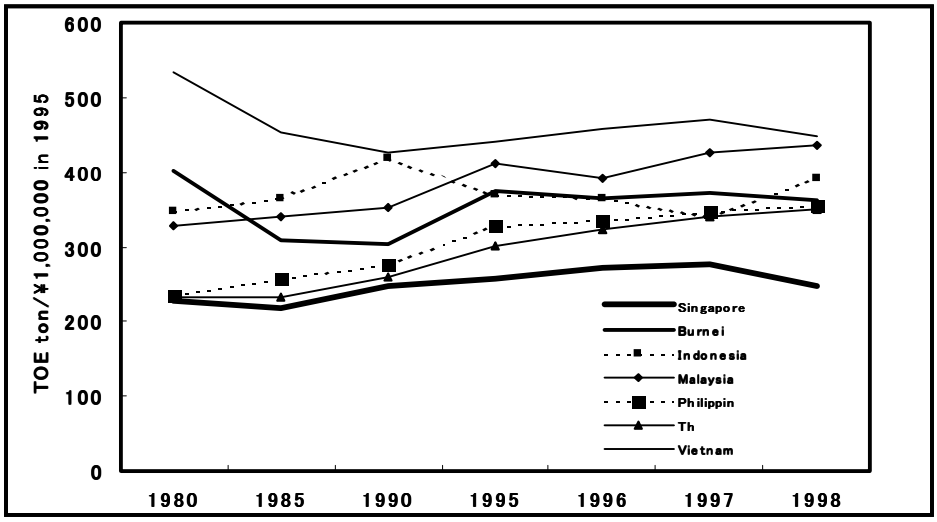
- **Thailand:** An energy-saving program based on the Energy Saving Act provided in 1992 is being executed on a five-year plan base.
- **Philippines:** The energy-saving target of 15.7 million barrel fuel oil equivalent is being pursued by 2009 through execution of energy control service, energy-saving campaign, efficiency improvement program of electric power generation plants, etc.
- **Indonesia:** The Basic Program for National Energy Saving has been executed since 1995.
- **Malaysia:** The promotion of energy saving is the important task in each five-year plan. In the next 8th Plan, establishment of a 0.8 billion Malaysian $ fund for an energy-saving promotion program (and promotion of renewable energy) is being examined.

[19] Exports of electric power by constructing hydro power plants and transmission line networks is planned by Laos, first,

- **Vietnam:** Under the energy-saving program started in 1995, an Energy Saving Center was established. An energy-saving fund was founded, and a number of energy-saving projects are being executed.

Thus, the promotion of energy saving is receiving high priority, but actually implementing energy-saving promotion and energy efficiency improvement is not an easy task. The reason is that expansion of energy consumption as a whole is unavoidable due to the "income effect", since increased industrial activity and the growing numbers and use of energy appliances in line with economic growth are expected in ASEAN countries. In fact, tracking the energy intensity in major ASEAN countries shows that conspicuous improvement in energy efficiency was not observed even after the 1980s, when energy prices rose sharply because of the preceding oil crises. (Fig. 1-2-1) It is believed that this reveals the significant influence of the income effect noted above, and that consequently, optimism is not warranted when it comes to predicting advances in future energy-saving.

Fig. 1-2-1 Energy Intensity in Major ASEAN Countries



(Source) Prepared by IEEJ/EDMC statistics

followed by Thailand, Vietnam, Cambodia and the Mekong River basin area.

2-5. Measures to secure oil imports by strengthening economic and investment relations with oil-producing countries

The promotion of the use of natural gas, coal, hydropower and the new/renewable energy and energy-saving promotions mentioned to date are positioned as energy security policies for the diversification of energy sources and the reduced reliance on energy imports. Despite these policies, an increase in oil imports is unavoidable in the years ahead. Thus, measures to secure the increasing oil imports are another key policy target.

