



The Geopolitics of Natural Gas

The Changing LNG Situation in Japan After March 11

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BY

KEN KOYAMA, PH.D.

MANAGING DIRECTOR AND CHIEF ECONOMIST
THE INSTITUTE OF ENERGY ECONOMICS, JAPAN

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ABOUT THE STUDY

Some of the most dramatic energy developments of recent years have been in the realm of natural gas. Huge quantities of unconventional U.S. shale gas are now commercially viable, changing the strategic picture for the United States by making it self-sufficient in natural gas for the foreseeable future. This development alone has reverberated throughout the globe, causing shifts in patterns of trade and leading other countries in Europe and Asia to explore their own shale gas potential. Such developments are putting pressure on longstanding arrangements, such as oil-linked gas contracts and the separate nature of North American, European, and Asian gas markets, and may lead to strategic shifts, such as the weakening of Russia's dominance in the European gas market.

Against this backdrop, the Center for Energy Studies of Rice University's Baker Institute and the Belfer Center for Science and International Affairs of Harvard University's Kennedy School launched a two-year study on the geopolitical implications of natural gas. The project brought together experts from academia and industry to explore the potential for new quantities of conventional and unconventional natural gas reaching global markets in the years ahead. The effort drew on more than 15 country experts of producer and consumer countries who assessed the prospects for gas consumption and production in the country in question, based on anticipated political, economic, and policy trends. Building on these case studies, the project formulates different scenarios and uses the Rice World Gas Trade Model to assess the cumulative impact of country-specific changes on the global gas market and geopolitics more broadly.

STUDY AUTHORS

Rawi Abdelal
Luay Al Khatteeb
Soner Cagaptay
Jareer Elass
Charles Ebinger
Andreas Goldthau
Simon Henderson
Trevor Houser

Amy Myers Jaffe
Robert Johnston
Ken Koyama
Azzedine Layachi
Michael Levi
Steven Lewis
David Mares
Suzanne Maloney

Kenneth B. Medlock
Keily Miller
Tatiana Mitrova
Isidro Morales
Martha Brill Olcott
Meghan O'Sullivan
Ronald Ripple

Introduction

Japan is the world's largest liquefied natural gas (LNG) importer. In 2010, even before the events of March 11, Japan's LNG imports reached as high as about 93.5 billion cubic meters (BCM), which accounted for 31% of global LNG trade. After the earthquake and tsunami on March 11, 2011, and the Fukushima nuclear accident that followed, Japan's LNG import volume significantly increased to offset the decline in power generation from Japanese nuclear power plants. This substantial increase of imports in the world's largest LNG consumer is no doubt a very important element influencing the global LNG and natural gas market as well as the geopolitics of gas. Furthermore, uncertainty regarding the future of nuclear power in Japan was an important element affecting Japan's long-term energy portfolio and thus its long-term gas/LNG demand. Various political, social, and economic factors are at work behind Japan's energy debate, which then attracts global attention. Given these circumstances, this paper examines the current status of Japan's energy and gas market, influential political and economic factors determining the future of LNG/gas demand in Japan, and possible long-term scenarios of LNG/gas and energy in Japan.

The Great East Japan Earthquake of March 11, 2011, and successive accidents at the Fukushima Daiichi Nuclear Power Station caused unprecedented catastrophic damage in Japan and were a stark reminder of the importance of energy, which forms the basis of economic activity and national governance. Urgent responses have been conducted since March 11, including controlling the effects of the nuclear accident, dealing with the short-term power shortage, and doing a comprehensive review of the long-term national energy policy. Great efforts and nationwide discussions of the issues are still continuing. Even today, 22 months after March 11, many problems remain unsolved, and Japanese society faces uncertainty and challenges for the future of its energy industry. Under the current difficult situation, Japan needs to achieve the three "E's" (Energy security, Environmental protection, and Economic efficiency), as well as ensure safety and macroeconomic protection, taking account of the new reality after the Fukushima accident.

Under the circumstances, the role of natural gas in Japan's energy mix has become increasingly important. This is primarily due to the urgent need to offset the reduced power supply from existing nuclear power plants in Japan after the Fukushima accident by substantial increasing fossil fuel use in power generation, particularly in LNG use. But the large increase in LNG and other fossil fuel use in power generation caused several serious challenges for the energy markets and economy in Japan, including the issue of the rising import bill for higher LNG and fuel imports. For example, Japan's LNG imports in fiscal year (FY) 2011 reached 83 million tons, up 18% from the previous year, but LNG import bill reached 5.4 trillion yen (approximately 68 billion USD), up 52% or by 1.85 trillion yen (23 billion USD), which is one of the most important factors behind the Japan's largest trade deficit in its history.

The role of natural gas is expected to become increasingly important, not only in the short term but also in the mid- to long-term in Japan, where a comprehensive review of energy policy is underway. In this situation, enhancement of gas supply security attracts much attention among Japan's energy policy planning and industry circles. For example, the issue of the "Asian premium in LNG prices" is now regarded as a very important issue to be addressed in the context of gas supply security consideration in Japan, and supply source diversification has become a very important energy policy agenda. In this regard, the possibility of LNG imports from North America is very significant, since many LNG export projects are being planned and prepared as a result of the gas supply glut caused by the "shale gas revolution" in the US. In addition to North America, other important potential supply sources, such as Russia, Australia, the Middle East, and Africa, are expected to play an important role to meet future LNG demand in Japan. For Japan as a LNG importer, cooperation among LNG-importing countries is also an important policy objective. In this regard, cooperation in the North East Asian energy market, mainly with Korea and China, is particularly essential.

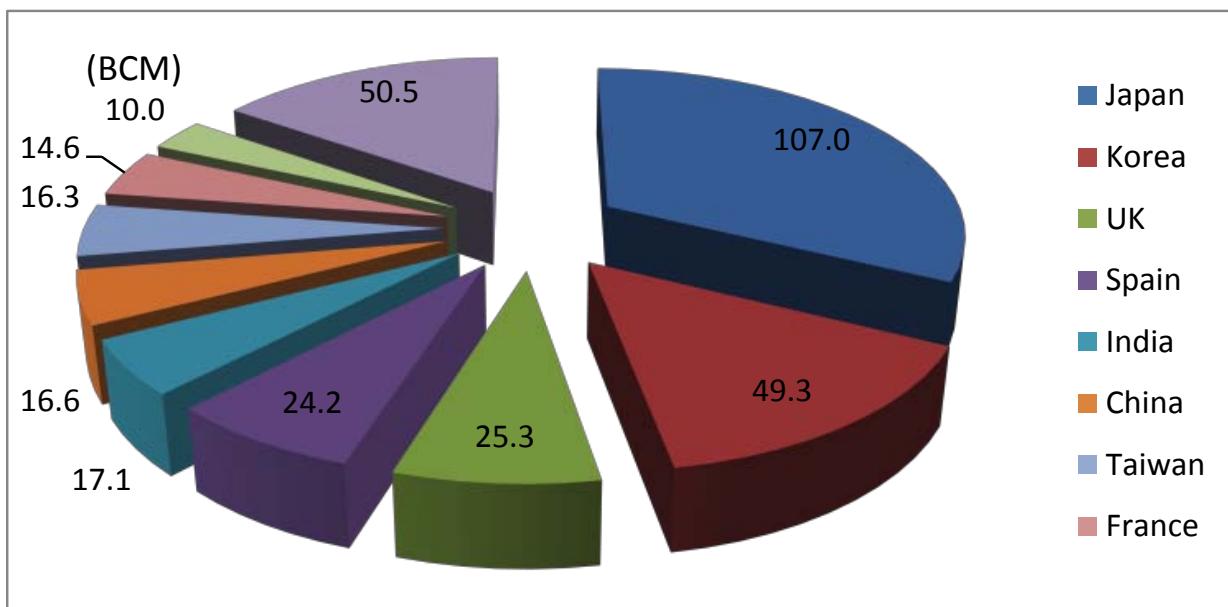
With these recognitions in mind, the following section gives an overview of Japan's natural gas supply-demand situation, followed by a detailed discussion of the impacts of March 11 on Japan's energy and LNG market.

