International Energy Security and Japan's Strategy*

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1. Introduction

Energy is a vital commodity, required for economic activity and public welfare. Ensuring a stable supply, in terms of availability and price, is therefore one of the most important challenges facing Japan. Japan, being poor in terms of the availability of domestic energy resources, depends on imports from the international energy market for most of its supply. For Japan, therefore, the establishment of an energy security system, based on a global perspective is a most important task in light of national interests.

The world today faces new threats and risks to the international energy security system. These issues include: the depletion of oil and gas resources in advanced nations such as the US and European countries; rapid increases in the demand for energy and national strategies to obtain resources in countries such as China and India; growing geopolitical risks in the Middle East, which is the world's main oil supplying region; concerns about the security of energy transportation and sea lanes; moves to tighten international regulations on nuclear fuel cycling policies, and; international obligations towards the reduction of CO_2 emissions to counter global warming. Japan's poverty of energy resources means that these new risks and threats have a crucial bearing on its existence as a state.

However, some aspects of Japan's overall approach to the energy problem still lag behind the changes taking place in the world. In particular, we need to be mindful of the fact that the paradigm shift that emphasizes the strategic importance of energy has far greater significance than is appreciated in Japan. The first manifestation of that significance is that the paradigm shift has caused national interests to collide with each other in the international energy market and that countries are now applying strategic thinking to energy issues. The second is that disputes between countries or players in the international energy market are now complicated by the fact that matters such as diplomacy, defense, economic and trade policies, environment and education, are intricately intertwined with energy problems. With this in mind, we must ensure that policies are

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not excessively influenced by short-term economic considerations.

Now is the most critical time to establish a comprehensive national energy strategy in order to effectively deal with the new circumstances that surround energy issues, rather than taking an approach linked solely to the narrow realm of the energy sector. That national strategy should be designed to be based on current and future global trends and must clearly define a grand design that matches our national interests. To this end, a comprehensive approach that takes into account such factors as diplomacy, defense, the economy, the trade and the environment is essential and it is imperative that issues are clearly prioritized. Based upon our perception of international relations, we need to create short-, medium- and long-term action plans, which delineate the roles and responsibilities of the nation, local governments and the private sector, and then work to strengthen our national commitment to such action plans.

In this paper, we will first analyze major risks and threats to the international energy market today. We will then discuss the problems with the current approach taken by Japan and identify the measures that Japan should take in the future. Finally, we will discuss the specific goals addressed by Japan's new national energy strategy.

2. Recent Developments of the International Energy Situation

2-1 Sharp Rise in the Crude Oil Price and Its Background

The price of crude oil in the international oil market has soared considerably: the WTI (West Texas Intermediate) crude oil price has risen to a level of nearly 80 dollars, after having repeatedly reached record highs. Such a sharp rise in the oil price can be seen as a result of multiple causes such as: the major growth in oil demand by the world, driven particularly by China; significant decreases in the reserve capacities at crude oil production and refining facilities in the world market; concerns about supply interruptions that could possibly occur from terrorism and conflict in countries like Iraq and Nigeria or from issues around the Iranian nuclear issue, and; the influx of speculative money into the oil futures market.

As a matter of additional concern, the peak oil theory, which postulates that world oil production will hit the peak in the near future, is attracting attention, particularly in the US and has become one of the factors contributing to a soaring crude oil price. In fact, a perception that the era of cheap and easily-available oil ("easy oil") is about to end, is beginning to spread around the world among those concerned with oil matters. In the background, there is the reality that the output of oil from the US, the North Sea and other regions that are located near consuming areas and could easily be developed has already peaked, followed by a decrease. Most of the promising oil suppliers are either a part of politically and socially unstable regions such the Middle East and Africa, or locations characterized by harsh natural environments such as the ocean floor or high latitudes.

The "World Energy Outlook", published by the International Energy Agency (IEA) in November of 2004, predicted that oil production would peak around 2015 in a case that makes pessimistic assumptions about the availability of resources; around 2030 in the reference case; and around 2035 in an optimistic case. An exact prediction about the time of peak production is difficult to make because it will depend on such factors as the size of undiscovered oil resources, the recovery rate, the oil development policies of oil producing nations and the trend of investments. Nevertheless, we must admit that the peaking of the oil production, which has so far sustained modern industrial

civilization, is already within sight.

For the humankind to go on living peacefully and affluently in the future while protecting the global environment, it is more important than ever to utilize the limited resources of oil, natural gas and coal as efficiently and cleanly as possible. In addition, we must note that nuclear power generation, which is CO_2 free, is expected to play a major role in the future as a source of electrical power indispensable to economic growth and as a means of producing hydrogen fuels in future.

Transforming the oil-based energy supply system of the world today into a new energy supply system based on alternative fuels will require enormous investments and take many years. In view of this, we must begin long-term efforts with a vision of the post-oil era before world oil production hits its peak.

2-2 A Paradigm Shift Concerning Energy Issues

From an era that preceded World War II up to the era of the first and second oil crises, energy (oil, in particular) was perceived as a strategic material and nations developed strategies and policies in keeping with this perception. Since the mid-1980s, however, due to such factors as a prolonged oil glut, low crude oil prices, the development of the international oil market and the subsequent collapse of the Cold War structures, the US and Europe gradually came to view energy supplies as little more than a commodity, and believe that only a bare minimum of energy related special measures and policies are required. This view then spread to Japan.