One measure to achieve this is to establish close political and economic ties with main oil-producing countries. A number of means of achieving close ties are conceivable. Among the options, mutual investment between the oil sectors of (Middle East) oil-producing countries as the main source of imports and the oil sectors of ASEAN countries is seen as the most direct measure to secure stable oil import.

A typical example of the investment approach from ASEAN to upstream sectors in oil-producing countries is the activities of the Malaysian national oil company Petronas. In Malaysia, with limited domestic oil resources and little chance of increasing production from the present level, Petronas started increasing access to overseas oil and gas resources in the 1990s. Activities to date include participation in the Iran Sirri A/E oil field development and South Pars gas field development (Phase 2 & 3) and development in the upstream sectors in 13 countries, including Sudan, Vietnam, Chad and Algeria. Petronas is involved in multifarious other businesses, such as joining in the exploration of exploration and developments in the North Sea, West Africa, etc. by taking a capital stake in Energy Africa, a subsidiary of South Africa Engen, and in Premier Oil (25%), a U.K. company active in the Asian oil and gas upstream sectors. Petronas is aiming to access overseas resources, achieve business diversification and increase returns through overseas businesses, while making effective use of its technologies, human resources and know-how. Petronas has the long-term objective of achieving a 30% overall return on its overseas business by 2005. It has already achieved that objective in fiscal 1998 (33.7%), fiscal 1999 (32.2%) and the first half of fiscal 2000 (32.8%).

With these Petronas activities and results, the national oil companies of other ASEAN countries, such as Indonesia's Pertamina, Thailand's PTTEP and the Philippines' PNOC-EC, are very interested in overseas business[20]. At present, however, the companies are not particularly active overseas, since there is no financing capacity for large-scale foreign investment and leading domestic projects must be the focus for now[21]. Actually, these national oil companies are embarking on their overseas deployment by participating in oil and gas development in neighboring ASEAN countries for the time being.

As for the bolstering of investment relations in oil sectors with oil producing countries, another measure is to accept investment from oil producing countries in oil downstream sectors. Investment along these lines was implemented by the Philippines national PNOC in December 1993, when the refining/marketing subsidiary PETRON was privatized, with Saudi Arabia's national Saudi Aramco taking a 40% stake. After that, crude oil equivalent to 80-90% of PETRON refining capacity (170,000 B/D) was supplied from Saudi Arabia to PETRON on a long-term contract basis[22], a significant result in terms of crude oil procurement.

Other examples are the capital stake of 10.6% taken by Kuwait national KPC in the Singapore oil marketing company SPC (October 1990 executed) and inroads by KPC into a Thai oil marketing sector[23]. In Indonesia, the recent product shortage, resulted from the increase in domestic oil demand and the occurrence of refinery accident, renewed a concern about bolstering refining capacity. Accordingly, new refinery construction plans with funds sourced from Middle East oil producing countries have emerged[24], although

[20] For example, it is said that Pertamina showed interest in participating in overseas upstream business, in the meeting with the Japan National Oil Corporation held on November 28, 2000. (Sekiyu Tsushin, November 28, 2000).

[21] As an example, for PNOC-EC, it is said to be necessary to concentrate on the Malanpaya Project currently underway.

[22] After 1999, crude oil supply from Saudi Aramco to PETRON fell to around 60% of the total refining amount.

[23] For the Thai oil downstream market, it is said that KPC and Oman national OOC were interested in entering the refining sector (construction of refineries) before the occurrence of the economic crisis, but completely withdrew after the crisis.

[24] Two specific examples are (1) The plan for construction of a joint venture refinery (300,000 B/D) in Batam by

this is not the business of the national oil companies of oil-producing countries.

2-6. Diversification of oil import sources, and transportation routes

Promoting the diversification of oil import source can reduce or limit the risks caused by relying excessively on one import source (for example, supply disruption in the source in question, weakness in bargaining power, etc). Thus the policy is regarded as very important in the pursuit of oil supply security.