Background

Japan's Natural Gas and LNG Consumption

According to the “BP Statistical Review of World Energy 2012,” Japan’s natural gas consumption is 105.5 BCM. Japan is the fifth largest gas consumer in the world, after the US, Russia, Iran, and China, but its share in world gas consumption is relatively low at 3.3%. However, in terms of LNG trade, which is the main source of gas supply to Japan, the country is the leading LNG importer/consumer in the world. Japan’s LNG import volume in 2011 was 107 BCM, accounting for 32% of global LNG imports.

Figure 1. Global LNG Imports in 2011



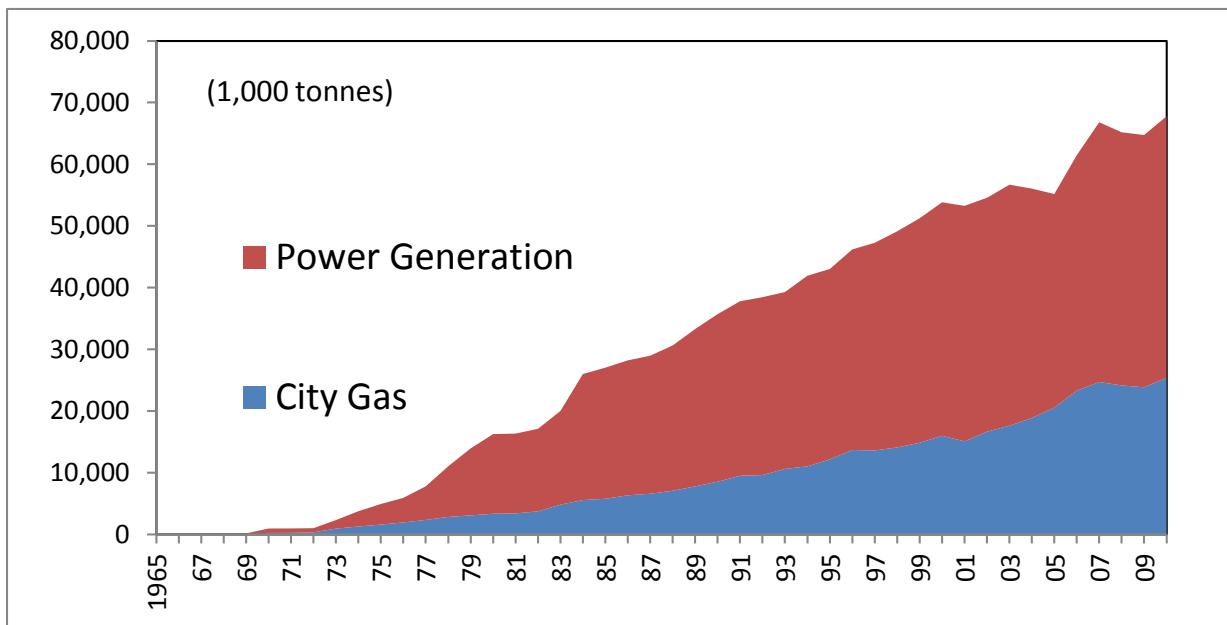
Source: BP Statistical Review of World Energy 2012

Natural Gas Supply and Demand Trends in Japan

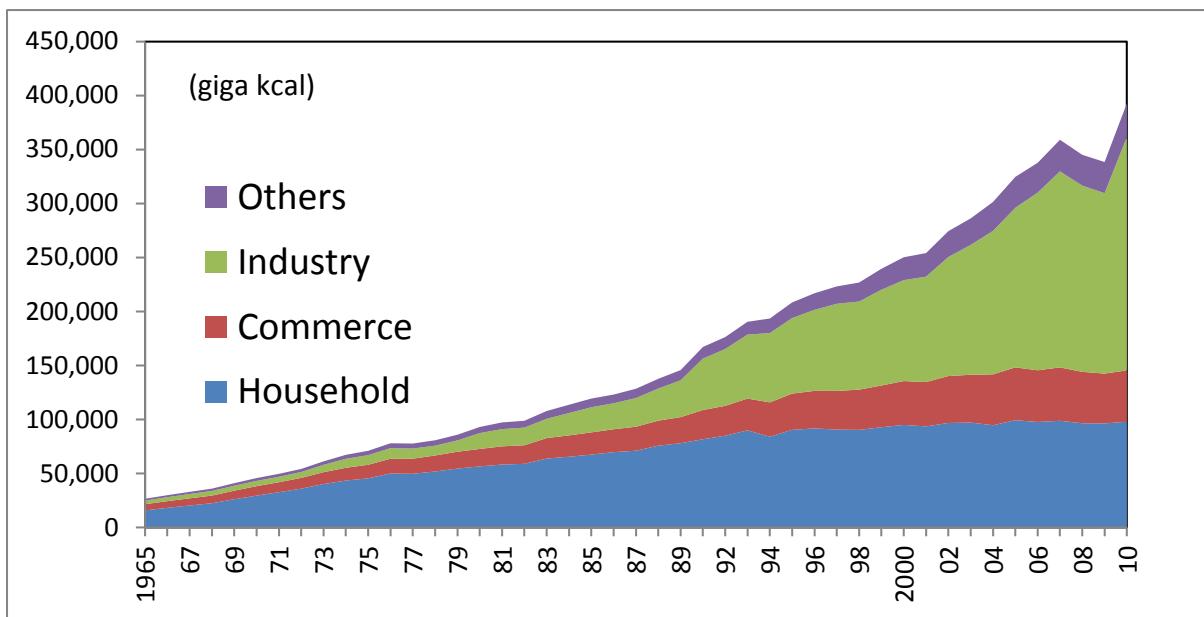
Natural gas use in Japan has increased substantially since the 1970s, since LNG/gas use was promoted as a means to introduce clean fuel and alternative energy for oil. Due to Japan’s very limited domestic natural gas resources, the growing national demand for gas has been met by imports in the form of LNG. As of FY 2010, domestic natural gas production accounted for just 4% of total gas supply in Japan, and the remaining 96% was supplied by LNG imports. In terms of LNG consumption, the power sector is a dominant user. LNG use in the power sector in FY

2010 was 42.4 million tons, while the city gas sector used 25.4 million tons. A breakdown in the city gas sector indicates that while gas sales to household used to be a mainstay in the past, sales to the industry sector is the largest segment now. As of FY 2010, the share of the industry segment in total city gas was 55%, followed by the household segment (25%) and commercial segment (12%).

Figure 2. LNG Consumption by Sector in Japan



Source: METI statistics

Figure 3. City Gas Sales in Japan

Source: METI statistics

LNG Pricing Mechanism and Infrastructure in Japan

The major part of LNG imports to Japan is supplied on a long-term contract basis. In recent years, the portion of spot LNG imports or non-traditional and more flexible LNG supplies increased, but still some 70%–80% of total imports are long-term contract based. As is well known, most long-term contract LNG supplies to Japan (as well as to other major LNG importing countries in Asia, such as Korea) are using similar crude oil price indexation. More specifically, Japanese (and Asian) LNG prices are determined by a pre-fixed price formula, negotiated and agreed upon by LNG suppliers and buyers of the contract, in which Japan's average crude oil import CIF price (so-called JCC) is used as a benchmark along with some other key components to reflect market conditions. Therefore, Japan's LNG import prices are directly influenced by Japan's crude oil import prices. In other words, LNG or natural gas supply-demand balances have a limited impact on short-term LNG pricing in Japan.