However, the terrorist attacks that occurred in the United States on September 11, 2001, were a crucial turning point in terms of bringing about a paradigm shift in the way the energy problem is viewed. A strong awareness has developed of the importance of ensuring national and individual security, bringing with it the need for a fundamental change in the policies of recent years that emphasized the pursuit of economic efficiency and equity. The recent soaring in the crude oil price and its background causes, such as the manifestation of geopolitical risks and the growing anxiety about long-term stringencies in energy supply and demand, are additional factors that have accelerated this paradigm shift.

As a result, the importance of activities for securing and managing the energy supply indispensably needed for the existence and operations of nations and people, came to be recognized in terms of national interests and the international energy market has become an arena where national strategies collide. Players in the arena, engaged in heated activities, are enterprises of enormous size and corporate power, such as the national oil companies of producing countries of the Middle East, Russia, etc., the national oil companies of importing countries such as China and India and the oil majors of the US and Europe. We should also note that, nowadays, the international energy security system would be affected not only by nations and major companies, but also by the new threats of weapons of mass-destruction and terrorism. This is now attracting attention as an important issue and calling for responses in terms of also protecting people's lives.

3. New Risks to Energy Security

(1) A rapid increase in China's oil imports and the intensified competition over energy resources

China, with its remarkable economic growth, is rapidly increasing its demand for oil. China's

dependency on imported oil exceeded 40% in 2004 and it appears certain that the percentage will go even higher. China perceives its growing dependency on imported oil, and on the countries of the Middle East, as a weakness of the state. Therefore China is making all efforts to overcome this weakness by developing domestic sources of energy, diversifying the sources of energy supplies, investing in upstream development in other countries, strengthening national oil companies as players in the international energy market, increasing the oil reserves and promoting energy conservation. In view of the globalization of the energy market, each country's effort to overcome weaknesses in its energy supply structure may contribute to the overall stabilization of the international market. However, actions that are overly exclusive of others, resulting from an aggressive pursuit of national energy security, may cause friction and tension with a monopoly of and competition for resources, negatively affecting the stability of the international energy market. Already, a tense relationship has arisen between Japan and China due to competition for oil resources in East Siberia of Russia and gas resources in the East China Sea. Thus, China's strategies are of great concern in relation to the future of the overall international energy security as well as to Japan's sovereignty and diplomacy.

(2) Tight energy market in the US and its impact on the international market

In the US oil market, which is the largest in the world, there is now tightness in oil supply and demand, causing an increase in the oil price and having a large impact on the international market. In the US, efforts have been made since the 1980s to cut refinery capacities in the context of rationalization and, as a result, domestic refineries are now generally run at full capacity, with little capacity left for producing more gasoline. Since regulations concerning the quality of gasoline differ from state to state, as a result of these regulations having been tightened under the amended Clean Air Act, there is little flexibility in distribution. This, combined with other factors, has produced a bottleneck in the supply of gasoline. In October of 2005, two big hurricanes damaged off-shore producing facilities of crude oil and natural gas, oil refineries and pipelines so badly that, for the first time since the Iraq crisis of 1991, the IEA arranged a coordinated disposal of oil stockpiles.

The price of natural gas has also skyrocketed because domestic production and import via pipelines could not match the steady increase in demand. This situation began to have an impact on the international gas (LNG) market as many plans for importing LNG were discussed in view of the rising price. In this way, stringency in the U.S. energy market is becoming a disturbing factor for the international market.

(3) Increase in geopolitical risks concerning energy

Today's international energy market is exposed to higher geopolitical risks concerning energy. The most important is the emergence of various instability factors in the Middle East that holds the largest oil reserves in the world. Such instability factors include: uncertainty about the Iraqi situation; the spread and rampage of terrorism; uncertainty about the future of Middle East peace-making efforts; reaction and frustration in Arab and Moslem societies concerning the US having fought the Iraq war and forcing democracy on other countries; growing tension between Iran and Western countries concerning Iran's nuclear development program. It is feared that the consequences of these instability factors may greatly affect the stability of the international energy

market. Concerning terrorism, we must note that its underlying factors are becoming more complicated with the passage of time and that terrorism is no longer an issue in the Middle East only, but has become a common threat throughout the world.

Russia, which is now rapidly increasing its influence over the international market after having increased its oil production greatly in recent years, is using energy as a powerful tool in the execution of its national strategies and is again strengthening state control over the oil industry, a tendency observed by many with anxiety. In particular, the conflict between Russia and the Ukraine from late 2005 to early 2006, with the supply of natural gas being stopped, caused European countries to recognize the seriousness of energy security issues again.

(4) Increase in risks concerning investments in resource development

In recent years, the amount of newly-discovered oil deposits in the OECD regions, such as the US and Europe (North Sea), that are easily accessible to international oil companies, has decreased significantly after having peaked. On the other hand, resource-rich countries, such as the OPEC nations and Russia, are strengthening state control over resources. In fact, oil resources owned by international oil companies constitute only 7% or less of all the world's proved oil resources, while the oil producing countries (national oil companies) hold a dominant share of more than 70%. Thus, the difficulty for international oil companies to secure reserves or to gain access to resources has increased, producing a major challenge to corporate strategies.

Even assuming that the world has sufficient energy resources to meet the growing demand over the next 20 to 30 years, investments are required to start production using these resources and the question is whether or not it will be possible to collect investments in a timely manner so that growing demand can be met. The IEA estimates that for growing demand to be met, a total investment of three trillion dollars in the oil and gas sectors will be required in the period between 2004 and 2030, three quarters of which is investment in upstream development. However, resource-rich countries, like the oil producing countries in the Middle East, Russia and Venezuela, are becoming less welcoming toward foreign investors, as they begin to focus more on their own national interests. Moreover, political unrest and uncertainty, prevalent in major oil producing countries, is producing anxiety about the possibility of promoting investments.