In viewing crude oil import at the center of oil import, major ASEAN countries' Middle East dependence is quite high[25]. Considering that past oil shocks were triggered by supply disruption in the Middle East, policies to diversify import sources have become policies mostly to reduce reliance on the Middle East.

But for businesses actually involved in crude oil imports, key points in selecting import sources are the economic factors of: (1) The oil product demand structure in the market, (2) The quality of oil products, (3) The properties of the crude to be selected (yield pattern, sulfur content, etc.), (4) The refining configuration (degree of sophistication), (5) The price (differential) of crude oil to be selected. Therefore, the pursuit of import source diversification that ignores economic rationality in viewing (1) – (5) is not practicable.

In particular, with competition among companies intensifying given market liberalization and deregulation, it should be noted that the pursuit of economic rationality is an indispensable task for business. In the oil downstream markets of most ASEAN countries, deregulation and market liberalization have steadily advanced in the 1990s. Further, the Asian oil market after the economic crisis has witnessed oversupply in the oil product market, meaning lower refining margins and growing pressure for rationalization

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Hightech International Group is Saudi Arabia and PT. Minyak Pola Permi in Indonesia and (2) two joint venture refineries (300,000 B/D each) in Pare-Pare and Batam by the Al-Banader International Group in Saudi Arabia, involving a Chinese enterprise and an Indonesia enterprise.

[25] Reliance on the Middle East for crude oil imports is 74% (2000) in Thailand, 94% (1999) in the Philippines, 81% (1999) in Singapore and 47% (1999) in Indonesia.

and efficiency. In these circumstances, oil refiners operating in the ASEAN market basically cannot bear additional costs simply for the diversification of import sources.

By the same token, the present oil (crude oil) import pattern in the ASEAN countries is the result of a comprehensive pursuit of economic rationality. Accordingly, when existing refineries in ASEAN select crude oil, no great change will be made basically (although a slight change may be possible with capacity upgrading). As for new refineries, crude oil to be selected for process depends on such factors as refinery design (configuration or the degree of upgrading. However, most of the new refineries will be designed to process crude oil from the Middle East), given that substantial increases in crude oil production in the Asian region are unlikely and that supply potential in the Middle East is great enough to cover the demand growth in ASEAN. Consequently, limiting reliance on Middle East crude oil imports through diversification will be difficult to achieve in practice.

Another problem concerning diversification is the planning to diversify crude oil transportation routes. As measures to cope with the tanker traffic problem in the Malacca Strait where the traffic remains quite heavy even now and there are concerns that it will worsen with rising oil demand in Asia, the idea of constructing a crude oil pipeline crossing the Malay Peninsula is being studied as a substitute route. Several projects are being studied independently, including a pipeline passing through the south of Thailand[26] and a pipeline passing through Malaysia and Thailand.[27] These projects include the participation of the national oil companies of the nations concerned (Thailand PTT, Malaysia Petronas), Japanese consortiums (trading houses, engineering companies), etc.

These projects, if realized, will help ease the congestion in the Malacca Strait and will

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[26] Construction of a crude oil pipeline of total length 200km from Thai Muang in the south of Thailand to Sichon with 1,000,000 B/D capacity is planned. Construction of crude oil tanks with 10,000,000 barrels on both sides of the pipeline is also planned. Gross investment is 0.7 billion dollars. PTT, Itochu and JGC are participating.

[27] Construction of a pipeline of total length 190km from Alor Setar of Malaysia to Sai Buri of Thailand with 2,000,000 B/D capacity is planned. Construction of crude oil tanks with 60,000,000 barrel on both sides of the pipeline is also

reduce the risks of accidents and environmental contamination caused by the congestion. However, the realization of these projects depends on economic viability. In the present project scheme, the economic viability is not sufficient, and to improve this government support such as large public funding assistance is required, in addition to further efforts to cut costs. At present, although it cannot be entirely denied that the circumstances surrounding these projects may change with changes in the understanding of the countries involved with the Malacca Strait problem, the possibility of prompt advancement of these projects is considered to be low, since the governments concerned have limited financial power to offer large-scale assistance.