Because LNG is the main supply source of natural gas to Japan, LNG-receiving terminals play an important role in gas supply logistics. As of March 2012, 29 LNG-receiving terminals are in operation, owned and operated mainly by electric power companies and city gas companies in Japan. At this moment, 12 new LNG-receiving terminals are being planned or constructed.

Regional gas pipeline systems were established to meet local market needs in particular for each main economic and industry area in Japan, such as Kanto (Tokyo), Kansai (Osaka), Chubu (Nagoya), etc. But there is no national trunk pipeline system for natural gas, and thus pipeline connections between major areas in Japan are weak or nonexistent.

Political Trends

It is very important to note that Japan's LNG demand increased substantially after March 11 to offset the significant reduction in the nuclear power supply. The complicated political situation in Japan is the most important element influencing the recent past, present, and future of Japan's energy portfolio and LNG/gas demand. In particular, the Fukushima nuclear accident became a major part of the national debate of energy policy in Japan. In other words, to have a better understanding of the future of LNG/gas in Japan, it is crucial to analyze energy and nuclear policy debate and its complications first.

Thus, it is also very important to understand the major actors influencing the energy policy debate in Japan. These actors include the national government (Prime Minister and other ministers), bureaucrats, major political parties (the Democratic Party of Japan and the Liberal Democratic Party), advisory committees to help formulate energy policy, local governments, economic and industry circles, governments of important ally countries such as the US, etc. Public opinion, especially after the Fukushima accident, has also become an important element affecting the ideas and behaviors of the major actors.

Before March 11

Simultaneous achievement of the 3 Es has traditionally been a policy goal for Japan. To reach this goal, the promotion of nuclear power, together with enhancement of renewable energy and energy efficiency, has been regarded as a priority. There seemed to exist a kind of consensus in Japan, or at least no strong objections, with regard to the priority given to nuclear power among related actors and stakeholders. This consensus may have been well supported by the overall Japanese perception of Japan's energy vulnerability, described below.

Energy is essential for people's welfare, economic activity, and national governance. A stable energy supply (i.e., energy security) is of utmost importance for Japan as a country highly dependent on energy imports. In terms of supply and demand, Japan is one of the largest energy consumers and importers in the world, ranking fifth by primary energy consumption, third by petroleum imports, and first by LNG imports. Moreover, as of FY 2010, petroleum accounted for the largest share of the energy supply portfolio (45%), followed by coal and natural gas. The combined share of fossil fuels was 84% in FY 2010. Since Japan depends on imports for almost all fossil fuels, the energy self-sufficiency ratio is as low as 5% excluding nuclear power. Even if nuclear power is included as a "semi-indigenous" energy source, Japan's energy self-sufficiency ratio is 17%, which is significantly lower than that of OECD countries. Moreover, Japan depends on the Middle East for about 90% of its crude oil supply.

Considering this unique energy vulnerability, the Japanese government, led by the Democratic Party of Japan, released its Basic Energy Plan, which was approved by a cabinet decision in June 2010. This plan set targets of increasing the energy self-sufficiency ratio¹ (including equity-based energy imports) from the present level of 38% to 70% by 2030 and reducing CO₂ emissions by 30% as compared to the 1990 level. The key to achieving these targets was identified as increasing use of nuclear power. Nuclear power was judged to be critical to expand the contribution of electricity in the energy supply-demand structure while conserving total primary energy and meeting about 70% of the total electricity demand with nuclear power and renewable-based power. Since nuclear power is semi-indigenous and CO₂-free, the goal was to increase the share of nuclear power in the generation mix to more than 50%. To reach this ambitious target, the government planned to build 14 new reactors while maintaining the reactors at existing plants, thereby expanding the installed capacity of nuclear power generation in Japan from about 49 GW at present to 68 GW by 2030. In addition, the government aimed to raise the capacity factor at nuclear power plants to 90%. All stakeholders at this stage were working collaboratively to achieve the national goal of the Basic Plan.

¹ The energy self-sufficiency ratio can be defined as a combined figure of: a) the ratio of domestic energy production versus total primary energy supply and b) the ratio of imported energy sources that are developed and produced by Japanese companies versus total primary energy supply.

After March 11

The March 11 events and the Fukushima nuclear accident completely changed the landscape of energy policy in Japan. Firstly, the “safety myth” for nuclear power in Japan disappeared after the accident. Strong concerns over nuclear safety emerged in the Japanese general public. Secondly, the accident itself and the way it was handled by the government and the Tokyo Electric Power Company (TEPCO) resulted in deteriorated public confidence on nuclear policy and damaged trust in traditional energy policy circles, including the national government, METI, advisory committees, electric power companies, etc.

Of course, the authorities responsible for energy policy had to address the “energy difficulties” such as power shortage concerns and the energy-related and economic impacts of increased fossil fuel usage (the details of which will be discussed in the next section) caused by the March 11 events and the Fukushima accident. However, the authorities were then required to deal with the new political environment surrounding nuclear power and energy policy in Japan, as mentioned in the above paragraph. Thus, the government as well as METI, which is responsible for actual energy policy planning and implementation, became very cautious to treat nuclear power issues, including the restart of shut-down nuclear plants and the future role of nuclear power in Japan’s energy portfolio.

In concrete terms, the Fukushima nuclear accident necessitated a fundamental review of the Basic Energy Plan. TEPCO, owner and operator of the Fukushima nuclear power station, announced that it intends to decommission Units 1 to 4 at the Fukushima Daiichi Nuclear Power Station. Given the public’s concern about the safety of nuclear power plants, especially among residents living near nuclear power stations, the future status of other existing nuclear power plants and the possibility of building new reactors is uncertain. Under the circumstances, Japan had to embark on a fundamental review and potential reform of its energy policy, based on the new reality after March 11.

Various initiatives to review the energy policy started simultaneously. The two main initiatives were made by the Energy and Environment Council of the Cabinet Office and the Basic Issues Committee of the Advisory Committee on Energy and Natural Resources, housed in the Ministry

of Economy, Trade and Industry. The former, composed of ministers, has a higher status in the government structure than the latter. The Basic Issues Committee, whose specific mission is to review the Basic Energy Plan, has held over 30 sessions with experts since October 2011. As the discussion deepened, however, it became clear that it was very difficult to achieve a consensus due to the split of opinions among the 25 committee members on the role of nuclear power. A third of the members maintained a strong anti-nuclear stance, arguing the support of a wave of anti-nuclear public opinion in Japan. Finally, the committee agreed to produce four different scenarios for the energy (in reality, power generation) portfolio in 2030, and submitted them to the Energy and Environment Council for further discussion. The Energy and Environment Council then met for discussions selected the following three scenarios for nation-wide debate, determining that the final decision on the long-term target of the energy portfolio should be scheduled for the summer of 2012, with due consideration of each scenario's implications for the three "E's" (Energy security, Environment protection and Economic efficiency), safety, and macroeconomic protections for Japan. Although the detailed data was not identified for gas/LNG demand in the three scenarios, it was believed that the lower the share of nuclear power, the higher the demand for gas/LNG.

Table 1. Three Scenarios for Power Generation Portfolio in 2030

	Nuclear	Renewable	Fossil fuels	Distributed Power	Power Saving (from current plan)
Scenario 1	Zero	35%	50%	15%	10%
Scenario 2	15%	30%	40%	15%	10%
Scenario 3	20-25%	20-25%	35%	15%	10%

Note: The % share is for total power generation in 2030.