(5) Energy transportation and the security of sea lanes

Concerning international transportation of energy, security of the means of transport at choke points is becoming a matter for concern. While many such choke points have been pointed out in terms of transport capacity, recent focus is on the safety of transport through the Strait of Malacca, which may develop into a serious issue as energy demand grows in Asia. Already a large number of oil tankers, LNG tankers and other vessels pass through the Strait of Malacca and the IEA expects that the passage of tankers will double by 2030, raising concerns about the risk of supply interruption that might result from an accident or terrorist attack, as well as the risk of environmental pollution. In fact, a pirate attack on a boat of Japanese nationality in March of 2005 heightened concerns about sea-lane security. In this connection, it is noteworthy that China is strengthening its relationship with Myanmar and pursuing a plan to build a pipeline that provides a connection between the Indian Ocean and the Yunnan Province of China.

(6) Constraints on investments due to siting restrictions and market liberalization

Ensuring the supply of energy requires not only upstream capacity but also the capacity along the entire supply chain. This is true not only with oil but also with natural gas and electricity, for which the development of infrastructure such as pipelines and grids is as important as the development of production facilities. However, investments for building an extensive- or large-energy installation (nuclear power plants, in particular) are becoming difficult due to siting restrictions, represented by the NIMBY (Not-In-My-Back-Yard) syndrome and increases in costs caused by increasingly restrictive environmental regulations. In addition, since energy market liberalization is seen as a factor bringing additional uncertainty to the economics and demand in the future, besides intensifying competition, energy companies are becoming more cautious about all kinds of investment. The resulting tendency to minimize the reserve capacity in energy supply will make it difficult to secure the energy supply capacity that may be judged necessary and sufficient from a security point of view.

(7) Issues concerning the environment and sustainable development

The Kyoto Protocol took effect in February of 2005 by the ratification of Russia and the countries listed in Annex B of the Protocol, that are now formally obliged to control their emissions of greenhouse gases. Since consumption of energy is the main cause of the production of substances that burden the environment, it is evident that environmental issues, including the global warming issue and energy issues, are two sides of the same coin. Matters concerning global warming prevention measures, to be prepared for the First Commitment Period (from 2008 to 2012), as well as matters concerning longer-term challenges to be addressed in the post-Kyoto period, are becoming pressing issues for the international energy security system as well. International negotiations on environmental issues, on the subject of measures against global warming, for example, take place in the arena of international politics where national interests collide and where discussions proceed with national interests at stake. We should note that, depending on the outcome of discussions about the establishment of stricter goals for stabilizing the atmospheric concentration of greenhouse gases in the very long term, the cost for the measures to be taken may increase significantly.

(8) Moves toward the tightening of international regulations on nuclear fuel cycling policies

There is a global trend of re-evaluating the role nuclear power generation can play in respect of energy security and global warming prevention. A report entitled: “The Future of Nuclear Power”, recently published by the Massachusetts Institute of Technology (MIT) of the US, estimates that the world will require a nuclear power generation capacity of one billion kW by 2050, which is about three times as large as the present capacity, due particularly to additional capacity requirements in Asia. Blair’s Labor Party administration of Great Britain announced a shift in policies toward the promotion of nuclear power generation in July this year. However, there are challenges to be overcome on account of the following issues: competition in the liberalized market; treatment and disposal of radioactive wastes; securing of uranium and nuclear fuels; gaining public acceptance; and ensuring safety management.

Since the terrorist attacks on September 11, the threat of nuclear terrorism has also begun to be perceived as a real danger. As preventative measures, the safeguard and reduction of the inventory

of weapon-convertible nuclear materials (highly-enriched uranium and plutonium) emerged as a major policy concern. In view of these, El Baradei, Director General of the International Atomic Energy Agency (IAEA), proposed a new multilateral approach to technologies and facilities connected with weapon-convertible nuclear materials. President Bush of the US proposed another concept in the same vein. In addition, a report from the United Nation's high-level panel committee made proposals about the freezing of any new construction of uranium enrichment/reprocessing facilities, and the freezing of production activities at such facilities. Thus, regulations on nuclear fuel cycling are likely to become even tighter in the future.

4. Establishment of Energy Security and Challenges for Japan

Since the first oil crisis, Japan has strived to achieve the best energy mix, through such measures as the diversification of supply sources, while making efforts to utilize energy more efficiently (energy conservation). As a result, Japan's dependency on oil was reduced to about 50% and the importance of oil, to the national economy as a whole, decreased significantly. (The ratio of the financial value of oil imports to GDP decreased from 4.2% as of fiscal year 1974, to 2.1% as of fiscal year 2005.) Japan currently has oil stockpiles that can last for about 170 days, including state-owned and private ones. Furthermore, Japan is implementing various measures under the provisions of the newly-established Basic Energy Policy Law, which sets the basic orientation of future policies around the three pillars of energy security, environmental protection and economic growth (the pursuit of economic efficiency).

However, Japan is faced with its own reality characterized by the emergence of such issues as the growing dependency on oil imported from the Middle East; the stagnation of nuclear power projects; the discontinuation of the Japan National Oil Corporation and the re-examination of oil development policies, and; difficulty in meeting the emission reduction goals set forth by the Kyoto Protocol. Japan should strengthen its efforts in the following areas, in view of the afore-mentioned paradigm shift concerning the approach to energy issues:

(1) Establishing a comprehensive national energy strategy

Japan's energy policies should be made more effective on issues that are inseparably entangled with matters such as diplomacy, defense, economic and trade policies, environment and education. In addition, there are issues, such as the threat of terrorism, against which we must strengthen safeguards because these issues have not been emphasized in the past development of Japan's energy policies, constituting gaps in policies. In the context of cultivating a shared perception among the public, education is also an important issue.

