



Japan's Energy Security Challenges: the world is watching

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**JAPAN'S ENERGY SECURITY CHALLENGES:
THE WORLD IS WATCHING
by Linda McCann, CDSS student 2012**

'This time of hardship is the ideal moment for Japan to overcome its inward-looking tendency and soar like a dragon, fulfilling more actively than ever the role we are called upon to perform in the world'¹

Koichiro Gemba, Japan's Foreign Minister

Introduction

On 11 March 2011, an earthquake registering 9.0 on the Richter scale struck off the north east coast of Japan. The earthquake and subsequent tsunami resulted in the death of over 20,000 people and caused over Y20 trillion worth of damage – making it the costliest natural disaster ever. The earthquake and tsunami caused a major meltdown of three reactors at Japan's Fukushima Daiichi nuclear power plant, resulting in tens of thousands of people being evacuated and eventually resulting in the shut down of all Japan's nuclear power plants. Sixteen months on, Japan is still to decide if the nuclear accident will eventually lead to Japan rejecting nuclear power-generated electricity over the longer term.

Japan was facing significant energy security challenges before the triple disaster of 2011. Scott Valentine et al noted in January 2011 that 'Japan is the most vulnerable of all OECD nations in terms of energy supply security'.² With almost no indigenous energy resources, Japan relies very heavily on imported energy resources to fuel its economy and society. In 2010, Japan imported about 96 per cent of its energy requirements. Almost half of the energy Japan consumes is oil and, in that year, Japan imported almost 90 per cent of its oil from one of the most politically unstable regions in the world - the Middle East.³ Japan also relies on the Middle East for some

¹ Koichiro Gemba, 'Foreign policy speech by Minister for Foreign Affairs to the 180th session of the Diet', *Ministry of Foreign Affairs of Japan*, 24 January 2012, available at <http://www.mofa.go.jp/announce/fm/gemba/speech_120124.html>, accessed 2 July 2012.

² Scott Valentine, Benjamin Sovacool and Masahiro Matsuura, 'Empowered? Evaluating Japan's national energy strategy under the DPJ administration', *Energy Policy* (2011), p. 1865.

³ 'Energy in Japan 2010', *Agency for Natural Resources and Energy*, p. 31, available at <<http://www.enecho.meti.go.jp/topics/energy-in-japan/english2010.pdf>>, accessed 15 May 2012.

of its gas imports, approximately 27 per cent in 2011.⁴ Japan is the world's largest importer of LNG and the second largest of coal.⁵ In addition, Japan has committed to significant greenhouse gas emissions reductions as part of the Kyoto Protocol and meeting these targets with Japan's current energy mix will be difficult.

The nuclear accident has brought a new level of focus on Japan's energy security challenges - the world is now watching Japan to see how it will deal with the implications of the nuclear meltdown at the Fukushima Daiichi power plant. While nuclear power only accounted for 13 per cent of Japan's overall primary energy consumption before the accident,⁶ Japan relied on nuclear power as a pillar of its central energy security strategy, as a way of achieving stable electricity supply with virtually no greenhouse gas emissions and reducing dependence on oil. Nuclear power was responsible for 30 per cent of Japan's electricity consumption before the accident and there were plans to increase this to 50 per cent by 2050.⁷

Most countries face energy security challenges of varying degrees of urgency, such as guaranteeing access to sufficient energy when the world's oil runs out in 40 years.⁸ With projections of 1.9 per cent per annum growth in global energy consumption to 2030, and approximately one half of this growth occurring in Asia, all countries, especially Asian net energy importing countries, will have to make some difficult decisions in the years ahead.⁹ Northeast Asia in particular now imports almost 80 per cent of its oil.¹⁰ As economic growth continues, this figure is likely to increase.

This paper will argue that Japan was facing some significant energy security challenges before the triple disaster of March 2011, most notably a very low energy self sufficiency ratio and a heavy reliance on the Middle East for oil. The meltdown at the Fukushima Daiichi plant has thrown Japan's long term energy plans to address

⁴ For comprehensive statistics on Japan's energy imports in 2011 see 'Japan', *US Energy Information Administration*, updated 4 June 2012, available at <<http://www.eia.gov/countries/cab.cfm?fips=JA>>, accessed 12 July 2012.

⁵ 'Japan', *US Energy Information Administration*.

⁶ 'Japan', *US Energy Information Administration*.

⁷ 'The Strategic energy plan of Japan', *METI*, June 2010.

⁸ 'Energy in Japan 2010', p. 13, citing BP Statistics 2009.

⁹ 'Energy Outlook 2030', *British Petroleum*, January 2012, available at <<http://www.bp.com/energyoutlook2030>>, accessed 20 June 2012.

¹⁰ Shigeru Sudo, 'Energy security challenges to Asian countries from Japan's viewpoint', in Antonio Marquino (ed), *Energy Security*, Palgrave Macmillan, 2008.

these concerns into turmoil, and while Japan's reliance on nuclear power has always had its detractors, there is now very visible public support for completely rejecting nuclear power in the country. The cost of rejecting nuclear power would be an increase in the cost Japan would have to pay for its energy, lower energy self-sufficiency, and likely compromises in foreign policy, as Japan searches for replacements to fill the gap left by nuclear power in electricity production. Rejecting nuclear power would also lead to a decrease in energy security for the short to medium term, a likely inability to meet domestic demand, possibly resulting in blackouts in the Summer months, with likely second order effects on local economies and unemployment.

The next ten years are a critical time for Japan as it has the opportunity while addressing the impact of the Fukushima accident to set the conditions for Japan's energy security into the future. Japanese policy makers must decide on the role nuclear power will play in electricity production. If it is to play a smaller role, Japan must design and rigorously implement serious policies to address the shortfall that will be created by this reduction. For longer term energy security, the paper will analyse options for Japan to work more closely with its Asian neighbours on improving energy security not only for Japan, but for the whole region. As Foreign Minister Gamba has recognised, the energy challenges facing Japan in 2012 create a significant impetus for Japan to adopt a more active foreign policy stance.

This paper is organised as follows. It will first define energy security, explain why it is important for national security and what it means for Japan specifically. It will briefly outline Japan's natural resource allocation, its energy requirements and its sources of energy. It will then outline the main components of Japan's most recent energy strategies and analyse Japan's success in meeting the goals contained therein, prior to the triple disaster of 11 March 2011. The paper will analyse the measures the Japanese government has been taking to improve its energy security since the 1970s oil crises and more recently, the adoption of the Basic Energy Act in 2002.

This paper will then consider the implications of the nuclear meltdown at Fukushima for Japan's energy security. It will consider the implications for Japan's electricity

supply and then analyse the wider impacts on Japan's energy security as Japan increases its use of fossil fuels to meet electricity demand.

While Japan faces many challenges in securing its energy, these challenges also provide opportunities for Japan to play a stabilising role in East Asian security. The paper will discuss several of these opportunities, such as cooperating with China on energy conservation measures and seeking agreement on exploration efforts in the disputed East China Sea. The paper will also consider the potential to improve Japan's energy security position through its underdeveloped relationship with Russia - a country that borders Japan and produced more oil and gas in 2010 than any other country in the world.¹¹ The paper will consider Japan's developing relationship with Burma and how it could be used to meet Japan's energy security interests into the future, as well as noting Australia's utility as an energy partner.

Because of the relative vulnerability of reliance on oil (most of it is sourced from a politically unstable area and it must transit long distances through several strategic choke points) this paper will focus more on oil and less on other fossil fuels, such as gas and coal. Japan's gas supplies are already relatively well diversified, with no single country supplying more than 20 per cent of Japan's imports, and most of these countries are regional. The paper will also consider the place of nuclear power in Japan's energy mix and the current dilemma of whether to continue using nuclear power in electricity production. While its inclusion has always been contentious, the March 2011 accident has heightened Japanese domestic sensitivity to nuclear power and has focused the world's attention on how Japan plans to deal with the issue. While acknowledging efforts underway to increase the production of renewable energy sources in Japan, the paper will focus more on international efforts to improve energy security, given the potential for Japan to positively affect regional security in the process.