Innovative Energy and Environment Strategy and the Cabinet Decision

During the summer of 2012, the nation-wide debate organized by the government (National Strategy Division under the Cabinet Office) continued to discuss the three scenarios. But as time went by, the government seemed to be increasingly influenced by anti-nuclear public sentiments. The government was under pressure from large-scale anti-nuclear demonstrations held every Friday night in the districts of Kasumigaseki and Nagata-Cho, the center of Japan's politics. Opinion polls conducted by the government during the course of the national debate seemed to suggest that the majority was in support of even Zero or lower nuclear scenarios. Some influential media sources and celebrities continued to support anti-nuclear campaigns. Under the circumstances, the politicians and the government faced additional pressure from the approaching lower house elections.²

On September 14, the Energy and Environment Council finally decided to adopt the “Innovative Energy and Environment Strategy,” which clearly states that Japan should pursue the establishment of a nuclear-independent society as soon as possible. The strategy also stated that all possible policy resources should be used to achieve a “zero nuclear” policy sometime in the 2030s. This new policy, although it had no concrete timetable or work plan to achieve its goal, was received by stakeholders quite differently. Interestingly, the strategy was questioned and criticized by some local governments (e.g., the Aomori government), economic and industry circles (Keidanren), and the US government.

The Aomori government questioned the strategy from the viewpoint of consistency of nuclear fuel cycle policy. The Aomori government had continued to support the nuclear policy of the national government, in particular by agreeing to host the controversial Rokkasho nuclear fuel cycle plant. But the important condition for Aomori was that nuclear spent fuel treated in the Rokkasho plant should be viewed as “energy resources for recycling,” not as “waste.” (The Aomori government claimed that Aomori should not be a place for waste disposal.) If Japan pursues a “zero nuclear” future as stated in the strategy, there will be no need to reprocess spent

² It is also important to note that the popularity of the government had eroded because of the perceived “mismanagement” of domestic economic policies as well as other important policies including diplomatic policies toward the US, China, Russia, and others. This unpopularity may have become another factor pressuring the government to bend to public opinion, which seemed to support zero nuclear policy.

fuels, which will thus be regarded as waste. The Aomori government may then send the stored spent fuels in the Rokkasho plant back to the original nuclear power plants that produced them. This may cause another very serious political problem for local governments of each nuclear power plant site as well as for power plant operations.

Keidanren and other industry circles in Japan criticized the strategy from the viewpoint of the country's economic security and wellbeing. They argued that economic cost of zero nuclear policy could be extremely high for Japanese economy and industry competitiveness.³ As Japanese industries were suffering from difficult business environments including high energy costs, the industries were very concerned about possible negative economic outcomes of the zero nuclear option.

Last but not least, it was reported that the US government expressed concerns over the negative impact of Japan's zero nuclear policy on US-Japanese relations, and thus US national interests were influential. In this regard, it may be useful to refer to the points made in the Armitage-Nye report "The U.S.-Japan Alliance: Anchoring Stability in Asia" released last year, which argued that the zero nuclear option may be a serious risk to Japan's tier-one country status at a time when the US needs a strong Japan as an ally in the rapidly changing geopolitical environment in the Asia-Pacific region due to the rising power of China.

Under the circumstances, the government held a cabinet meeting on September 19 to conclude a decision on new energy policy by referring to the strategy. According to the cabinet's decision, the establishment of new energy policy should be based on responsible discussion with local governments and international society as well as an understanding of the preferences of Japanese citizens, with a continuous check-and-review process. In other words, flexibility and uncertain factors surrounding the future of Japan's energy portfolio further increased after the cabinet issued their decision.

³ According an estimate by the Institute of Energy Economics in Japan, zero nuclear policy may result in an average electricity cost run-up of 3.4 yen/kWh, which is equivalent to a 36% hike in power rate for industry users in Japan.

Lower House Election on December 16, 2012

After the cabinet decision, the Japanese political situation continued to be unstable as criticism from the Liberal Democratic Party (LDP), the leading opposition party, became increasingly fierce toward many important policies of the Democratic Party of Japan (DPJ) government. At last, the then Prime Minister Noda decided to call for lower house elections to reshuffle the Japanese political scene.

During the election campaign up to the election date of December 16, agendas such as economic policy, social security policy, and diplomatic policy together with energy policy were regarded as important for voters' interests. With respect to energy policy, many political parties, including DPJ, supported the concept of "zero nuclear" or "nuclear phase-out" (although the timing of the "phase-out" differed greatly throughout the parties), while LPD alone continued to take a stance that favored restarting the existing nuclear power stations in Japan and emphasizing the importance of the "best energy mix" for Japan.

The result of the election turned out to be a landslide victory for LDP, which took a majority of the seats in the lower house alone and over two-thirds of the seats if combined with Kohmei Party as an alliance party. With this new political situation, it is quite likely that Japan will start another round of energy policy review under the LDP government headed by prime minister Shinzo Abe. Since Prime Minister Abe and the LDP continued to criticize the DPJ's energy policy during the election campaign, it was expected that the Abe government would take a more supportive stance toward the best utilization of nuclear power in Japan's energy portfolio while enacting stringent enhancements of nuclear safety and trying to restore the public credibility of nuclear policy. But as the LDP (and the Kohmei Party) remained a minority in the upper house, it was still uncertain how the national debate on energy policy would progress. Much would depend on the outcome of the upper house elections in July 2013.

LDP and the Kohmei party again won a landslide victory in the elections in July, gaining a majority in both houses of Japan's legislature. During the upper house election campaign, Abe and the other LDP leaders continued to argue that nuclear power plants could be restarted if and when the plants passed the safety review based on the new Safety Standard published by the

Nuclear Regulatory Authority (NRA) of Japan. At the same time, it is important to remember that there are still strong safety concerns about nuclear power for ordinary citizens in Japan (especially for those in the nuclear-disaster affected areas), and so issues related to restarting nuclear power are sensitive. Under the circumstances, the role of the NRA is very important for both enhancing nuclear safety in technical and operational terms and regaining public trust in nuclear regulation and policy.

Political Factors Affecting Gas Security of Supply Policy

As discussed earlier, the outlook for gas/LNG demand will be significantly affected by the political situation and eventual decision on energy (and nuclear) policy. But it is worth discussing other political factors that may impact the gas/LNG security of supply for Japan. Since Japan is almost completely dependent on imports for its gas supply, substantial growth of LNG imports after the March 11 events created a serious challenge with regard to security of gas supply, in terms of both quantity and price.

A simple, clear policy solution for natural gas (LNG) supply security is to increase supply capacity of natural gas (LNG) to Japan in order to meet growing demand, and also to diversify its supply source. In this regard, a noteworthy possibility emerged that the number of LNG and natural gas supply potentials available for the Japanese (and Asian) market is growing in many parts of the world.

LNG Imports from North America

One of the most important developments in the global gas market is the ongoing “shale gas revolution” in the United States. The shale gas revolution has profound implications for the US gas market such as: gas supply glut; lower gas prices; gas demand responses in the power generation, industry, and even transportation sectors; reduced requirements for LNG imports; and possibilities of LNG exports.

In particular, emerging possibilities of LNG exports from the US and Canada are attracting strong attention from Asian LNG market players, including Japanese buyers. This is happening for several reasons. First, the LNG export potential from North America is very large. A simple

calculation adding up all the planned LNG export projects in the US indicates LNG export potential may reach as high as 200 million tons, although not all of these planned projects will materialize in the real market. Second, at current price differentials, Asian buyers may be able to procure LNG from the US at significantly lower prices than the current prices in Asia, even taking into account necessary costs to liquefy natural gas and ship it to the Asian market. For example, assuming that the US Henry Hub price is \$3–\$4 and the necessary cost mentioned above is \$6, the delivered LNG price from the US (such as the Sabine Pass project) is calculated at \$9–\$10, which is quite lower than the current Asian LNG prices of \$16–\$18. Finally, if Asian buyers can successfully import LNG from the US (which is based on Henry Hub pricing), this means diversification of not only import source but also the pricing mechanism of LNG procurement.