Today, Japan needs to establish a comprehensive energy strategy for the nation, based on current and future global trends. To this end, a comprehensive approach that takes account of a range of matters such as diplomacy, defense, economic and trade policies, environment and education is essential and it is imperative that issues are clearly prioritized.

In terms of creating an action plan, we need to create short-, medium- and long-term action plans, which delineate the roles and responsibilities of the nation, local governments and the private sector. Such planning has to reflect our perception of international relations. The national government has to assume responsibility for developing national strategies that protect national interests, strengthen

its own capacity in this respect and play a corresponding role. To this end, namely strengthening the capacity for energy strategy development, national efforts should be made to reinforce inter-ministerial and inter-agency cooperation under the leadership of the Prime Minister. On these points, France would be a good example for Japan. More specifically, it is noteworthy that France traditionally adheres to the doctrine of protecting its vital interests on its own in terms of general security and energy security policies and consistently observes this doctrine as it formulates national strategies, develops its players in the market and establishes market rules, while giving consideration to national interests.

We should also note that China, which has intensified national efforts to strengthen energy security, established "Energy Leading Group" headed by the Prime Minister, Wen Jiabao. The members of the Energy Leading Group are ministerial-level representatives of energy-related government organizations and the establishment of such a group is significant because it shows China's commitment to reinforcing the comprehensive efforts of the nation.

Japan's energy risk management system also requires reinforcement. With regard to risk management, comprehensive and systematic preparation is required in the form of short-term measures concerning supply and price, and mid- to long-term measures concerning sustainability. On the subject of oil stockpiles, for example, even though we already have sufficient stockpiles, we still need to conduct further discussions and preparations in order to ensure an effective disposal of reserves. Another important issue requiring discussion is the safety of the public (humans), protection of life and the security of lifelines to that end, through such actions as disaster prevention at nuclear power plants and LNG terminals, measures against terrorism and vigilance against a major blackout.

(2) Striving further to achieve the best energy mix

Japan needs to strengthen its efforts to achieve the best energy mix by further diversifying its sources of supply and developing alternative sources of energy. It is crucially important that we make good use of the unique features and advantages of each energy source and of Japan's technology, human resources and experience, as we promote the development of nuclear power, natural gas and coal, as well as new and renewable forms of energy.

Even though we will discuss nuclear power generation in detail in a separate paragraph, it is worth mentioning here that Japan is the only country in the world that does not have nuclear weapons but has complete facilities for nuclear fuel cycle, a fact that has a very significant meaning in the context of international politics. In view of this fact and also of such facts as that nuclear power is a semi-domestic source of energy and that nuclear power is an indispensable choice for achieving reduction of CO_2 emissions, we need to strengthen efforts to promote nuclear power development.

The demand for natural gas, as a cleaner fuel, is growing and natural gas is expected to play a more important role as a primary energy source in the future. We need to establish a more economic and flexible supply system in order to meet market needs. In view of the fact that demand for natural gas has increased rapidly in recent years in countries such as China and the US, it is also important that we should establish a future-oriented strategy to ensure the security of our supplies of natural gas.

Coal has the major advantages of stability and low cost of supply because of its abundance. While coal is expected to play an important role in the future, as it does now, we will have to deal with environmental issues such as CO_2 emissions from its use. Therefore, efforts to make use of coal should be integrated with the development of clean coal technologies.

Renewable energy are promising as future sources of energy because they are basically domestic sources and can play an important role in our efforts to curb global warming. The renewable energy including hydro-power presently has only a very limited share of 5% in the total primary energy supply. To ensure that they achieve major penetration in the market in the future, it is important that we reduce the supply cost through further technical development.

(3) Strengthening the development of energy technologies

Technology plays a critical role in terms of simultaneously dealing with major long-term challenges concerning energy security, the environment and economic growth (economic efficiency). Technological development is crucial to certain aspects of the above-mentioned pursuit of the best energy mix, in terms of developing and increasing the shares of different sources of energy and is also important to the progress of energy conservation. Moreover, establishing and developing technological areas where Japan enjoys superiority provides one important pillar for Japan's international energy strategies. More specifically, we must further develop those technologies in which we already enjoy international superiority, such as energy conservation and environmental protection measures, as well as the technology and know-how developed through our experience as an advanced nation in terms of the nuclear power generation.

Concerning the future development of energy technologies, it is important that we prepare technological strategies under a comprehensive set of energy strategies in consideration of how given technologies will be accepted in the global community and with an emphasis on feasibility. The choice of technologies for carbon capture and storage, for example, has to be made after sufficient examination from these perspectives.

When planning the development and practical utilization of technologies, we need to develop strategies according to a grand design and with a long timeframe in mind, understanding that a long lead-time will be required. For example, since renewable energy, as well as hydrogen energy, are very important in the future energy mix, it is extremely important that we pursue the development of corresponding technologies as a long-term challenge. We should note, however, that such forms of energy probably could make only a small contribution as a primary energy supply in the time span of 10 to 20 years. It is also important that we choose energy options, and develop strategies to make the choice possible, from a long-term perspective of the energy supply-demand balance, the trend in energy prices and the limited availability of fossil fuel resources from a very long term perspective.

(4) Developing internationally competitive players capable of carrying out the strategy

Even though the national government is responsible for the development of a comprehensive energy strategy, it is not an actual player in the market. Therefore, based upon appropriate role sharing between the government and private sectors, we need to establish the capacities of energy companies to compete in the international market as Japan's players.