¹¹ '2011 Key World Energy Statistics', *International Energy Agency*, Paris, p. 11-13.

What is energy security?

The Australian Department of Resources, Energy and Tourism defines energy security simply as ‘...the adequate reliable and competitive supply of energy’.¹² The International Energy Agency includes consideration of the environment in its definition, ‘...the uninterrupted physical availability at a price which is affordable, while respecting environment concerns’.¹³ Von Hippel et al argued in 2009 that environmental protection must be incorporated into concepts of energy security.¹⁴ Noting that energy security overlaps with the concept of sustainability, their comprehensive energy security concept has ‘energy supply, economic, technological, environmental, social and cultural and military/security dimensions.’¹⁵ For the purposes of this paper, I define energy security as continuing access to sufficient energy, at affordable prices, to sustain the Japanese economy and meet domestic demand, while enabling Japan to meet its greenhouse gas (GHG) emission reduction targets.

Energy security is inextricably linked to national security. Arguably, the single most important institution for any country’s national security is an effective military. While Japan has the most capable defence force in the region, it relies very heavily on imported energy to power its aircraft, ships, land vehicles, generators, communication and computer systems. Other factors important to national security, such as a strong economy, functioning government, and law and order institutions, also rely heavily on energy to function.

¹² ‘Energy’, *Department of Resources, Energy and Tourism*, available at <http://www.ret.gov.au/energy/energy_security/Pages/EnergySecurity.aspx>, accessed 3 July 2012.

¹³ ‘Energy Security’, *International Energy Agency*, available at <http://www.iea.org/subjectqueries/keyresult.asp?KEYWORD_ID=4103>, accessed 3 July 2012.

¹⁴ David von Hippel et al, ‘Energy security and sustainability in Northeast Asia’, *Energy Policy* (2009), p. 5.

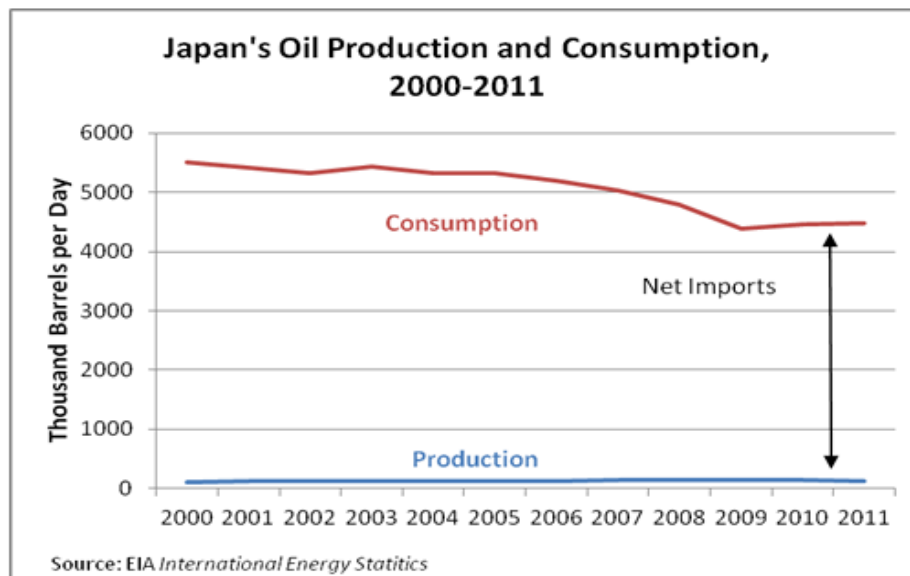
¹⁵ Von Hippel, ‘Energy security’, p. 6.

Japan's Energy Profile

To quote Japan's Ministry of Economy, Trade and Industry (METI) in its *Energy in Japan 2010* report, 'Energy is used for the production of everything'.¹⁶ Japan's *Basic Energy Act* of 2002 begins, 'Energy is essential to the maintenance and development of the national economy and enhancing the stability of people's lives.' While energy security is important for all countries it is particularly important for Japan because it has so little of its own energy resources and has to rely heavily on imports.

Japan has very little in the way of indigenous energy resources and much of what it does have is relatively expensive to access. Japan has only very small reserves of oil and gas, with less than two per cent of Japan's oil and gas requirements being met domestically.¹⁷ Japan has a small amount of coal but it has been expensive to mine and produce, compared to imports from countries like Australia, so it has been heavily subsidised but ultimately uncompetitive. Figure one illustrates just how heavily Japan relies on imported oil products to meet domestic consumption.

Figure One: Japan's oil production and consumption, 2000-2011¹⁸



¹⁶ 'Energy in Japan 2010', p. 3.

¹⁷ 'Japan 2012', *Renewable energy and energy efficiency partnership*, available at <<http://www.reegle.info/policy-and-regulatory-overviews/JP>>, accessed 10 July 2012.

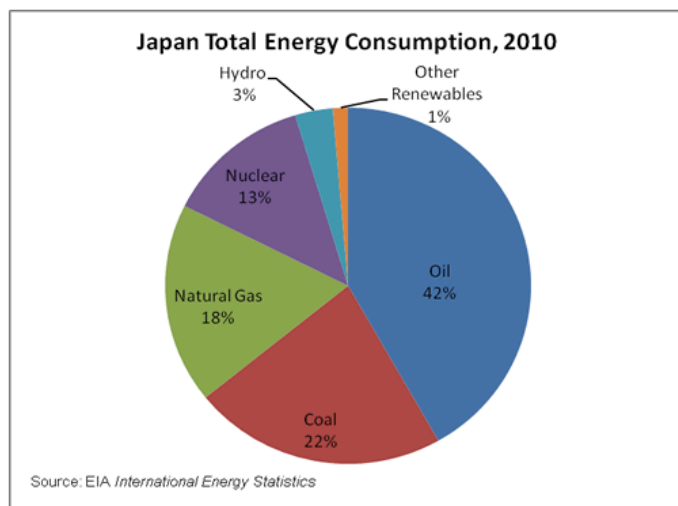
¹⁸ 'Japan', *US Energy Information Administration*.

As a result of the country's lack of resources, Japan has a very low energy self-sufficiency ratio: using figures from 2007 it was four per cent. If nuclear power from reprocessed fuel is included in the calculation of the ratio, noting that Japan imports its uranium, the figure increases to 18 per cent.¹⁹

Although Japan remains the world's second largest energy importer, Japan's energy demand is expected to plateau before FY2030, due to depopulation and changes in socioeconomic structure. Japan's population peaked in 2008 and has already started to decline so unless there are periods of very high economic growth in the future, Japan's overall energy requirement should decrease. In fact, Japan experienced a decline in energy consumption in 2011²⁰ (although given Japan's current unique circumstances following the nuclear accident and the extraordinary electricity supply restrictions, this decrease cannot be seen as the beginning of a trend).

By far the largest energy type consumed in Japan is oil (see Figure two). Oil accounts for almost half the energy supplied in Japan – 42 per cent in 2010. This is down from a peak of 77 per cent in 1973, just before the first oil crisis, following which, Japan had a deliberate policy of diversifying away from oil to alternative energy resources.²¹

Figure Two: Japan's total energy consumption, 2010²²



¹⁹ 'Energy in Japan 2010'.

²⁰ 'Statistical review of world energy 2012', *British Petroleum*, available at <http://www.bp.com/sectiongenericarticle800.do?categoryId=9037128&contentId=7068555>, accessed 8 July 2012.

²¹ 'Energy in Japan 2010'.

²² 'Japan', *US Energy Information Administration*.