Of course, importing LNG from the US is not entirely simple. First, determining how many LNG export projects can be realized (for Japan in particular) is a matter of economic and political considerations. The latter includes the issues of permitting LNG exports to non-FTA countries (the US does not have a free trade agreement with Japan) and managing the impact of LNG exports on domestic gas prices.⁴ On this note, the US Department of Energy published a widely read report in 2012 analyzing the impact of US LNG exports on the domestic economy, which concluded that US LNG exports will have net economic benefits. After the publication of the report, it is expected that the domestic debate in the US on the pros and cons of exporting LNG will heat up among related stakeholders in the country.

Japanese companies have accelerated efforts to secure US LNG exports originating from shale gas. On April 17, 2012, Mitsui & Co. and Mitsubishi Corp. stated that they have broadly agreed to secure 4 million tons in LNG exports each, including those possibly exported to Japan, from Sempra Energy Inc., which is planning to export LNG from the Cameron LNG-receiving terminal in Louisiana. On April 27, 2012, Tokyo Gas Co. and Sumitomo Corp. stated that they have reached a broad agreement with Dominion Cove Point LNG L.P. to liquefy natural gas at an annual volume of 2.3 million tons at the Cove Point LNG Terminal in Maryland and launched

⁴ In this connection, it is useful to note that oppositions for LNG export are largely from domestic gas-consuming industries such as petrochemical and power companies which are benefiting from lower gas prices from industry competitiveness viewpoints.

negotiations on their final agreement. On July 31, 2012, Chubu Electric and Osaka Gas announced that they have agreed to secure 4.4 million tons in LNG exports each, including those possibly exported to Japan, from Freeport LNG Development, which is planning to export LNG from the Freeport LNG-receiving terminal in Houston.

For the above projects, various negotiations and construction are necessary before final agreements can be reached. In order to enable US LNG to be exported to Japan, project participants will also have to negotiate with the US government to acquire licenses for LNG exports to countries that do not have free trade agreements with the United States. The Japanese government is expected to support the projects by enhancing dialogue with the US government on the issue of LNG export permits. In this regard, an important decision was made by the US Department of Energy in May 2013 to permit LNG exports from the Freeport LNG project to non-FTA destinations. This recent progress in deals for LNG exports to Japan represents a great step forward for Japan's stable LNG procurement and supply.

Russia, a Significant Emerging Player in Asia

Russia currently makes most of its oil and gas income from exports to Europe. In Europe, however, energy demand has slackened due to the economic crisis. In addition, LNG supply from the international market, cheaper than pipeline gas from Russia, has been flowing into Europe. Furthermore, gas demand in Europe is now being depressed by cheap coal and policy-driven renewable energy sources. Russia's energy (especially gas) exports to Europe thus face a difficult situation. Russia's negotiations with Germany's E.ON and other major Russian gas buyers about pricing formula revisions and price cuts have run into rough waters.

Therefore, Russia and President Putin himself are now looking to the East, specifically Asia and the Asia-Pacific region. Asia contains important markets, including China that is expected to drive global oil and gas demand growth. Natural gas demand is expected to grow in almost all Asian countries, especially in Japan, where gas demand soared after the nuclear plant accident triggered by the Great East Japan Earthquake. Expanding exports to Asian markets is significant for Russia's regional economic strategy of boosting underdeveloped Eastern Siberia and Far East regions. Energy is the most important issue for Russia to grow into its regional role as an Asia-

Pacific country. This is the reason why Russia placed priority in its energy agenda at the annual summit of the Asia-Pacific Economic Cooperation Forum in Vladivostok in September 2012.

Russia is already an important LNG supplier to Japan since its start of LNG exports from the Sakhalin-2 project in 2009. In FY 2011, Japan's LNG imports from Russia stood at 7.8 million tons, accounting for 9% of its total LNG imports. Furthermore, Russia has a huge potential for natural gas and LNG exports to Asian markets, including Japan, considering its resource endowment in Sakhalin and East Siberia. The Russian government is keen to promote several important LNG and natural gas projects for Asian markets. The Vladivostok LNG project is a typical example, but other options such as the third LNG train of Sakhalin-2, the Russia-North Korea-South Korea gas pipeline project, further development of Sakhalin-1 and -3, and others are also attracting regional attention. In this regard, it is important to pay attention to such new developments as emerging aggressive activities if Russian state oil company Rosneft, with Putin's permission, is to explore new market possibilities in Japan, China, and Korea (including possible LNG export liberalization).⁵ Igor Sechin, CEO of Rosneft, visited Japan, China, and Korea on several occasions and met with high-level government officials and industry executives to discuss Russian gas export from Sakhalin-1. During his visit, Sechin made a strategic partnership agreement to develop a Far East LNG project in April 2013. A pipeline option from Sakhalin to Japan has emerged as a possibility among the stakeholders, although this option (as well as others) has serious technical and economic hurdles to overcome. It is also important to note that there is a political hurdle for further enhancement of Japanese-Russian cooperation, namely the unresolved northern territory issue. Thus, Russian gas potentials may be viewed as a mid- to long-term option for Japan and Asian countries, but its huge resources and geographical proximity should never be neglected.

Australia, Growing LNG Exporter

Australia is one of the most significant LNG suppliers in the world, especially with respect to exports to the Asian market. In FY 2011, Japan imported 13.6 million tons of LNG from Australia, which accounted for 16% of Japan's total LNG imports of the year. Australia is the third largest LNG supplier country to Japan, after Malaysia and Qatar. The significance of

⁵ Gas exports are currently monopolized by Gazprom, according to Russian law.

Australia is that it has numerous LNG projects in the construction and planning phases. Thus it is expected that Australia may become the world's largest LNG exporter, surpassing even Qatar, before 2020. Thus the speed and degree of LNG capacity expansion in Australia is a key factor influencing LNG supply-demand balances in the Asia-Pacific market.

The Middle East and Africa

Japan's LNG imports from the Middle East (Qatar, United Arab Emirates, and Oman) in FY 2011 reached 24.1 million tons, accounting for 29% of its total imports. Of the total, imports from Qatar were the largest at 14.3 million tons (a share of 17%). Although it is unlikely that there will be an increase in LNG supply capacity in the region in the short- to mid-term, the Middle East—in particular, LNG from Qatar—will continue to play a very important role in the Asian market because it has the world's largest LNG supply capacity at this moment, is strategically located between the Asian and Atlantic markets, and has the role of “swing supplier.” In addition, LNG export capacity in the region may be expanded in the long run, backed by the world's largest conventional gas reserves in the region.

Africa is also viewed as a significant LNG supplier region to the world as well as to Asia. LNG supply capacity expansion in such countries as Nigeria has been very substantial up to now, and in the future, increased LNG supply capacity is expected from countries such as Mozambique,⁶ where Japanese company Mitsui & Co. participates in natural exploration projects to find a giant gas resource.

Cooperation with Natural Gas Consumers

It is natural that each buyer and importer of LNG is competing for the best procurement for individual specific need/requirement. In this regard, Japan and other LNG consumer/importer country are in competing relation in the world LNG market. At the same time, however, it is also true that all the LNG consuming countries are able to share common interests as a buyer or user of LNG.

⁶ Investment opportunities in Tanzania are also attracting attention.