2-7. The current status and future tasks of oil stockpile buildup

As energy security policies, buildup of oil stockpile is regarded as a key measure, to cope with emergencies such as an oil supply disruption. In particular, it is considered that for oil importing and consuming countries, the buildup of an oil stockpile is one of the most important energy security policies, given the circumstances shown below:

(1) Growing numbers of people in government and industry now recognize[28] that the main risk factors in future oil supply security in the international oil market lie in political and military crises and conflicts such as the Gulf Crisis/War. Hence, the improvement of emergency preparedness is considered an important energy security policy.

(2) During the tightening of international oil supply/demand and crude oil price increase starting in 1999, oil stockpile and inventories as factors for market stabilization and supply/demand buffers are seen as very important[29].

However, a look at the present oil stockpile situation in ASEAN shows that with some exceptions, there are numbers of problems, as described below:

- **Thailand:** Oil refiners and marketers are obliged to stock 3% of the annual throughput.

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planned. Gross investment is 2 billion dollars. Petronus, PTT and Chiyoda are participating.

[28] Many Asia countries including ASEAN members recognize such risk factors. For details, refer to "Oil Supply Security in the Asian Economies," (No. 335 Periodical Study Report Meeting of IEEJ, 1997/10/31) by Ken Koyama and Hitoshi Endo.

[29] With the crude oil price hike in 2000, the United States government considered releasing its strategic petroleum reserve (SPR) to stabilize the market. In September 2000, the government actually decided to release 30,000,000

Presently, storage equivalent to 22 days' domestic consumption exists.

- **Philippines:** Oil companies are not obliged to stock. (Until February 1998, stocks for 40 days were required.) Presently, crude oil for around 30 days operation exists in storage.
- **Singapore:** Oil companies and independent tank operators are not obliged to stock. Power generation plants are obliged to stock for 60 days on site. Suppliers to power generation are also obliged to stock fuel (heavy oil) for 30 days.
- **Indonesia:** State Pertamina is obliged to stock for 34 days. However, it is said that storage for operation for only around 20-25 days actually exists.
- **Malaysia:** Oil companies are not obliged to stock, since Malaysia is an oil producing and exporting country.
- **Brunei:** Storage for 21 days is kept for domestic consumption.
- **Laos:** The government keeps 10% of the import amount for stocks in emergencies.
- **Vietnam, Myanmar, Cambodia:** Unknown

In other words, the present status of oil stocks in ASEAN is:

(1) There is no national oil stockpile that is expected to play a critical role in emergency.

(2) Only Thailand, Singapore, Indonesia and Brunei have prepared a stock obligation system for private/national oil companies and major oil consumers (power companies).

(3) Days of obligation are limited.

(4) Consequently, in most ASEAN countries, storage only for minimum operation requirements exists.

The main reasons why the oil stockpile system is insufficient in the ASEAN countries are:

(1) In oil producing countries such as Indonesia and Malaysia, underground oil resources are considered to be stocks basically, and the need to build special stock facilities and system is not highly appreciated.

(2) Constructing and maintaining facilities for stock and storage is expensive. Most ASEAN countries are developing countries with limited economic capacity to take on the burden.

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barrels, which was implemented later.

Under the situation, however, one conspicuous case is seen in Thailand: the introduction of national stock system is being discussed based on recognition of the potential importance of oil stockpile buildup. In Thailand, stockpile buildup plans are being debated, for which National Energy Policy Office (NEPO) plays a center role. In December 1999, a three-phase national stock strategy was proposed[30].

The strategic plan is:

1st stage:

While holding the present stock obligation to oil companies (3%, stock for 22 days) as is, the obliged stock and other operational inventories (around 10-15 days) being stored in the same tanks, etc. is physically segregated.

2nd stage:

The stock obligation reference is raised to 5% (stock for 36 days).

3rd stage:

A national stockpile is established, independent of the stock obligations of oil companies. Stock date is expected to be a total of 51 days.