Particularly in the area of oil and gas development, it is expected to see the emergence of national-flag companies that are powerful enough, in terms of technology, capital and management, to be able to compete effectively with national oil companies and the oil majors in the international market. As long as Japan is dependent on energy supplies procured from the international market, Japan's oil industry requires players of such integrity that they are stronger in procuring supplies and have stronger bargaining power in their relations with suppliers.

For the future of nuclear power generation, it is also important that the emergence of major players is encouraged in such areas as nuclear equipment manufacturing and in the electric power industry, so that they can ensure succession and retention of technologies and human resources in the long term.

It is also important to review the structure of the energy industry, with such ideas as re-organizing the industry on vertical or horizontal integration, in view of the above-mentioned points and with an intention to support the emergence of strong players.

(5) Supporting progress of the international energy strategy and regional cooperation in Asia

We need to reinforce the mechanisms of international cooperation to strengthen energy security for Japan. Currently, there are various frameworks for international cooperation such as the following: partnerships between advanced energy-consuming countries through the IEA; producer-consumer dialogues through the IEF; regional cooperation among APEC nations and among ASEAN+3 nations, and; bilateral cooperation between major countries. For Japan, it is important to build multiple layers of international cooperation mechanisms that serve different purposes.

Most importantly, Asian countries that share the same interests as energy consuming countries, should work together to create a cooperative and joint approach within the region, taking advantage of such frameworks as the East Asia Summit. Important programs that can be pursued in this manner include a thorough implementation of energy conservation measures in Asia where energy utilization efficiency is still low, by means of establishing appropriate benchmarks, for example. It is also required that the energy consuming countries of Asia join hands to restrain the suppliers' market power and eliminate restrictions to more flexible energy trading (e.g. restriction on destinations).

Japan should use its accumulated experience, knowledge and technological capabilities in formulating an energy security policy, as it promotes regional cooperation in Asia. As agreed at the ASEAN+3 Energy Ministerial Meeting in 2004, Japan should take a leading role in cooperative activities for preparing oil stockpiles, developing the oil market, promoting the utilization of natural gas and renewable energy and so on, while at the same time transferring energy conservation technologies and helping to implement clean coal technologies.

In connection with energy-related cooperation in Asia, the relationship with China is of critical significance. To prevent China from becoming a destabilizing factor in the international energy market, we should strive to share a common perception with China on the importance of regional cooperation, with the purpose of inviting China to join the framework of cooperation. Concerning sovereignty issues such as the exclusive economic zone (EEZ) in the East China Sea, however, Japan should of course insist on its national interests being upheld with arguments that are

internationally persuasive. Even though we cannot be optimistic about the future of energy-related cooperation with China, as demonstrated by this example, we must note that the escalation of tension and competition between the two major energy consumers in Asia will harm both parties and profit only the energy exporting countries. As the importance of Japan's energy strategies in relation to China and Asia grows in the future, an approach to manage energy-related interactions between Japan and China in reliance on the Japan-US alliance is also important, in view of the increasing military and political powers of China. India is in the unique position of being capable of serving as a bridge between the oil consuming nations of East Asia and the oil producing nations of the Middle East and is expected to increase its impact on the international market as its energy consumption increases. In this respect, Japan should attach importance to partnering with India in the area of energy cooperation.

(6) Establishing a strategic approach to oil producing nations to ensure a stable supply of oil

We should note that oil is expected to be the foundation of Japan's energy supply for a considerable time to come, even with progress in the development of alternative energy sources. Since oil excels in economics and convenience, it is difficult to find an alternative energy source, particularly as a fuel used in the transport sector. It is extremely important, therefore, that we try to use oil in an efficient way and at the same time establish a strategic approach to oil producing nations for purposes of ensuring a stable supply of oil.

Since the oil producing nations of the Middle East will assume increasing importance as sources of oil, Japan, to start with, should strengthen interdependent relationships with these countries. To this end, Japan needs to strengthen the support systems for the private sector seeking to do business with the oil producing nations of the Middle East through such measures as working to improve the investment climates in those countries and enhancing financial vehicles and insurance for trade and investment. Political and social stability in the Middle East is a major prerequisite and to realize this, we need to make the maximum use of soft power through technical cooperation in the areas of IT, medical care, the environment and so on. Political stability in the Middle East requires not only economic development but also human resource development. In this respect, we should help develop, through education of the increasing youth population, a milieu in which fanaticism and extreme ideologies are unlikely to grow and as a means to achieve this end, it will be worthwhile if we consider improving our system of accepting students from abroad. For the stability of the entire Middle East region, efforts toward Middle East peace-making have great significance. Japan needs to reinforce, more than ever, its policy measures and international cooperation with the goal of supporting progress in Middle East peace-making.

Besides strengthening interdependent relationships with the oil producing nations of the Middle East, another important challenge facing Japan is to develop and secure new sources of energy supply as a means of strengthening the bargaining power it has as a major energy consumer and importer, while at the same time achieving a diversification in supply sources. To this end, it is extremely important that Japan should be able to effectively utilize oil and natural gas resources in Russia, in view of the great supply potential that they offer, given the geographical proximity to Japan and the importance of Russia as a supplier of energy to Northeast Asia. Japan, therefore, needs to establish a strategic approach towards Russia, based on a long-term vision. We also need

to observe trends in the oil producing nations of Africa and Central Asia, with particular attention being paid to the potential for resource development and the possibility of production capacities being increased.

(7) Improving the energy infrastructure and market according to a grand design

The improvement of infrastructure, such as pipelines to Japan, for transportation of energy from those countries that possess resources, will help strengthen energy security and improve the domestic energy market through diversification of supply sources. In addition, such infrastructure improvement is important in terms of promoting links with Asian countries and integration of the Asian market. However, with uncertainty about and competition in the energy market, a major investment to infrastructure is unlikely to happen if it is left entirely to decision-making by individual companies.