In particular, Japan has very important regional neighbors that consume LNG or natural gas, namely Korea, China, and Taiwan in the Northeast Asian market. LNG imports in the Northeast Asian market (including Japan) stood at 189.2 BCM, accounting for 57% of global LNG trade. In addition to the Northeast Asian market, LNG imports are increasing or expected to start and increase in India and ASEAN countries. Under the circumstances, it is crucial to promote cooperation between Asian LNG and natural gas consuming countries to address common challenges for gas supply security. In this interest, the first Asian LNG Market Forum was organized in Shanghai in November 2012 to discuss cooperation among Asian LNG-consuming countries. Participants from China, India, Japan, Korea, and Taiwan discussed LNG supply-demand prospects and common market challenges. And then, cooperation among Northeast Asian market, where not only LNG issues but also issues related to region-wide gas pipeline network planning can be an agenda for discussion, will be very important for all the regional members.

At the same time, geopolitical tensions were heated among Northeast Asian countries with regard to territorial problems. In particular, Japanese-Chinese relations deteriorated significantly over the Senkaku Island issue, while Japanese-Korean relations were also tense due to the dispute over Takeshima island and other factors. Considering the political situation in both countries, including rising nationalism, it is unlikely that bilateral relation will dramatically in the near future.

LNG Producer-Consumer Dialogue

For the purpose of developing and stabilizing LNG markets, it is essential to promote a mutual understanding of the interdependence between LNG producers and consumers. Producer-consumer dialogue for oil market players has a long history after the experiences of the past oil crisis in the 1970s. But there is still no LNG producer-consumer dialogue framework, although large-scale international conferences for natural gas and LNG exist, such as the World Gas Conference.

In this regard, the Japanese government played an important role in organizing the first-ever LNG producer-consumer dialogue conference held in Tokyo September 18–19, 2012. The

purpose of the dialogue was to provide a platform for LNG producers and consumers to discuss the market outlook, pricing, related new technology, etc., in order to promote better understanding of common challenges for mutual prosperity. The Japanese government hoped that Japan, as the largest LNG-consuming country, could play a role to prepare for a platform of dialogue. The first LNG Producer-Consumer Conference enjoyed global attention, attracting over 700 high-level participants including six energy ministers from major producing and consuming countries as well as CEO-level top management representatives from major companies in connection with LNG business. The Japanese government is planning to make the conference a regular annual event.

Promotion of Gas Upstream/Midstream Investment by Japanese Companies

Hoping to enhance natural gas and LNG security of supply, the Japanese government is now promoting upstream and midstream investment by Japanese companies in the gas/LNG supply chain. The government is keen to use resource diplomacy toward resource-rich regions such as Russia, East Africa, the Middle East, South East Asia, and North America. Government-related entities such as Japan Oil, Gas and Metal Corporation (JOGMEC) and Japan Bank for International Cooperation (JBIC) are giving financial support to Japanese companies investing in these regions. Japanese upstream oil companies, trading houses, and power and gas utility companies are keen to explore economically viable investment opportunities in gas/LNG supply chains.

In addition to the above-mentioned efforts toward international aspects of LNG security of supply policy, the Japanese government is also trying to promote initiatives in the domestic gas market for the purpose of enhancing gas security of supply.

Gas Pipeline Network

To enhance natural gas pipeline connections in Japan, the government established a special study committee, METI, and discussion on how to promote gas pipeline connections nation-wide is underway. Based on the experience after the March 11 earthquake and tsunami when the existing gas pipeline from Niigata to the disaster-affected area of Sendai played an important role as an

alternative gas supply source, METI is keen to promote pipeline connections between major areas of Japan in order to enhance the resilience and security of Japan's gas supply network.

Enhancement of Emergency Preparedness

In parallel with the above efforts, discussion is also underway on how to enhance emergency preparedness for gas supply. This is due to the combined effects of Japan's increased dependence on LNG, particularly from the Middle East, after March 11; higher risk perceptions about Middle East oil and LNG supplies due to the ongoing Iranian crisis; limited LNG stockpiling in Japan; and other factors. While it is widely understood that LNG stockpiling is very costly, Japan is considering using depleted natural gas fields as underground gas storage.

Economic Factors

In addition to political factors, economic factors such as economic growth and price competitiveness influence the outlook for gas/LNG demand in Japan.

Economic Growth

According to the "Japan Revival Strategy" of the Japanese government, published in July 2012, desirable real GDP growth rate is targeted at about 2% until 2020. However, the actual average GDP growth rate for Japan from 2000 to 2012 stood at 0.8%, with negative growth recorded in 2008, 2009, and 2011. Mid-term growth estimates by the International Monetary Fund (IMF) indicated that for the period 2011–2017, average growth is projected at 1%. With due consideration to the reality of economic difficulties in Japan (discussed in the next section) and the condition of the world economy, a mid-term growth target of 2% may be optimistic.

For the purpose of long-term energy projection, forecasting institutions normally adopt the economic growth rate as a major assumption of their forecast. For example, both the International Energy Agency in "World Energy Outlook 2012" and the Institute of Energy Economics, Japan (IEEJ) in "Asia/World Energy Outlook 2012" assumed Japan's annual average GDP growth rate for the period 2010–2035 to be 1.2%.

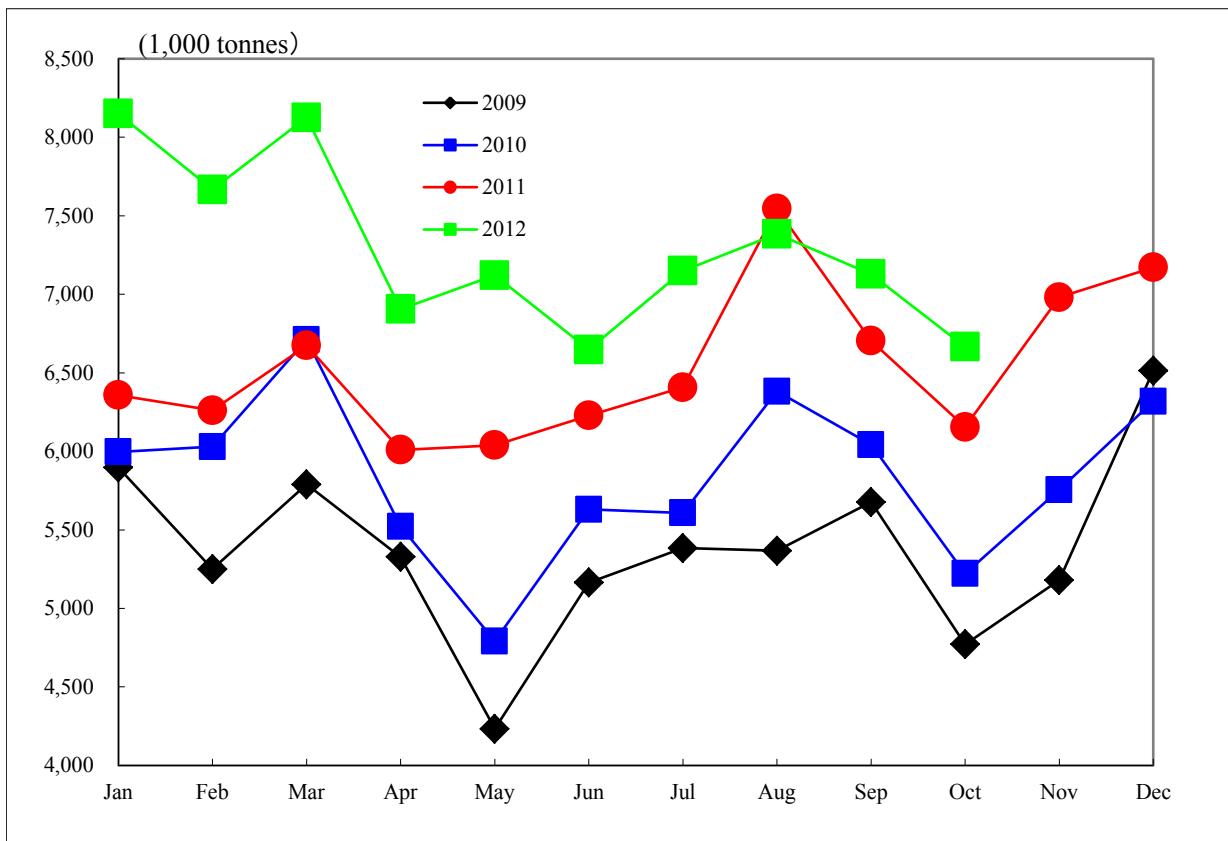
Economic Difficulties

The Japanese economy was expected to show steady growth for the years 2011 and 2012 because of the contributions from reconstruction demand after the March 11 events and the recovery of the world economy. In reality, however, actual growth turned out to be depressed for both years due to delayed reconstruction, the Eurozone crisis, slowdown of the Chinese economy, damaged economic relations with China because of heightened geopolitical tensions, and other factors. An IEEJ estimate shows that Japan's real GDP growth rate is expected to be 0.3% for FY 2011 and 0.9% for FY 2012.