As the world's third largest economy Japan imports 384 mtoe²³ of energy each year, making it the second largest energy importer behind the United States, using 2009 figures.²⁴ It is the world's largest importer of LNG and the second largest of coal.²⁵

Increasing Japan's relative vulnerability is the fact that it does not have an active presence in foreign oil markets through a strong national oil company, in the same way that other energy-poor countries do.²⁶ Adding to Japan's vulnerability to increasing oil prices and oil supply interruptions is the fact that Japan is a significant exporter of energy resource intensive products such as petroleum products, chemicals, steel and cars.²⁷ Japan suffered an economic contraction following the first oil crisis in 1973 and a slow-down in economic growth following the second (although direct causality cannot be determined beyond a doubt).²⁸

This is when Japan diversified into nuclear energy and natural gas. In 1973 natural gas only accounted for two per cent of Japan's primary energy imports. By 2010 this had increased to 18 per cent, with Japan becoming the world's largest importer of natural gas.²⁹

In considering electricity production, and it is in this area that nuclear power plays a role, the contribution of refined oil has decreased since the 1970s, with percentages generated from coal, LNG and nuclear power increasing (see Figure three). Japan has invested over US\$70 billion in nuclear power research since the 1980s.³⁰ Japan has the world's third largest nuclear generating capacity and is the world's third largest consumer of electricity. While nuclear power contributed 30 per cent of Japan's electricity just before the Fukushima accident, nuclear power in Japan has always been controversial.

²³ Million tons of oil equivalent.

²⁴ 'Key World Energy Statistics 2011', *International Energy Agency*, Paris, available at <http://www.iea.org/textbase/nppdf/free/2011/key_world_energy_stats.pdf>, accessed 8 July 2012, p. 48.

²⁵ 'Japan', *US Energy Information Administration*.

²⁶ Alexandros Gasparatos, 'Environmental support, energy security and economic growth in Japan', *Energy Policy* (2009), p. 4038. [for bib pp. 4038-4048]

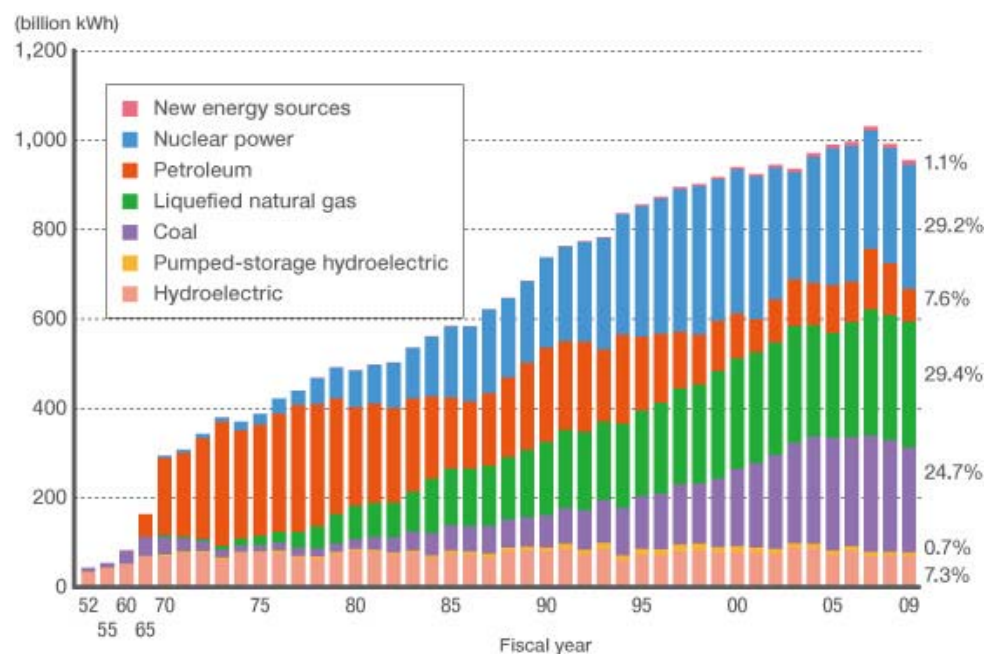
²⁷ Gasparatos, 'Environmental support', p. 4038.

²⁸ Gasparatos, 'Environmental support', p. 4038.

²⁹ 'Japan', *US Energy Information Administration*

³⁰ Valentine 2011, p. 1866.

Figure Three: Breakdown of Japan's electricity production³¹



In 2011, the Japanese government published a report outlining the cost in Japan of each form of power generation method.³² Table two illustrates that nuclear power, even including significant capital costs, remains relatively inexpensive. While both residential solar power and wind power generation are very expensive alternatives by comparison, it is acknowledged that these types of energy have the potential to significantly decrease in costs by 2030, making them more competitive.³³

Table One: Comparison of power generation methods

Energy type	Calculated cost
Nuclear power	Above 8.9 yen/kWh
Coal-fired thermal	9.5-9.7yen/kWh
LNG thermal	10.7 to 11.1yen/kWh
Oil-fired thermal	over 20yen/kWh, based on cost of oil
Onshore wind power generation	9.9 to 17.3 yen/kWh
Residential solar power	33.4 to 38.3 yen/kWh

³¹ 'Changes in Japan's energy sources', *Nippon.com*, available at <<http://www.nippon.com/en/features/h00006/>>, accessed 12 July 2012.

³² The report was from the Cost estimation and review committee within the Energy and environmental council and released on 19 December 2011.

³³ Yuji Matsuo, 'Summary and evaluation of cost calculation for nuclear power generation by the cost estimation and review committee', *Institute of Energy Economics, Japan*, May 2012, p. 1.

Approximately 96 per cent of the energy resources used in Japan are imported.³⁴ Despite initiatives to diversify the types and sources of energy used (away from oil) since the oil shocks of the 1970s, Japan still relies on oil for 42 per cent of its primary energy. Japan imports almost 100 per cent of this oil, most of it from the Middle East. In 2011, approximately 87 per cent of Japan's imported crude oil was from the Middle East (refer Table two and Figure four).

For a while Japan was importing oil from China and Indonesia, which helped to reduce its dependence on the Middle East but as economic growth has increased in these countries, the amount of oil available for Japan to import has decreased. This resulted in Japan returning to the Middle East for the bulk of its oil.

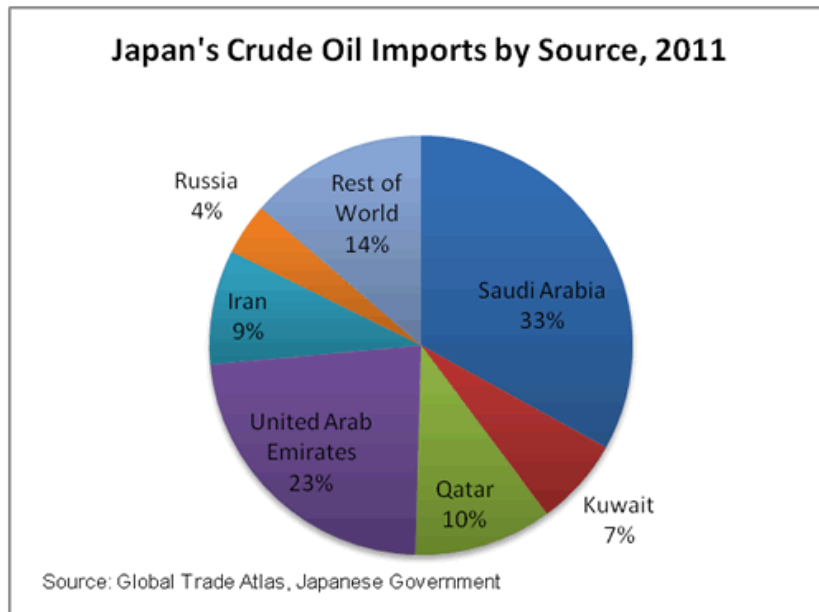
Table Two – Japan's crude oil import by source 2011³⁵

Country/region	Oil imported
Middle East	179, 788, 749
East Asia	404,243
Southeast Asia	11,302,899
India	5, 290
UK	95, 137
Russia	8, 706, 702
South America	700, 222
Africa	4, 368, 786
Canada	32,320
Australia	1, 476, 169
PNG	98, 716
Total	206, 979, 233

³⁴ 'Energy in Japan 2010'.