However, execution of the plan has basically shown little progress[31]. It is pointed out that: (1) Since the latter half of 2000, the national election and reshuffle in the government has been the focus in Thailand, and policy decisions requiring large investments have been difficult; and (2) With the crude oil price increase in the international market in 2000, the priority of the Government's energy policies has moved to stabilization in domestic market[32]. Since the new Thaksin government was inaugurated in 2001, it is likely that this national oil stockpile plan will be on the agenda again in the government.

[30] The plan is called National Oil Stockpile Strategy (NOSS).

[31] In the summer of 2000, a seminar on this plan was held in Bangkok, and it is reported that about 100 government and oil industry personnel took part and presented various opinions, including concerns about the validity of the stock objective (51 days) and the cost burden.

[32] This was pointed out in the overseas hearing survey executed for ours study.

2-8. Regional energy cooperation in ASEAN

Within ASEAN, there are some regional cooperation frameworks in energy security policies. One is the ASEAN Petroleum Security Agreement (APSA), an agreement specifying regional cooperation in emergencies such as oil supply disruption. APSA is a cooperation agreement concluded in 1986 for the purpose of responding to the marked oil supply shortage (and oversupply) in ASEAN countries. In APSA, with respect to the supply shortage, when oil supply to ASEAN oil importing countries drops to 80% or less of the domestic demand, this agreement is triggered, and ASEAN oil exporting countries (Indonesia, Malaysia, Brunei, Vietnam, etc.) supply oil to oil importing countries in question, with high priority.

However, the effectiveness of APSA has often been questioned specifically by oil importers, given that: (1) Since the supply price in APSA framework is considered to be the market price, it is difficult for oil importing countries to purchase oil when prices rise substantially, or when purchasing at the market price, it is the same situation as when purchasing from oil producing countries outside ASEAN and "cooperation" is meaningless; (2) It is expected that present oil exporting countries such as Indonesia will become net importers in the future, and the oil supply capacity in APSA will be weakened; and (3) In any case, APSA has not been put in motion (even during the Gulf Crisis). Presently, based on the views of the oil importing side (Thailand, Philippines, etc.), the effectiveness of APSA is being reviewed by the ASEAN Council On Petroleum (ASCOPE).

Other regional cooperation plans concerning energy security improvement include plans for building a natural gas pipeline network across the ASEAN region and plans to build an electric power grid. The former is called the Trans ASEAN Gas Pipeline (TAGP) plan and the latter the Trans ASEAN Power Grid (TAPG) plan. TAGP aims to improve gas supply security by promoting the development and use of natural gas resources and diversifying sources of supply, economy vitalization by active trade in the region and mutual reliance reinforcement in the ASEAN countries, by setting up networks among main gas supply areas and main consuming areas in ASEAN. At present, international gas pipelines in ASEAN are limited to certain areas such as (1) Malaysia - Singapore, (2)

Myanmar - Thailand and (3) Indonesia - Singapore, but the TAGP Plan has set the grand objectives of a total 13,000km in pipeline construction and the attainment of international gas trade of 0.26 billion m^3/day by 2020. TAPG plans to form a wide area electric power network by linking the ASEAN countries through a total 14 high-voltage power transmission network connection projects. Implementing these projects is expected to produce a number of benefits, such as the improved supply reliability in the whole region, the availability of back-up when problems and emergencies occur, the enhancement of mutual cooperation, an easing of the electric power supply and demand imbalance in countries and regions and promotion of consolidation in the ASEAN.

TAGP and TAPG are thus grand plans, and inevitably their progress and completion will take quite some time, considering the enormous amount of funds required and the limited investment capabilities of ASEAN governments and related energy enterprises. But as described above, ASEAN countries presently have many natural gas development and use plans, albeit on an individual bases, and pipeline construction plans are being examined[33]. When these individual projects are implemented based on economic consideration and network connections advance steadily as a result, TAGP or TAPG will make development based on sound foundations. For these projects, it is significant to advance steadily on the basis of economic rationality, even if a long time is required.