Another economic difficulty for Japan that emerged after March 11 is the negative impact of substantial increases in fossil fuel imports on the Japanese economy and energy security. Japan avoided serious unexpected power shortages during the summers of 2011 and 2012, partly due to the restart of Ohi nuclear plants. However, the reduced nuclear power generation after the Fukushima accident led to a substantial increase in natural gas and oil for power generation, which in turn caused an increase in LNG and oil import payments, an increase in cost of power generation, a decline in Japan's energy self-sufficiency, an increase in CO₂ emissions, and other problems.

Figure 4 shows monthly LNG import trends in Japan. It clearly indicates that Japan's monthly LNG import volume after April 2011 is much higher than in previous years. Natural gas (LNG) is the most preferred energy source to replace reduced nuclear power generation in the short-term. This is due to several reasons, such as: renewable power generation (such as wind, solar, etc.) cannot be increased quickly enough; natural gas is cleaner than coal and oil; LNG-fired power generation is positioned as "middle-peak" load—thus there is enough room to increase capacity utilization (while coal-fired power generation, as a base-load power source, has limited room to further increase capacity utilization); and the power generation cost of LNG is better than that of oil-fired generation. While nuclear power generation continued to fall after March 11th, LNG fired power generation kept higher utilization, which resulted in higher LNG imports in Japan.

Figure 4. Japan's Monthly LNG Imports



Source: Ministry of Finance Statistics

As a result, Japan's LNG imports in FY 2011 reached record-high 83.2 million tons, up 18% or by 12.7 million tons from FY 2010. The latest IEEJ estimate (December 2012) indicates that the LNG import is expected to reach 88-89 million tons in FY 2012 and 2013.

Problems Caused by Increase in LNG Use for Power Generation

Increase in LNG and Oil Import Payments

In the case of LNG imports, Japan's import payment in FY 2011 reached a record high at 5.40 trillion yen (\$68 billion), up 52% or by 1.85 trillion yen (\$23 billion) from FY 2010. This unprecedented increase, together with an increase in other fuel (oil and coal) import payment, contributed to Japan's highest trade deficit in its history at 4.4 trillion yen (\$55 billion) in the same year. Incremental import payment for LNG, crude oil, and oil products in total reached 4.63 trillion yen (\$58 billion) for FY 2011, almost equal to the trade deficit of that year. This is a very substantial "outflow" of the national wealth of Japan. According to IEEJ's estimate

mentioned earlier, Japan's fossil fuel (oil, gas, and coal) import payment will increase from 18.1 trillion yen (\$226 billion) in FY 2010 to 24.2 trillion yen (\$303 billion) in FY 2012, and to 23.4 trillion yen (\$293 billion) in FY 2013 in its reference case projection. Under this analysis, Japan's trade deficit will reach 7.1 trillion yen (\$89 billion) for FY 2012 and 6.3 trillion yen (\$79 billion) for FY 2013, meaning that Japan will suffer from a trade deficit for three consecutive years. Furthermore, it is important to note that the recent depreciation of the yen under the effects of "Abenomics" has impacts on the higher energy import bill in yen-based amount.

Increase in Costs for Power Generation

Increased import payment for fossil fuels has resulted in higher costs for power generation. The IEEJ estimate shows that the increase in import payment for fuels for power generation purposes will be 3.6 trillion yen (\$45 billion) in FY 2012 and 3.1 trillion yen (\$39 billion) for FY 2013 as compared to FY 2010. If the incremental payment amount for FY 2013 is divided by Japan's total power generation (about 890 billion kWh), increase in power generation cost is calculated at 3.4 yen (43 cents) per kWh from FY 2010 levels. The estimated cost increase is significant; given the amount is equivalent to a 15% increase in the power consumption bill for an average household in Japan and equivalent to about a 40% increase for large-scale industry users. The possible increase in power consumption bills will become a serious challenge for civil life and industry competitiveness in Japan. As Japanese industries have continued to suffer from higher energy costs, beginning even before the March 11 events, a further run-up of energy costs due to lower nuclear contribution was perceived as a serious threat to sustainable business operations in Japan. In addition, not only power price increase but also potential power supply instability have become a source of concern for Japanese industries with regard to the soundness of business environment.

Impacts on Energy Self-Sufficiency and CO2 Emissions

Increase in LNG and oil use in power generation results in lower energy self-sufficiency in Japan, as oil and LNG are imported energy to Japan while nuclear power is regarded as a "quasi-domestic energy source" in Japan. The IEEJ estimate indicated that Japan's energy self-sufficiency in total primary energy (nuclear energy counted as domestic energy) will decline from 17.7% in FY 2010 to 6.7% in FY 2012 and to 7.8% in FY 2013. CO2 emission will also

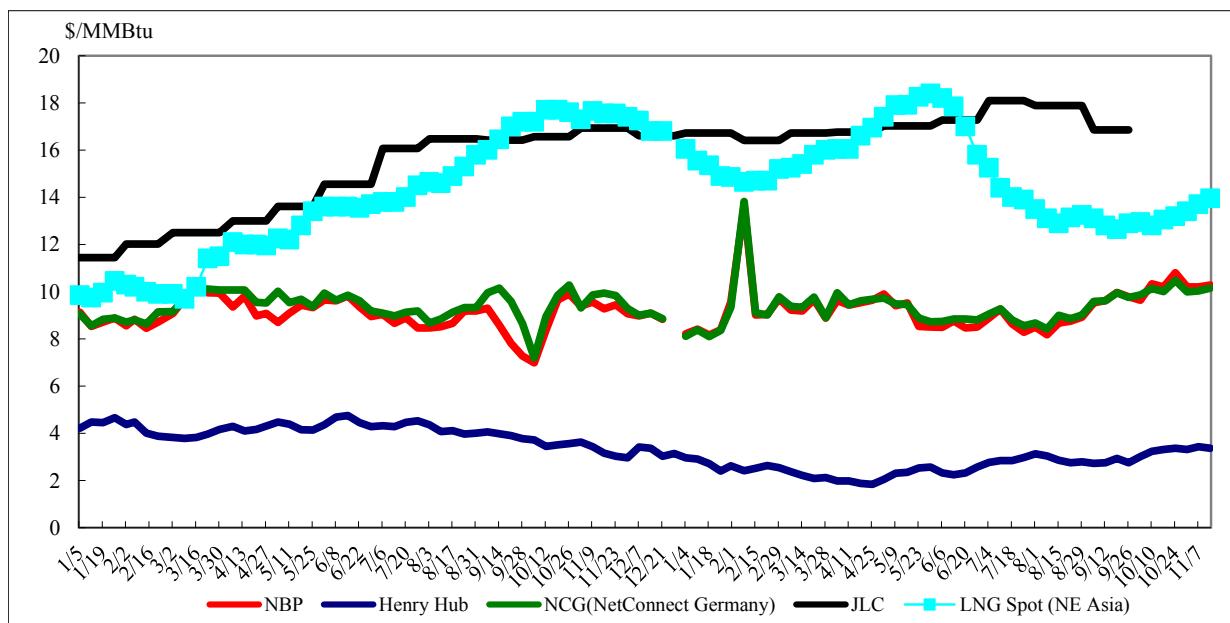
increase because of higher fossil fuel use to replace nuclear power. According to IEEJ estimate, Japan's energy related CO₂ emissions will increase from 1.12 billion tons (6% higher than that in FY 1990) in FY 2010 to 1.22 billion ton (15% higher) in FY 2012 and 1.20 billion ton (13% higher) in FY 2013. Thus, additional efforts, including the use of GHG credit by the government and industry, may be required to comply with the Kyoto target.