³⁵ 'Preliminary report on petroleum statistics', *METI*, March 2012, available at <www.meti.go.jp/english/statistics/tyo/sekiyuso/index.html>, accessed 24 May 2012.

Figure Four: Japan's Crude oil import by source, 2011³⁶



Japan's energy strategy over the last decade

Japan has employed deliberate strategies to improve its energy security since the oil shocks of the 1970s. Following the introduction of the Basic Energy Act in 2002, Japan's first Basic Energy Plan (BEP) was adopted in late 2003. It was revised in 2007 but this iteration was based heavily on another energy strategy document – the New National Energy Strategy, released in 2006 by METI and outlined below. The BEP version completed in 2010 was released as the Strategic Energy Plan of Japan. The plans had three fundamental principles: energy security, environmental protection and efficient supply.

The 2006 New National Energy Strategy was interpreted by commentators at the time as an indication that Japan was increasing the relative importance of security in Japan's energy policy objectives, representing 'an attempt by the government to build a coherent vision to guide its role in energy markets, reinforcing the shift away from

³⁶ 'Japan', *US Energy Information Administration*.

open markets and towards greater government intervention.’³⁷ The METI press release at the time noted, ‘In view of recent severe energy situation, including the escalating price of crude oil, has been advancing the formulation of its ‘New National Energy Strategy’ with energy security as its core [sic].’³⁸

Some of the 2006 energy strategy goals aimed at improving energy security were:

- Improve energy efficiency by 30 per cent by 2030
- Diversify and decentralise energy resources
- Nuclear power to increase to comprise 30 to 40 per cent of total electricity supply
- Strengthen Japan’s resource diplomacy
- Improve oil stockpiling system
- Reduce oil dependence to less than 40 per cent of total primary energy supply (from 50 per cent in 2006)
- Reduce oil dependence in the transport sector to 80 per cent by 2030³⁹

The strategy explicitly noted that ‘nuclear power, which is excellent in terms of its stability of supply, and is a clean energy source that does not emit CO₂ in operation, will be promoted’.⁴⁰

The 2010 updated energy plan continued the original three themes of the 2003 basic energy plan and added two more: economic growth based on energy and structural reform of the energy industry.’⁴¹ One of the targets for 2030 in the 2010 plan was to double Japan’s energy self-sufficiency ratio to about 40 per cent. To achieve this target, consumption of natural gas, coal and oil would have to decline by 24, 35 and 42 per cent respectively. Consumption of renewable and nuclear energy would have to increase by 91 and 103 per cent respectively.⁴² This would see the nuclear share of power production increasing to 50 per cent by 2030.

³⁷ Peter C Evans, ‘Japan’, *The Brookings Foreign Policy Studies Energy Security Series*, December 2006, p. 19.

³⁸ ‘New National Energy Strategy’, *METI*, 31 May 2006. available at <http://www.meti.go.jp/english/information/downloadfiles/PressRelease/NewEnergyStrategy.pdf>, accessed 13 June 2012.

³⁹ ‘New National Energy Strategy’.

⁴⁰ ‘New National Energy Strategy’.

⁴¹ ‘The Strategic energy plan of Japan’, *METI*, June 2010.

⁴² John S Duffield and Brian Woodall, ‘Japan’s new basic energy plan’, *Energy Policy* (2011), p. 3743.

Analysis of energy security strategies employed before Fukushima

Japan has had varying levels of success in achieving the goals of its energy strategies in recent decades. These outcomes are analysed below.

Diversification of energy sources away from oil

Following the oil crises of the 1970s, Japan was relatively successful in diversifying its energy types. While in 1973 77 per cent of Japan's energy needs were met by oil, by 2005 this had dropped to only 49 per cent, and dropped even further to 42 per cent in 2010. Japan's push to diversify its energy sources away from oil was so successful that by 1985 Japan comprised almost three quarters of the world's LNG demand and played a leading role in launching the LNG industry. Natural gas has the benefits of being available from many suppliers, as opposed to oil which is largely concentrated in the Middle East. Since 1973, Japan has also increased efforts to secure independently developed crude oil resources, with some success. The ratio of crude oil resources independently developed by Japan increased from about 8 per cent in 1973 to about 16 per cent in 2008.⁴³

By 2010, Japan got close to the 2006 stated target of oil comprising less than 40 per cent of total primary energy supply. However, while the transport sector remains heavily reliant on oil, this figure is unlikely to get much lower. The transport sector now, unsurprisingly, consumes twice the energy it did at the time of the first oil crisis. Oil is also easily transported and relatively cheap – in many countries a litre of petroleum is cheaper than a litre of bottled water.

Reliance on oil from the Middle East

While Japan has been quite successful at decreasing overall oil dependence, it has not managed to significantly decrease the percentage of oil it sources from the Middle

⁴³ 'Energy in Japan 2010'

East. Following concerted efforts in the 1970s to move away from oil, the percentage of Japan's crude oil imported from the Middle East decreased to around 70 per cent in the late 1980s but by the late 1990s, it was back up to almost 90 per cent.⁴⁴ This puts Japan in a vulnerable position, relying on an oil supply from one of the most politically unstable regions in the world, and on a transit route incorporating several of the world's most well-known maritime choke points.

In February 2011, when oil prices rose as a result of the Arab Spring moving across the Middle East, then Japanese Prime Minister Kan said, 'Japan relies on the Middle East for almost all the oil it needs. I am concerned about the outlook'.⁴⁵ Economy, Trade and Industry Minister Banri Kaieda echoed these concerns when he noted, 'The largest risk that could be a drag on Japan's economic recovery is rising crude oil prices due to the political unrest in the Middle East.'⁴⁶

Over the short term, Japan cannot do much about its reliance on Middle Eastern oil. So what can Japan do to ensure continued access to this source? Japanese Foreign Minister Gamba said in January 2012 that it is important for Japan to 'transform challenges into opportunities'. He also noted that he was committed to proactive diplomacy. Gamba acknowledged in the same speech that Japan should continue efforts to 'build stronger relationships with resources supplying countries and the countries that lie along the transportation routes'.

Japan is in a strong position to enhance its economic relations with many Middle Eastern countries. Its combined business acumen, technology edges and management skills are valuable commodities, especially somewhere like the Middle East where these attributes have never been pursued to a great extent in the past because the oil has ensured a relatively effortless income stream. Japan has made a tentative start in Middle East engagement, with the Japan International Cooperation Agency (JICA) establishing offices across the Middle East, engaging in small projects. Japan chooses to promote stability in the Middle East through official development assistance (ODA) and volunteer projects, such as teaching programs. JICA supports programs

⁴⁴ 'Energy in Japan 2010'.

⁴⁵ 'Middle East unrest sparks Japan oil supply fears', *The Daily Star*, 23 February 2011, available at <<http://www.thedailystar.net/newDesign/news-details.php?nid=175092>>, accessed 7 May 2012

⁴⁶ 'Middle East unrest sparks Japan oil supply fears'.

such as an agro-industrial park in Jericho, a maternal and child healthcare drive in Ramallah in the West Bank and educating refugees in the north of Jordan. Japan follows a philosophy known as the Corridor of Peace and Prosperity, developed by Japanese diplomat Hideaki Yamamoto in 2006 – it uses skills and finance to encourage cooperation between communities and across borders; tries to encourage greater regional cooperation to lead to economic growth, greater trust and eventually peace.⁴⁷

In terms of ensuring supply of Middle Eastern oil while it is being transported to Japan, the Japanese Maritime Self Defense Force web site lists as one of its three priorities ‘proactive efforts to improve the international security environment’.⁴⁸ Pointing to Japan’s lack of resources, the web site notes Japan’s heavy reliance on its maritime transport network, which is responsible for transporting more than 90 per cent of Japan’s imports. Japan has also been able to participate in proliferation security initiative (PSI) activities and has been involved in minesweeping in the Persian Gulf.