2-9. The energy security policy situation

As described, right now a number of policies to achieve energy security are being instituted in ASEAN countries. It must be noted, however, that approaches for energy security policies differ among member countries, in line with differences in economic conditions, energy resources, and the balance of energy supply and demand, etc.

More specifically, naturally oil producing countries and oil exporting countries place lower priority on energy (oil) supply security policies at present when compared to the priority given in oil importing countries. Actually, oil-producing countries are executing a range of policies to maintain and expand oil (energy) export income, which is important for the

national economy. In considering GDP per capita, etc., in countries in the early stage of development or countries currently facing severe economic difficulties, it is difficult to actually allocate large economic resources simply for executing energy security policies, although the necessity of doing so is recognized.

Actually, countries in the early development stage have economic and technical constraints when it comes to acquiring human resources for the government agencies in charge of energy security policy planning and execution, the acquisition of opportunities for capacity building or training, reinforcement of the organization, etc. The collection and analysis of energy data as the basis for policy development and execution is insufficient in some countries[34]. Energy demand in developing countries will rise sharply in the future, and a study of the ground design to secure sufficient quantity of energy at reasonable price is crucial. In practical terms, however, planning ability for the study has to be improved and reinforced at first, at least in those countries at the early development stage.

As is clearly described above, ASEAN consists of countries with differing economic development and growth and diverse energy supply and demand conditions. As is revealed, the economic and energy situations in ASEAN are changing markedly, towards the direction of high growth as a whole. Under the circumstance, it is very important for ASEAN countries to develop more effective and efficient energy policies. To do this, better understanding on the factors influencing the present status, and the improvement of the capabilities for analysis on the energy market will be essential.

Chapter 3 Implications for Japan

3-1. Relation of ASEAN energy security and Japan

The ASEAN countries are important economic partners[35] of Japan, being connected with

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[33] Refer to 2-1 in this paper.

[34] This point was made in overseas interviews survey carried out for our study by many government personnel, etc.

[35] Exports from Japan to ASEAN countries in fiscal 1999 accounted for 13.3% (yen basis) of Japan's total exports. Import from ASEAN countries in fiscal 1999 accounted for 15.2% of total import.

Japan through trade and investment. ASEAN is likely to see a great increase in energy demand and imports, making it an urgent task to acquire the energy supply needed for stable socioeconomic development and growth at reasonable prices. Viewed from this point, it is very significant for Japanese economic security that ASEAN countries deal with the tasks in energy supply security and attain stable economic development and growth.

In today's energy market, including the petroleum market, globalization is advancing, and a supply disruption or price hikes in the international market impacts all countries. So even if Japan executes energy security measures of its own, if any energy supply disruption is occurred in ASEAN, with its growing weight in the world energy market reflecting rising energy demand and imports in the future, the impact will subsequently hit the international energy market and it is likely that Japan will experience a critical impact.

Moreover, ASEAN countries and Japan enjoy a close relationship in terms of energy trade. For example, crude oil imports by Japan from Indonesia reached 14,170,000kl (5.7% of Japan's total crude oil imports) in fiscal 1999, making Indonesia Japan's largest supplier of crude oil outside the Middle East. For LNG, import amounts in fiscal 1999 reached 18,130,000 tons, 10,100,000 tons and 5,740,000 tons from Indonesia, Malaysia and Brunei, respectively, and the total of these three countries accounts for 65% of total LNG imports. Thus, ASEAN countries are important energy suppliers for Japan[36].

In considering these points, it is clearly a matter of great importance that ASEAN countries achieve energy supply security to respond to future increases in energy demand. Consequently, it is significant for Japan to provide possible cooperation to enable ASEAN countries to attain energy security.

3-2. Tasks for Japan's cooperation with ASEAN energy security policies

As described above, it is vitally important that Japan cooperate with ASEAN countries in energy security policies. In looking at the economic environment surrounding Japan, however, cooperation must take the form of "meaningful cooperation" for both Japan and

ASEAN, while placing priority on the cost effectiveness.