In this sense, it is important that the energy infrastructure be improved according to a comprehensive national strategy developed with a long-term vision and perspective into the future. Particularly on the subject of energy resource development in East Siberia and Sakhalin of Russia, we should examine a pipeline construction plan for the entire Northeast Asia, including a plan for the transportation infrastructure to Japan, from a strategic point of view, identifying drawbacks and constraints to its realization and then take appropriate measures. Because Japan depends on imports for most of its energy supply, ensuring the safety of energy transportation routes is another important challenge.

Concerning the optimum distribution of resources, an effective use of the market mechanism is the most efficient approach, in principle. Therefore, it is important that we enhance the market function, which calls for not only the improvement of hard infrastructure such as that mentioned above, but also the preparation of soft infrastructure by making the market more transparent, improving the climate for competition, promoting free and flexible energy trading and so on. Speaking about international rules, important rules that should be made include such rules that may make the market more transparent and enable the sharing of information in a timely manner and international rules concerning direct overseas investments to promote resource development. When establishing such rules, we must pay due attention to the protection of energy security as a national interest.

(8) Meeting challenges of maintaining and expanding the role of nuclear energy

Since nuclear energy, as a non-fossil (carbon-free) energy, is an inevitable choice in view of the need to stabilize the world's energy supply and the restrictions imposed by the global warming issue, its use needs to be maintained and expanded. Japan, therefore, should re-affirm the importance of nuclear energy, in the context of dealing with energy security and the global warming issue and make efforts to maintain and expand its role.

In order to maintain and expand the role of nuclear energy, we must meet the following five challenges:

(i) Ensuring continued investment in nuclear power generation in the liberalized market

As the liberalization (deregulation for promoting competition) of the electricity market

proceeded in the world, investment in nuclear power generation became more difficult in the resulting competitive market because of the large amount of capital required and the presence of various risks. In the electricity markets of Europe and the US, construction of a new nuclear power plant has been started in Finland and several plans to resume this have been recently announced in the US. These two countries have adopted measures to encourage investment in nuclear power generation in competitive markets. Japan also needs to establish programs that strive to reconcile the need to ensure the safety of existing nuclear power plants and the need to improve their economic efficiency, by allowing a longer operation period between scheduled outages and a higher output, for example. Simultaneously, we must strive to prepare a proper climate for continued investments in new nuclear power plants. In addition, it is important that the government strengthen its support of the nuclear power industry, including support for the export of reactor components.

(ii) Strengthening the backend measures (measures concerning spent fuels and the processing and disposal of the final wastes)

The most significant risk associated with nuclear power generation is the backend measures. The most important of the backend measures is the management of spent fuels. A shortage of space for safe management and storage of spent fuels may lead to an interruption of nuclear plant operation. In addition, sufficient care is needed in terms of nuclear non-proliferation and safeguards against terrorism. Even though the Principles of Nuclear Energy Policies, announced in October of 2005, reaffirmed the basic policy of pursuing nuclear fuel cycle, plans are still unclear beyond some short-term plans concerning the Rokkasho Reprocessing Plant. Therefore, it still remains to clarify a long-term perspective on nuclear fuel cycle and identify the measures to be adopted for spent fuel management, based upon appropriate role sharing between the government and private sectors. It is desirable, therefore, that we choose a policy to continue development activities for alternative solutions, so as to be able to act flexibly in the face of future uncertainties, while maintaining the basic policy of nuclear fuel cycle.

Even after achieving the operation of a reprocessing plant and securing capacity for intermediate storage, we will still need to establish, in the long term, a system for final waste disposal. Some aspects of the waste disposal over an extremely long period, however, involve responsibilities that go beyond the levels that a private electric power company can accept as a part of its corporate responsibility. As long as matters concerning this point remain uncertain, it is difficult to expect continued investments in nuclear power plant. In many countries including the US, the government assumes responsibility for final disposal. In Japan, we need to discuss more seriously from a viewpoint to promote nuclear power generation.

(iii) Developing innovative technologies for higher safety and economic efficiency

Most reactors at existing nuclear power plants, in spite of repeated improvements, are basically designed on a light water reactor developed in the US, to which no innovative technological progress has yet happened. For reactors to be more widely used in the world, we need a new type of reactor that is much safer (including resistance to nuclear proliferation) and more economically efficient than existing reactors. Japan, in spite of being an active and important member of the Generation-IV International Forum, (GIF) in which the US is most active, has not yet achieved a

world-leading level of expertise. It is desirable that Japan, in the years to come, strengthens its ability to develop innovative technologies until it becomes capable of leading nuclear power development activities in the world. Having such technological prowess will strengthen the Japanese nuclear industry's competitive power overseas and increase Japan's influence in the arena of nuclear power diplomacy.

(iv) Restoring the public's confidence and improving the decision-making processes

Scandal and accidents in the area of nuclear power generation took place repeatedly in Japan, and moreover, some inconsistencies were observed in the government's administration policies. Municipalities and local residences increased their mistrust of the government administration and electric utilities involved in nuclear power generation and efforts to resolve such mistrust have not produced satisfactory results. In addition, there still remains a feeling of mistrust of the decision-making processes, led by the government and electric utilities. We need to design a program that takes a more fundamental approach to cultivating trust, based on the review of past programs (round table discussions, dialogues with citizens, negotiations with municipalities, etc.). Substantial measures and policies are required for making real progress in the promotion of nuclear power generation.