Japan already operates as part of Combined Maritime Forces (CMF), headquartered in Bahrain.⁴⁹ CMF’s role is to promote security, stability and prosperity across the international waters of the Middle East, home to some of the world’s most important shipping routes. Japan has worked with this coalition of 26 nations since 2003 and while it operates independently, it has three liaison officers in the CMFHQ in Bahrain. Japan allocates ships and maritime surveillance aircraft to escort Japanese convoys through the Gulf of Aden. This activity is inside the bounds of Japan’s constitution as it is protecting Japan’s national interests by protecting Japanese vessels and assets inside a UN and IMO designated threat area.⁵⁰ This augurs well for a Japanese contribution to any future coalition operation aimed at keeping the Strait of Hormuz open to international shipping. Japan has an impressive maritime capability

⁴⁷ Dominic Dudley, ‘Japan’s Middle East soft power’, *The Diplomat*, 13 April 2012, available at <<http://the-diplomat.com/2012/04/13/japan%E2%80%99s-middle-east-soft-power/>>, accessed 7 May 2012.

⁴⁸ JMSDF website, *Government of Japan*, available at <http://www.mod.go.jp/msdf/formal/english/>, accessed 18 July 2012.

⁴⁹ CMF official website, available at <<http://www.combinedmaritimeforces.com>>, accessed 18 July 2012.

⁵⁰ Interview with RAN Captain Tony Aldred, previous CMF Director of Operations, 12 June 2012.

– 150 maritime combat aircraft, 47 destroyers and 16 submarines – and would be a useful addition to any coalition operation.

Another strategic energy security option is for Japan to build its relationship with India, especially in the maritime area, to improve the security of the Indian Ocean sea lanes of communication (SLOCs). One of the focuses of the India-Japan security agreement signed in 2008 is safety of SLOCs. The Indian Navy has a significant presence between the Strait of Hormuz and the Strait of Malacca – the route much of Japan’s oil takes. The Indian Navy is developing a significant maritime force, acquiring a Kiev class aircraft carrier INS Vikramaditya and is constructing a second one, both due into service by 2015. Assistant Professor in international relations at Pandit Deendayal Petroleum University in India Rupakjyoti Borah believes there is scope for improved defence relations between Japan and India, especially in the areas of maritime security and energy security. He notes that both coastguards have been exercising together since 2000. India and Japan make natural partners, given they are the largest, most developed democracies in Asia, and both wary of China’s growing power.⁵¹

Energy efficiency

Japan’s 2010 energy plan’s stated goal on energy efficiency was, ‘maintaining and enhancing energy efficiency in the industrial sector at the highest level in the world.’⁵² Energy-saving measures incorporated in Japan, even before the adoption of the Basic Energy Act of 2002, have been very successful, leading Japan to be one of the most energy efficient countries in the world. Japan has one of the lowest rates of energy use per unit of GDP among developed countries.⁵³ Due to Japan’s lack of resources, global price increases are felt keenly in Japan, leading to power saving behaviours being adopted by consumers and industry. There has also been general acceptance of government measures to restrict energy use, with some commentators pointing to a

⁵¹ Rupakjyoti Borah, ‘Japan and India: natural but wary allies’, *New Zealand International Review*, 2011, pp. 23-28.

⁵² ‘The Strategic energy plan of Japan, Summary’, *METI*, June 2010, p. 2.

⁵³ Kae Takase and Tatsujiro Suzuki, ‘The Japanese energy sector: current situation and future paths’, in *Energy Policy* (2011), p. 6731.

resurgence of the Japanese culture of minimising waste as explaining the success in energy saving.⁵⁴

Oil Stockpiling

Japan has been very successful in maintaining high levels of strategic reserves of oil, to guarantee some measure of supply during any disruption. At the end of 2009, a total of 197 days' worth of oil was stockpiled by the government and in the private sector.⁵⁵ Oil refineries in Japan must retain stocks equivalent to 70 days of consumption.⁵⁶

Climate Change Goals

Underlying Japan's energy security goals are Japan's greenhouse gas (GHG) emissions reduction targets. Japan established itself as a world leader in the fight to reduce GHG emissions when the Kyoto Protocol was adopted by the UN Framework for convention on climate change (UNFCCC) in 1997 in Japan. Japan ratified the Kyoto Protocol in 2002, committing to reduce its GHG emissions to six per cent lower than its 1990 levels, by 2012. At Copenhagen in 2009, Japan committed to reducing GHG emissions further, to 75 per cent of 1990 levels by 2020. At the following UNFCCC conference in Cancun, however, Japan announced that it would not accept further reduction targets unless there were broader participation rates from other nations.

Prior to March 2011, Japan was relying heavily on nuclear power to reduce GHG emissions. Japan's Atomic Energy Agency did some modelling in response to METI's 2008 Cool Earth 50 plan that would see carbon dioxide emissions falling by 54 per

⁵⁴ Shigeru Sudo, 'Energy security challenges to Asian countries from Japan's viewpoint', in Antonio Marquina(ed), *Energy Security: visions from Asia and Europe*, Palgrave Macmillan, 2008, pp. 147-161.

⁵⁵ 'Energy in Japan 2010', p. 32.

⁵⁶ 'Japan', *US Energy Information Administration*, 4 June 2012.

cent by 2050 from 2000 levels and then a 90 per cent reduction by 2100. This model relied on nuclear contributing 60 per cent of primary energy in 2100.

Natural gas is a much ‘cleaner’ fuel than oil, emitting less harmful pollutants than other fossil fuels, making it easier for Japan to reach its Kyoto Protocol targets. Natural gas emits approximately 30 per cent less carbon dioxide than oil when burned, and almost 45 per cent less than coal.⁵⁷

Table Three: Fossil fuel emission levels (pounds per billion btu of energy input)⁵⁸

Fossil Fuel Emission Levels - Pounds per Billion Btu of Energy Input			
Pollutant	Natural Gas	Oil	Coal
Carbon Dioxide	117,000	164,000	208,000
Carbon Monoxide	40	33	208
Nitrogen Oxides	92	448	457
Sulfur Dioxide	1	1,122	2,591
Particulates	7	84	2,744
Mercury	0.000	0.007	0.016

Source: EIA - Natural Gas Issues and Trends 1998

Renewable energies have been recognised for their low GHG emissions and their usefulness in meeting climate change emissions targets. Japan has been at the forefront of research and development for many renewable energy technologies but renewables account for only a fraction of the energy mix.⁵⁹ It is very unlikely that Japan is going to meet the renewable targets set in 2010. Insufficient government incentives have largely been blamed for this. New Zealand, for instance, relies on renewable energy for 79 per cent of its electricity generation and is aiming for 90 per cent by 2025.⁶⁰ In Japan the figure is a mere one per cent.⁶¹ Germany aims to eliminate nuclear power by 2022 and as of 2012, electricity generated by renewable

⁵⁷ ‘Natural gas and the environment’.

⁵⁸ ‘Natural gas and the environment’, *Natural gas supply association*, available at <<http://www.naturalgas.org/environment/naturalgas.asp>>, accessed 12 July 2012.

⁵⁹ Gasparatos, ‘Environmental support’, p. 4046.

⁶⁰ ‘Renewable energy in New Zealand’, New Zealand Government, available at <<http://www.med.govt.nz/sectors-industries/energy/pdf-docs-library/energy-strategies/renewable-energy-in-nz.pdf>>, accessed 17 July 2012.