From this perspective, the following points must be thoroughly examined:

(1) Energy security policies cover various fields and items. However, in what fields does Japan hold a "comparative advantage," in terms of international cooperation for energy security?

(2) What are the most important "needs" for ASEAN in receiving cooperation?

In considering these points, one of the most important options is cooperation in the field of oil stockpile system, for the following reasons.

(1) Japan has established oil stockpile system as an oil consuming and importing country since the 1970s, and has accumulated ample know-how, technologies, expertise and human resources in this field.

(2) In ASEAN countries, a number of policies are planned and implemented to restrain oil imports, but in fact oil import is increasing markedly. Thus, oil supply security will become an increasingly important issue.

(3) As described earlier, it is recognized that the role of oil stockpile is very important for achieving oil supply security[37].

(4) In ASEAN, oil stockpile buildup is insufficient in fact.

(5) In Thailand, action aiming at oil stockpile buildup is actually examined.

(6) Although not directly relating to ASEAN, in other Asian countries (South Korea, China, Taiwan), efforts to plan oil stockpile buildup have started[38], and it is probable that initiatives in ASEAN will be an element contributing to the stabilization of the oil market.

However, ASEAN oil exporting countries in particular, are not that interested in buildup of oil stockpile system, and at present, the efforts concerning oil stockpile buildup throughout ASEAN has been weak. It will be necessary, then, to increase recognition of the importance of the oil stockpile buildup throughout region first, taking into

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[36] Conversely, viewed from these exporting countries, Japan is the biggest export market.

[37] Refer to 2-7 in this paper.

[38] For efforts to set aside oil stocks by South Korea, Taiwan and China, refer to "Asia APEC countries oil security policies" (Energy Economy by The Institute of Energy Economics, 2000 summer issue) by Ken Koyama.

consideration the fact that reliance on oil imports will increase throughout ASEAN and major ASEAN oil-producing countries will become oil-importing countries in the future. At the same time, advancing cooperation in bilateral base with the country that is now actually examining oil stockpile buildup program should be important as a specific cooperation in this field. In addition to oil stockpile buildup, there may be various fields of cooperation, including the spread and promotion of energy-saving technologies and technical cooperation in efficient utilization of coal.

Cooperation in training personnel (capacity building) for energy security policy planning is a field in which ASEAN has great needs and high expectation of Japan. The reasons are:
(1) ASEAN highly evaluates Japan's ability and implementation of energy security planning.
(2) On the other hand, ASEAN recognizes the need to improve these abilities in almost all member countries, especially those countries in the early developing stage.
Thus, Japan's cooperation in this field may be highly appreciated by all of ASEAN, and good performance can be attained when capacity building succeeds and encourages planning and execution of more effective energy security policies in ASEAN.

Moreover, one aspect in cooperation in this field is the collection and maintenance of information and data on the energy and oil markets in ASEAN countries, the building of a database and information sharing system. As was described previously, an accurate understanding and analysis of the present circumstances are indispensable for effective policy planning. Today, numbers of problems are cited in energy data collection and maintenance in many ASEAN countries with respect to accuracy, frequency, speed, etc. Subsequently, the base of capacity building will be first to deal with the problems in data collection and maintenance at the level of each country and to build more systematic collection and maintenance systems for information and data. On the other hand, for the objective of energy security improvement, data collection and maintenance, the use of a database and its sharing are very important. As is clear from the experiences of the past oil crises, when information on the state of supply and demand in the market is insufficient or inaccurate, or when a supply disruption occurs, confusion and panic are often generated

and widespread. So, for example, if many market participants can obtain accurate information in real-time on production, import/export, consumption, stockpile/inventory, price, etc. on the oil market, it can be of great significance for improving oil supply security. In this sense, data and information collection and maintenance of the energy market in the ASEAN region, the use of a database and its sharing will have double effects.