Gas Price Competitiveness

In the above-mentioned situation, stable procurement of fossil fuels for power generation has become one of the most important items on the energy agenda for policymakers and industry circles. In particular, stable procurement of LNG at a more competitive price is now being regarded as a very important challenge. This is not only because of a substantial increase in LNG import volume (a requirement), but also because of the recognition that the current LNG import price in Japan is much higher than that in US and European markets. The problem is now being quoted in Japan as the “Asian premium in LNG price,” and attracts very wide attention in Japanese policy, industry, and media circles.

Actually, Japan's LNG import (CIF) prices continued to rise after March last year, and both long-term contract LNG prices and spot LNG prices are hovering at about \$16-18/MMBTU recently. Although natural gas or LNG is basically the same commodity, the current European price at their trading hubs is around \$8-9/MMBTU, and the US benchmark Henry Hub price is around \$3-4/MMBTU. The observed price differentials between Japan and the US in particular are so large that a strong argument has emerged in Japan for Japanese buyers to further enhance efforts to procure LNG at more “reasonable” prices from a viewpoint of international comparison.

Figure 5. Natural Gas and LNG Prices in the US, Europe, and Japan



Source: Data from Energy Intelligence Group

Of course, this is a very complicated problem, and basically a market phenomenon. The big price differential between Japan and the US is attributable to the completely different market structure and the related recent market developments:

- 1) Japan's (long-term) LNG price is indexed to its crude oil import CIF price, and thus has basically nothing to do with gas (LNG) market supply-demand balances in the short term. Under the circumstances, the higher crude oil price since early 2011, caused by such geopolitical problems as the Arab Spring and Iranian nuclear crisis, resulted in higher LNG prices in Japan;
- 2) US natural gas price is determined solely by gas supply-demand. Gas prices in the US continued to decline because of the impacts of the ongoing "shale gas revolution", under which the increase in shale gas production created an oversupplied market.

Therefore, it is fair to say that it is not at all an easy task to reduce the Asian Premium although Japanese buyers wish to do so. The difference in market structure and market development is a fact, which requires the Japanese government and buyers to address this issue from various approaches based on mid- to long-term strategic viewpoints discussed in the "Political Trends" part of this paper.

Efficiency Improvement by Introducing Advanced CCGT

While natural gas (LNG) utilization in the power sector is expected to continue to play an increasingly important role, it is also essential to promote more efficient use of natural gas in the sector by promoting efficient improvement in the use of gas. This is important because efficient utilization of natural gas can conserve natural gas use in the primary energy supply base, thus reducing the import requirement for Japan.

According to industry hearings, as many as 18 MW of aged and rather low-efficient LNG-fired power generation plants are in full operation now, because of the special circumstances after March 11. An estimate shows that about 7 million tons of LNG consumption can be saved if the low-efficient plants mentioned above are replaced by advanced CCGT. Considering the reality of the market, however, step-by-step or gradual replacement of aged and low-efficient plants is likely to be considered and implemented.

Scenarios

There is huge uncertainty about the future outlook of gas/LNG demand in Japan. Under such circumstances, it is possible to have widely different scenarios for the future of the gas/LNG situation in Japan. To develop future scenarios, the most important thing to do is to select an appropriate and useful “branching point” of the scenarios. The branching point should be the element with the highest uncertainty over its occurrence as well as the largest impact when it occurs.

There are so many important factors that can affect Japan’s gas/LNG demand for the future as discussed so far, but considering its uncertainty and impact, the branching point for the Japan case should be the future of nuclear power generation. In other words, the scenarios for the outlook of gas/LNG demand in Japan will depend on whether the LDP government is able to re-establish nuclear policy with enhanced safety and public trust. Depending on the answers to the above question, we may have such scenarios as:

- A) Maintaining nuclear share scenario (at 20-25% of total generation in 2030);
- B) Reduced nuclear share scenario (at 10-15% of total generation in 2030); and
- C) Nuclear phase-out scenario (zero nuclear contribution in 2030).

Table 2 (below) shows the estimated primary energy demand in 2030 by scenario, and Table 3 shows the outlook for gas/LNG demand by scenario. As shown in the tables, gas demand in Japan will be very much affected by the future of nuclear power generation, and the difference in gas demand for Scenario (A) (20-25% nuclear contribution) and (C) (zero nuclear) is as large as 41 MTOE (34 million tons of LNG) in 2030, which will have important implications for the global gas/LNG market. It is important to note here that the actual LNG import level of Japan in the short and medium term will be restrained by capacity limitation of LNG-receiving terminals, port/loading capacity at about 90 million tons. Thus it will require substantial investment and lead-time to reach import levels beyond 90 million tons.

At the same time, however, the relative importance of gas in Japan's energy portfolio (the share of gas in total primary energy) will be bigger in any case if compared to the current situation. In this regard, security of gas supply in terms of both quantity and price will be increasingly important for Japan in any future scenario. Of course, it is also important to note that the higher the share of gas, the more difficult the related challenges will be. In this case, supply diversification policy and international gas strategy for Japan will be crucial in particular.

Table 2. Outlook for Japan's Primary Energy Demand in 2030 MTOE

	Nuclear	Natural Gas	Oil	Coal	Hydro	Others
(A) Scenario	62	84	133	92	10	44
(B) Scenario	44	120	154	121	8	29
(C) Scenario	0	125	157	128	10	44

Source: Prepared by author

Table 3. Outlook for Japan's Gas Demand in 2030 MTOE (LNG million tons)

	1990	2000	2010	2020	2030
(A) Scenario	44 (36)	66 (54)	86 (71)	90 (74)	84 (69)
(B) Scenario	44 (36)	66 (54)	86 (71)	105 (86)	120 (98)
(C) Scenario	44 (36)	66 (54)	86 (71)	114 (93)	125 (103)

Source: Prepared by author

Conclusion

The outlook for gas/LNG demand in Japan will be affected by many uncertain political and economic elements. But the single most important element is the impact of national decisions on the future of nuclear power in Japan. The largest difference in gas demand in Japan in 2030 between the various scenarios may be as high as 41 MTOE (34 million tons of LNG), which may significantly influence the global LNG market.

In any scenario, gas is expected to play an increasingly important role in Japan's energy portfolio, which will require the Japanese government and industry to enhance both domestic and international gas security of supply policy. To enhance supply diversification policy, international gas relations with such major players as the United States, Russia, Australia, Qatar, Mozambique, and others, will be a key strategy for Japan. Japan will also be required to explore and enhance cooperation with major gas-consuming countries in Asia such as China and Korea, both of which are sources of geopolitical tension for Japan, to address common challenges as consumers and importers of gas/LNG, including the issue of the "Asian premium in LNG price."