⁶¹ Takamitsu Sawa, ‘Energy conservation is key’, *The Japan Times*, 10 April 2012, p. 11

sources is expected to be about 20 per cent.⁶² There are lessons Japan can learn from Germany, especially in terms of government initiatives to encourage take-up of renewable energy sources such as solar power.

Nuclear capability increases

Achievement of many of Japan's energy plan's targets is heavily reliant on an increasing contribution from nuclear power. Nuclear power contributes to decreasing GHG emissions and increasing energy self-sufficiency. The 2010 plan details that in order to meet the nuclear targets of increasing from 30 per cent of electricity production to 50 per cent, nine new nuclear power plants would have to be built by 2020 and more than 14 by 2030.⁶³ Even before the accident at Fukushima, Japan's nuclear generation capacity was not increasing at a rate sufficient to meet the 2006 or 2010 targets for nuclear power. One reason given for this is the public relations disasters for the industry following various accidents and cover-ups. In 2002, Tokyo Electric Power Company (TEPCO) announced that there had been 29 alterations of data at 13 of its nuclear plants. When more cover-ups were discovered it resulted in all 17 of TEPCO's plants being shut down for inspection and repair. There has also been a series of accidents at various nuclear power plants across the country since the late 1990s, through the 2000s, further adding to public disquiet about nuclear power.

Resource diplomacy

Some commentators argue that Japan has never moved much beyond the Yoshida doctrine – shunning the high profile politics of international security and military force in favour of the low profile agenda of trade and multilateralism. In other words, less Godzilla, more gecko. The Australian Strategic Policy Institute's Rod Lyon notes that following the onset of Japan's economic woes in the 1990s, from which it has never completely recovered, Japan lost most of what non-military

⁶² Takamitsu Sawa, 'Energy conservation is key', p. 11.

⁶³ 'The Strategic energy plan of Japan', *METI*, June 2010.

influence and power it had.⁶⁴

For several decades, Japan has been seen to shy away from an active role in international affairs commensurate with the size of its economy. While Japan's challenges are well documented (for instance its aging population, limiting constitution, large government debt and stagnating economy), Japan is still the third largest economy in the world, with a GDP of USD \$5.5 trillion,⁶⁵ and is a technologically advanced democracy. Yet it focuses more on internal issues than global issues. Since Japan's economic miracle that started in the 1960s, Japan has been under pressure to do more globally – donate more foreign aid, contribute to UN peacekeeping operations, participate in various multinational military forces aimed at securing peace, or combating illegal fishing, piracy and be more active in global institutions such as the WTO.

While Japan's energy concerns are acute, the wider Northeast Asia region is facing similar energy challenges, albeit on a smaller scale. Northeast Asia is already dependent on imported energy, importing 80 per cent of its oil, and as the region's economies keep growing, this dependence will increase.⁶⁶ While this raises the possibility of competition for energy resources, it also creates the conditions for cooperation.

Bilateral Relationship with Russia

While estimates vary on the size of Russia's oil reserves, in 2010 it produced more oil than Saudi Arabia, making it the world's largest oil producer that year. It was also the world's largest gas producer in 2010.⁶⁷ In 2011, Japan only sourced four per cent of its crude oil from Russia.⁶⁸ While Japan does not have a history of importing large amounts of oil or gas from Russia, and so there is a lack of infrastructure to support

⁶⁴ Rod Lyon, 'Japan's strategic outlook', *Australian Strategic Policy Institute*, December 2011, p. 5.

⁶⁵ 'Japan', *World Bank*, available at <<http://data.worldbank.org/country/japan>>, accessed 9 July 2012.

⁶⁶ Shigeru Sudo, 'Energy security challenges to Asian countries from Japan's viewpoint', in Antonio Marquina (ed), *Energy Security: visions from Asia and Europe*, Palgrave Macmillan, 2008, pp. 147-161.

⁶⁷ '2011 Key World Energy Statistics', *International Energy Agency*, Paris, p. 11-13.

⁶⁸ 'Japan', *US Energy Information Administration*.

such an arrangement, the arguments for addressing this are overwhelming. Russia borders Japan, so any oil going from Russia to Japan travels a much shorter distance than oil coming from the Middle East. As well as reducing transport costs over the longer term as economies of scale kick in, oil from Russia also avoids the relatively vulnerable straits of Hormuz and Malacca. So importing more oil from Russia and less from the Middle East would decrease costs and increase the reliability of energy supply over the longer term.

Russia relies heavily on its resources sector to maintain its GDP. Oil and gas comprised 65 per cent of Russia's exports in 2011. Russia is keen to develop its oil and gas fields in the far east and far north of the country to maintain its energy export earnings but will need significant foreign investment and assistance – a perfect opening for energy-poor Japan. Additionally, Russia's main markets have traditionally been in Europe but the economic crisis there leaves Russia turning east for new markets. Russian President Putin has made clear that his focus is on the Asia Pacific. In an article Putin wrote in early 2012 called 'Russia and the changing world' he did not mention Japan once.

A significant factor that has hampered efforts to improve bilateral relations is the unresolved territorial dispute between Japan and Russia. Both countries claim sovereignty over islands to the north of Japan, which Japan refer to as the Northern Territories and Russia calls the Kuril Islands. The claims are complex, ensuring that any resolution will be difficult and protracted. While some commentators believe the lack of Japanese investment in Russia is at least equally due to Russia's 'failure to create viable conditions for foreign investors'⁶⁹, the bilateral dispute has created significant tension between the two countries, as recently as November 2010, when then President Medvedev visited one of the disputed islands. The Japanese prime minister at the time called it 'an unforgivable outrage'.⁷⁰

Prime Minister Noda and President Putin met for the first time in June 2012 on the margins of the G20 Summit in Mexico. According to the overview of the meeting

⁶⁹ Stephen Blank, 'Russia's failure in Asia', *UNISCI Discussion Papers*, No 24, October 2010, p.63.

⁷⁰ Tsuneo Akaha, 'Russia-Japan territorial disputes, divisive as ever', *East Asia Forum*, 23 February 2011, available at <http://www.eastasiaforum.org/2011/02/23/russia-japan-territorial-disputes-divisive-as-ever/>, accessed 19 July 2012.

available on Japan's Ministry of Foreign Affairs (MoFA) website, both leaders, 'agreed to strengthen efforts ... with a view to contributing to the stability and prosperity of the Asia-Pacific region. The two leaders confirmed, in particular, the importance of promoting cooperation in the field of security and defense as well as cooperation on the sea.' In a sign that the territorial dispute might be seriously addressed, the leaders, 'agreed on reactivating negotiations concerning the territorial issue, and instructing their respective foreign ministries to carry forward substantial discussions in a calm environment. Then, the two leaders agreed to coordinate Minister Gamba's visit to Moscow as early as this summer to discuss the progress of bilateral relations in a wide range of fields, including the territorial issue.'⁷¹

The opening of an LNG plant at Russia's Sakhalin-2 in 2009, supplying Osaka gas with over 967 trillion cubic feet of LNG a year through to 2030, was an important milestone for Japan-Russia relations.⁷² This, along with other bilateral energy commercial agreements led to then Prime Minister Taro Aso expressing hope that these projects would lead to improved broader bilateral relations, including possibilities for resolving the northern territories dispute.

While small steps have been made in the bilateral relationship in recent years, a telling sign of the state of the relationship can be found on Japan's Ministry of Foreign Affairs (MoFA) website dedicated to the bilateral relationship. The first link on the page is '150th anniversary of the establishment of diplomatic relations between Japan and Russia.'⁷³ A noteworthy anniversary but it was in fact in 2004.