(v) Strengthening the system for nuclear nonproliferation

It is desirable that, with a deep understanding that the maintenance and expansion of the role of nuclear energy require us to ensure nuclear nonproliferation along with the safety of nuclear power generation, Japan proactively pursues nuclear power diplomacy with the goal of reducing the risk of nuclear proliferation. It is particularly desirable that Japan, as the only country in the world that does not have nuclear weapons but does have sophisticated technologies and facilities for reprocessing and enrichment, proactively pursues policies for ensuring that the spread of nuclear fuel cycle in the world will not increase the risk of nuclear proliferation. More specifically, Japan should: assume a leading role in the development of nonproliferation technologies; promote agreement on additional protocols and help with the establishment of new security measures; make contributions to the multilateral approach to nuclear fuel cycle, and; strengthen safeguards.

In view of a concept recently proposed by El Baradei, Director General of the IAEA, and a proposal from President Bush of the US, it seems that opinions are going to be divided between the two following approaches: "We should have the reprocessing done outside our country, using the arrangements jointly established by other countries" and "Our country should undertake the reprocessing of spent fuels from other countries as well under an international control scheme." If Japan chooses the latter approach instead of being alone in the world by adhering to the third, conventional approach, it would mean that Japan has chosen to play a more important role in the world. It is time now for Japan to seriously consider the preparation of a national system that can enable such a choice. With this in mind, the related ministries, such as the Ministry of Foreign Affairs, the Ministry of Economy, Trade and Industry, and the Ministry of Education, Culture, Sports, Science and Technology, as well as the Atomic Energy Commission, should work hand in hand, under the leadership of the Prime Minister, to heighten their ability to develop comprehensive and strategic policies.

(9) Accelerating the introduction of renewable energy

Along with nuclear power generation, we need to expand the use of renewable non-fossil energy. Presently, with few exceptions (e.g. wind power and geothermal generation), renewable energy options tend to be less competitive than others. Renewable energy options, however, need to be positioned as important energy options in the long term because they provide domestic sources of energy and are effective as measures for countering global warming. Most promising among them are the three options of wind power generation, solar photovoltaics and biomass.

For us to ensure further expansion in the utilization of renewable energy, we first need to re-evaluate, from time to the time, appropriate measures for promoting the penetration of renewable energy into the competitive market, such as the RPS (Renewable Portfolio Standard) legislation, and reinforce such measures as identified of being effective and efficient. Secondly, it is desirable that the government's strategy for the development of technologies for renewable energy is redesigned and a system for technological development led by the private sector is established, based on a policy to pursue innovative and diverse options in the mid- to long term and pursue cost reduction and practical application in the short term. In parallel to this, studies on comprehensive evaluation of the relationship between technology and society should be promoted. Thirdly, it is also important that policies for expanding and supporting the new-energy industry, with a view to the global market, are implemented. More specifically, we expect the implementation of industrial policies, designed from a wider perspective such as the strengthening of support for developing nations that will have great demand for renewable energy, and also of support in the context of global warming prevention on the basis of the Clean Development Mechanism (CDM). Fourthly, it is essential that renewable energy, as a form of local-based energy, is supported by the involvement and leadership of local government. Since even the implementation of wind power generation may be complicated by a siting problem, we need to clearly establish the details of the siting and environmental assessment processes.

(10) Designing a future framework for effective global warming prevention measures

Global warming prevention also requires planning of long-term measures as part of a comprehensive energy strategy. Being aware that decisions in the post-Kyoto international rule-making process will have a crucial bearing on countries' economic growth and industrial competitiveness and also that rule-making will reflect the bare reality of international politics, Japan should be a key insider to this rule-making and take the lead in framing concepts for moves to create fair and effective rules. With the Kyoto Protocol having taken effect, formally obliging Japan to control the emissions of greenhouse gases, it goes without saying that we should strive to achieve these goals with a strict implementation of global warming prevention measures toward the First Commitment Period (from 2008 to 2012).

At the G8 Summit held in Gleneagles, Great Britain, in July of 2005, the leaders of advanced nations, including the US, shared an awareness of the critical nature of climate change issues and the need for long-term measures. They clearly identified the need for internationally coordinated action with such mechanisms as the UN Framework Convention on Climate Change (UNFCCC) and the Intergovernmental Panel on Climate Change (IPCC). However, the Kyoto Protocol is currently handicapped by the break-away of the US and Australia and by exemption from the

obligation to reduce emissions for developing nations including China and India, and therefore, it is essential that we establish a framework that is inclusive of these countries. In this respect, it is important that, in addition to the top-down approach used to date, we should bring in a bottom-up approach that allows countries to select measures matching their specific circumstances, as a framework of international rules. With such arrangements in place, we need to build a scheme to ensure support for the development and dissemination of technologies through international cooperation.

Particularly, when we pay attention to developing nations, having a vision that is not limited to the solving of global warming issues, but inclusive of ideas on the solving of energy security and local environmental issues, will help strengthen our relationships with developing nations and facilitate framework planning. Moves in this direction have already become manifest with the establishment of the Asia-Pacific Partnership on Clean Development and Climate (APP) in July of 2005 by the six countries of Japan, the US, Australia, China, India and South Korea, and we hope to see fruitful development in this trend. It is also beneficial if Japan can commit itself eagerly to the activities included in the action plan agreed upon at the G8 Summit, such as the IEA's project for the collection of an efficiency index and other data from different countries, including developing nations and the work concerning the UNFCCC's technology-transfer clearing house. With a view to Japan's hosting of the G8 Summit in 2008, we should establish a strategy that takes a truly integrated approach to energy and environmental issues.