Prime Minister Noda and President Putin recognise the mutual benefits likely to flow from closer energy cooperation,

the two leaders agreed to engage themselves actively in cooperation in the field of economy including energy, for the purpose of advancing such cooperation based on the principle of mutual benefit. Prime

⁷¹ 'Japan – Russia Summit Meeting at the G20 Los Cabos Summit (Overview)', *MOFA*, available at <http://www.mofa.go.jp/region/europe/russia/meeting1206_pm2.html>, accessed 27 June 2012.

⁷² 'Sakhalin II signs LNG supply deal with Osaka gas', *Ria Novosti*, 4 March 2009, available at <<http://en.rian.ru/business/20090304/120411460.html>>, accessed 19 July 2012.

⁷³ 'Japan-Russia relations', *MoFA*, available at <<http://www.mofa.go.jp/region/europe/russia/index.html>>, accessed 10 July 2012.

Minister Noda stated that he expected tangible progress such as the realization of the LNG project in Vladivostok and the participation of Japanese enterprises in the Sakhalin 3 Project. President Putin expressed his expectation for further development of bilateral economic relations, stating that the trade volume between Japan and Russia is not meeting the potential of their economic relations, although investment from Japan has been increasing recently.⁷⁴

Closer relations between Japan and Russia could prove a powerful relationship – two of China’s largest neighbours becoming closer. Russia is hosting APEC in Vladivostok in September, presenting an opportunity for both countries’ leaders to have meaningful discussions in the margins.

Bilateral relationship with China

According to realist theories of international relations, Japan – China energy relations are competitive, due to: China’s recent increase in importance as an energy importer, relative to Japan; sovereign disputes in the East China Sea; China’s active efforts to ensure alternative oil supply sources to the Middle East; and uncertainty over access to Russian oil and gas.⁷⁵ China became the world’s second largest consumer of oil in 2003, overtaking Japan.⁷⁶ As both countries race to secure energy supplies, tensions have inevitably been created. An article in China’s ‘People’s Daily’ in 2004 noted, ‘It is no exaggeration that Japan is almost shadowing China wherever there is oil’.⁷⁷ China – Japan competition for limited oil supplies to date has served to increase the price paid for oil in Asia – the Asian premium. A well-known and documented manifestation of the competition for energy between China and Japan occurred in Russia when Japan intervened in an agreement between Russia and China for a

⁷⁴ ‘Japan – Russia Summit Meeting’.

⁷⁵ Elizabeth Wishnick, ‘Competition and cooperative practices in Sino-Japanese energy and environmental relations: towards an energy security ‘risk community’?’, *The Pacific Review* Vol. 22 No.4, Routledge, September 2009, p. 401.

⁷⁶ Wishnick, ‘Competition and cooperative practices’, p.401.

⁷⁷ ‘China-Japan oil race inevitable’, *The People’s Daily*, 28 October 2004, quoted in Wishnick 2009, p. 410.

pipeline to be built from Siberia to Daqing in China, preferring that the pipeline be redirected to the Pacific.⁷⁸

While relatively high rates of Asian economic growth will lead to continuing increases in regional demand for energy, there are several opportunities for Japan and China to cooperate on energy security. The Japan – China bilateral economic relationship is already the third largest in the world.⁷⁹ China and Japan have begun dialogue on several energy issues, relying on common strategic interests stemming from the need to improve energy conservation, energy diversification and the reduction of pollution. It is clearly in both countries' interests to create an oil purchasing block and negotiate pricing together.

One of China's top energy priorities is energy conservation and Japan is internationally recognised as being a world leader in conservation technology. The 'Renewable energy law' adopted in February 2005 in China and the 'Decision on strengthening energy conservation by the state council' of August 2006 created an opportunity for bilateral cooperation. The energy ministers of China and Japan met in April 2007 and issued a joint statement on 'enhancement of cooperation between Japan and the People's Republic of China in the energy field.' Both countries agreed to facilitate cooperation in areas such as energy conservation, clean coal technology and renewables. There was recognition that a common focus on renewables would create business opportunities for both sides.⁸⁰ China plans to reduce its carbon dioxide emissions by 17 per cent between 2010 and 2015 and reduce energy consumption as a percentage of GDP by 16 per cent, according to China's 2011 Five Year Plan.⁸¹ This is another potential area for cooperation, given Japan's technology edge in this area.

⁷⁸ Wishnick, 'Competition and cooperative practices', p. 403.

⁷⁹ Peter Drysdale, 'Japan's foreign policy and avoiding the unthinkable', *East Asia Forum*, 9 April 2012, available at <<http://www.eastasiaforum.org/2012/04/09/japans-foreign-policy-and-avoiding-the-unthinkable/>>, accessed 27 June 2012.

⁸⁰ Shoichi Itoh, 'China's surging energy demand: trigger for conflict or cooperation with Japan?', *East Asia* 2008, Vol. 25, pp. 79-98 2008, Vol. 25, pp. 84.

⁸¹ Li Zhidong, 'China watching: general energy policy of China', in *IEEJ e-Newsletter* No. 2, Institute of Energy Economics, Japan, 16 May 2012, p. 5.

The most significant impediment to closer energy cooperation in the bilateral relationship is the territorial dispute in the East China Sea. China and Japan both claim sovereignty over the Senkaku/Diaoyu Islands in the East China Sea. In addition to the dispute over the islands, China and Japan also disagree on the sea boundary between their countries. China National Offshore Oil Corporation (CNOOC) estimates total gas reserves in the East China Sea at between 15 and 250 trillion cubic feet and total oil reserves between 70 and 160 billion barrels.⁸² While the islands are incapable of sustaining life, ownership of them would grant the owner access to much of the resources of the East China Sea. China and Japan have been working to resolve the dispute since 2004. Both have offered joint development of the resources in the disputed areas but neither can agree to the conditions proposed by the other.⁸³ A positive step was taken in 2008 when Japan and China agreed on joint development of an area that potentially includes significant gas deposits. But there have been several bilateral incidents since then, such as the 2010 ramming of Japanese Coast Guard vessel by a Chinese fishing boat and the subsequent arrest of the Chinese captain by the Japanese, which have precluded the 2008 consensus being ratified. The dispute remains sensitive in 2012. The Chinese ambassador in Tokyo was asked to explain in July 2012 why three Chinese patrol boats approached islands in the disputed area owned privately by a Japanese businessman. Following this, China's Foreign Minister advised Japanese Foreign Minister Gamba that 'Diaoyu Islands and their affiliated inlets have always been China's territory since ancient times, over which China has indisputable sovereignty'.⁸⁴

Bilateral relationship with Australia

Currently providing significant amounts of gas and coal to Japan, but with the potential to provide more, Australia is an attractive energy supply partner to Japan. Australia is a developed liberal democracy, with very little risk of unrest or upheaval

⁸² US Energy Information Administration, 'East China Sea', *US Department of Energy* 2008, available at <<http://www.eia.gov/countries/regions-topics.cfm?fips=ECS>>, accessed 27 May 2012.

⁸³ James Manicom, 'Sino-Japanese cooperation in the East China Sea: limitations and prospects', *Contemporary Southeast Asia* Vol. 30, No. 3, 2008, pp. 455-478.

⁸⁴ 'China warns Japan in East China Sea island row', *France24*, 11 July 2012, available at <<http://www.france24.com/en/20120711-china-warns-japan-stay-out-disputed-territory-islands-east-china-sea-asean-soverignty>>, accessed 17 July 2012.

disrupting the provision of agreed energy resources. Australia is not growing at such a rate that it will need vastly increasing amounts of energy to power its own domestic needs, so should have no trouble servicing its own economy. Geographic proximity to Japan keeps transport costs relatively low and minimises potential risks to the safe transport of energy resources to Japan. Australia and Japan are natural partners with shared strategic interests – both democracies, both allies of the US. Australia and Japan have a relatively strong defence and security relationship already, with some criticism that it is too focused on these areas.⁸⁵ Increased energy cooperation could serve to broaden bilateral cooperation.