Japan should pursue international negotiations with the aim of taking initiatives in the building of a framework that serves not only Japan's national interests but also global interests, in terms of contributing to the prevention of global warming, by making use of the country's technological and other resources. Since the global warming issue requires long-term efforts, our aim should be to transform the entire country into a low-carbon society while maintaining competitiveness in the international market. As a country that is heavily dependent on imported energy, Japan should promote the development of technologies, such as energy conservation technologies, renewable energy technologies, nuclear power technologies and carbon capture & storage technologies, and strive to establish an energy supply-demand system capable of ensuring energy security, while at the same time contributing to the prevention of global warming.

5. Japan's New National Energy Strategy

In view of the domestic and international energy situation described above, the Japanese Ministry for Economy, Trade and Industry (METI) announced the New National Energy Strategy in June, this year and decided on a policy of maximum effort, with a close partnership between the government and private sectors. The strategy sets forth five specific numerical targets for Japan to achieve by 2030:

(i) The energy consumption per unit of GDP should be improved by 30%.
(ii) The dependency on oil, as a percentage of the total primary energy supply, should be reduced to 40% or less from the present level of a little less than 50%.
(iii) The percentage of oil in total energy consumption by the transport sector should be reduced to about 80% from the present level of almost 100%.

(iv) The percentage of equity oil secured by Japanese companies in the total supply of imported oil should be increased to 40% from the present level of 15%.

(v) The percentage of electricity generated by nuclear power in the total generated electricity should be increased to the level of 30-40% or more from the present level of 30%.

These targets are major challenges for Japan and the achievement thereof will require serious efforts on the basis of close cooperation between the government and public sectors. However, the level of difficulty for achievement seems to differ greatly from target to target. A report titled "Japan's Long-term Energy Outlook" that our Institute of Energy Economics, Japan (IEEJ) published in April this year, views the first two numerical targets as quite achievable. This view is based on a prediction that the absolute amount of energy demand will not grow much when we assume an economic growth of 2% per annum in the period from 2004 to 2015, 1% per annum for the subsequent period up to 2030 and 1.5% on average in the period from 2005 to 2030. Behind this prediction, there are factors such as: the population in Japan has hit its peak and is already decreasing; that a shift toward a knowledge-intensive industrial structure is expected to go further, and; that energy conservation will be promoted further with concerted efforts by the government and private sectors.

We predict that the dependency on oil, as a percentage of the total primary energy supply, will be reduced to 37% by 2030 from the present level of 47%, and that the diversification of supply sources will make progress with increasing shares of nuclear energy and natural gas. With regard to renewable energy, even though a growth in its share is expected to result from support from government policies, it will not yet become a major source of supply because its percentage of the total energy supply is expected to increase only about 1%. In contrast, we expect that the percentage of nuclear energy of the total generated electricity will increase to about 40%, assuming the construction of ten new nuclear power plants and the improvement of the average annual plant availability to 88% by 2030.

The most difficult to achieve among the above-mentioned numerical targets, seems to be the reduction in the oil dependency ratio of the transport sector and the increase in the percentage of equity oil. Oil serves as a medium for 97-98% of energy consumed by the transport sector, as fuels for automobiles, ships and airplanes. In this connection, discussions on the use of bio-ethanol have intensified recently in Japan, which is preparing a plan to allow the introduction of ethyl tertiary-butyl ether (ETBE), a bio-ethanol-based chemical product, into gasoline, initially at a concentration of 3% from 2008, and subsequently at a concentration of 10% in the future (referred to as "E10"). Even when all demand for gasoline is met by E10, however, merely 4-5% of the fuel supply to the transport sector will be substituted by bio-ethanol, because the share of gasoline in the fuel supply to the transport sector is a little less than 50%. In this sense, the target to reduce the oil dependency of the transport sector to 80% will be very difficult to achieve without extensive use of natural gas based GTL and DME, and a major market penetration by fuel cell and electric vehicles. This could be the toughest target among the five numerical targets given above.

The target to increase the percentage of equity oil secured by Japan of the total supply of imported oil from 15% to 40%, on the other hand, can also be very difficult to achieve, but we believe that it is possible. The present level of equity oil import is 0.6 million B/D, which is roughly

15% of the gross import of crude oil at a level of about 4 million B/D. Since the volume of crude oil imported by Japan is expected to decrease to a level of about 3 million B/D by 2030, 40% of the gross import is about 1.2 million B/D. The challenge, therefore, is to double the absolute volume of equity oil secured by Japan from the present level of 0.6 million B/D, to 1.2 billion B/D. As a follow-up to the New National Energy Strategy, the METI has decided on a policy to reinforce the supply of risk money for oil/gas exploration overseas conducted by Japanese oil companies and have started preparing by specific arrangements. With the rise of crude oil prices in recent years as a backdrop, the private sector has begun to actively seek opportunities for exploration & development and asset acquisition activities in overseas oil and gas resources. To support such activities by private companies, the government has adopted a policy to reinforce diplomatic activities in the area of energy resources with the strategic use of Official Development Assistance (ODA), for example.

Finally, it must be mentioned that, according to the reference case forecast by the IEEJ, Japan will only succeed in reducing its emissions of CO_2 to the level of 1990, the Kyoto Protocol reference year, as late as in 2030. Even though Japan has committed itself, by signing the Kyoto Protocol, to reduce emissions of greenhouse gases to a level 6% less than the 1990 level by 2010, the emissions have increased to 7-8% greater than the 1990 level. Since the CO_2 emissions in the world will increase significantly in the future, driven by increases in developing nations such as China and India, Japan will need to make further efforts to promote energy conservation and make wider use of nuclear power generation and renewable energy.

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