During a visit to Australia in May 2012, former METI Minister and current vice president of the Japanese upper house Masayuki Naoshima said, ‘Australia is one of the most important countries for Japan in terms of natural resources supply.’ During his visit to meet with Prime Minister Gillard he told *The Canberra Times* that LNG and coal are on top of Japan’s shopping list. Japan has been increasing its import of Australian LNG in recent years. While US shale gas projects are coming on-line and US prices are currently lower than what is paid for Australian LNG, as supply security is so important to Japan, Japan is likely to continue to pay a premium.

While Japan was already involved in buying Australian energy resources before the triple disaster, as Japan has turned to fossil fuels to fill the gap created in electricity production left by nuclear power, Japan has stepped up efforts to ensure access to Australian LNG. Tokyo Electric Power signed a deal with Chevron in 2011 to buy 3.1 million tonnes of LNG a year for 20 years from the Wheatstone gas project in Western Australia. Tohoku Electric Power signed a preliminary agreement with Chevron in May 2012 for 1 million tonnes a year of LNG from Wheatstone for 20 years.⁸⁶

⁸⁵ Des Ball, ‘Whither the Japan-Australia security relationship’, *Nautilus*, September 2006.

⁸⁶ Andrew Burrell, ‘Japan to spend \$4.4bn on gas stake’, *The Australian*, 16 May 2012.

Bilateral relationship with Burma

A closer relationship with Burma could be mutually beneficial but it is so far unclear exactly what and how much energy resources Burma is endowed with. Japanese corporations are involved in exploratory measures in Burma in an effort to ascertain the extent of Burma's resource riches. Japan could investigate options for co-development of gas fields in Burma to diversify Japan's supply. As part of the arrangement Japan could assist Burma with the management of the possibly significant profits which would flow from exporting the gas. Japan could also help integrate Burma into the regional and global economy. There are signs the Japanese government is keen to act along these lines.

In an effort to improve the likelihood of access to Burma's resources, Japan recently wrote off approximately AUD\$3.6 billion in yen loans.⁸⁷ Japanese Foreign Minister Gamba visited Rangoon in December 2011, announcing, 'the Japanese government would like to help and support the Burmese government's efforts as much as it can.'⁸⁸ He also announced that Japan will assist Burma in the areas of health, education, poverty alleviation and farming. On the resources front, Japan's Nippon Oil company has been cooperating with Premier, Myanmar oil and gas enterprise and PTT-EP in the offshore Yetagun gas blocks in the Gulf of Martaban, while other Japanese companies are exploring almost 20 other oil and gas blocks in Burma.

The impact of the triple disaster

The major meltdown at the Fukushima Daiichi nuclear power plant in March 2011 eventually resulted in the shut-down of all Japan's nuclear power plants. While the earthquake and tsunami killed about 20,000 people, the extent of radiation poisoning from the nuclear accident is still being determined. Tens of thousands of people were evacuated from the area and several thousand remain homeless. The earthquake was the largest ever recorded in Japan. It didn't just interrupt the nuclear power supply, it

⁸⁷ Robin Bromby, 'Japan's Itochu joins the charge of the mining brigade into Burma', *The Australian*, 4 May 2012.

⁸⁸ Ko Wild, 'Japan, Burma to talk about economic aid projects', *Mizzima*, 28 December 2011, available at < <http://www.mizzima.com/business/6326-japan-burma-to-talk-about-economic-aid-projects.html>>, accessed 17 June 2012.

had effects on oil, LPG and gas supplies. The gas supply was interrupted in eight prefectures and an LNG base was closed for the first time ever in Japan (Sendai City Gas Bureau LNG base). The gas supply to 400,000 households had to be repaired. In addition, oil refineries, oil terminals, tanker trucks and petrol stations were damaged, interrupting energy supply further.

As outlined above, Japan's energy plans have been heavily reliant on the contribution from nuclear-generated electricity. In 2011, Japan was the third largest consumer of nuclear power in the world.⁸⁹ Up until the triple disaster in March 2011, about 30 per cent of Japan's electricity was generated by nuclear power plants.⁹⁰ Thirty six nuclear plants were operating in March 2011. Ten were shut down directly by the earthquake.⁹¹ By 5 May 2012, all had been shut down for maintenance or safety checks, leaving Japan with no nuclear power capacity for the first time in 42 years.⁹²

To cope with the electricity shortfall, Japan has turned largely to fossil fuels, importing increasing amounts of LNG and coal and recommissioning previously mothballed thermal power stations. Japan's total fuel imports in 2010 were Y17.4 trillion; in 2011 they were Y21.8 trillion – an increase of 25 per cent. As a percentage of GDP, the fuel imports went from 3.6 per cent to 4.6 per cent.⁹³ Japan's import of LNG increased by 17.9 per cent from FY 2010 to FY 2011. By the end of 2011, Japan's LNG imports alone exceeded one per cent of GDP for the first time.⁹⁴

Fukushima served to illustrate the vulnerability of Japan's electricity grid system so another result of the disaster has been moves to decentralise control of electricity generation and have local governments take more control of their respective jurisdictions. Japan's electricity grid operates on two different frequencies, making it almost impossible to share electricity between east and west Japan. While Tokyo and the rest of eastern Japan runs at 50 hertz, southwestern Japan runs on alternating

⁸⁹ 'Japan', *US Energy Information Administration*, 4 June 2012.

⁹⁰ 'Energy in Japan 2010', p. 19.

⁹¹ Tomoko Murakami, 'Japan's options and strategies on nuclear energy and fuel cycle post Fukushima', presentation given to 2012 Resilience and security of spent fuel in East Asia working group meeting, 13 April 2012.

⁹² 'Last Japan nuclear reactor shut', *Sunday Canberra Times*, 6 May 2012.

⁹³ Andrew DeWit, 'Japan's remarkable renewable energy drive – after Fukushima', *The Asia-Pacific Journal*, Vol. 10, Issue 11, No. 10, 11 March 2012.

⁹⁴ 'Japan Energy Brief', No. 18, *The Institute of Energy Economics, Japan*, March 2012, p. 5.

current at 60 hertz.⁹⁵ This has made it extremely difficult for Japan to share electricity from one side of the country with the other, where there are significant shortages.

The Japanese government has been scrambling to find acceptable solutions to Japan's immediate energy demands, caused by the shut-down of the nuclear power plants. At time of publishing, the METI website still bears the plea, '...ask you to please refrain from purchasing non-urgent gasoline, light oil and kerosene unnecessarily'.⁹⁶

Political pressure from the US has resulted in Japan reducing the amount of oil that it buys from Iran. While Japan has complied with US requests to boycott Iranian oil as much as it can, Japan's heavy reliance on oil from Iran, as well as the current energy shortfall in Japan since Fukushima, make complete embargo very difficult.

Addressing safety concerns surrounding nuclear power

Following the triple disaster, then Prime Minister Naoto Kan announced that Japan would aim to reduce nuclear power to zero. When Prime Minister Noda took over in September 2011, he modified this goal to reduce nuclear dependence as much as possible over the mid to long term.⁹⁷ This approach was reflected in Japan's 2011 Annual Report on Energy, also known as Japan's Energy White Paper 2011, which acknowledged that the triple disaster 'significantly damaged public trust in the safety of nuclear power'. The White Paper noted that the basic energy plan was to be reviewed and that the target for the medium to long term would be 'a reduction of nuclear power generation dependency'. The White Paper flags that the next Basic Energy Plan will be a return to first principles and it is expected to be released by Japan's Summer 2012. Japan's leadership will either have to restore the public's confidence in the safety of nuclear power or find sufficient energy alternatives – not just sufficient to meet the 30 per cent of electricity generated in 2011 by the nuclear

⁹⁵ Peter Fairley, 'Why Japan's fragmented grid can't cope', , May 2011, available at <http://spectrum.ieee.org/energy/the-smarter-grid/why-japans-fragmented-grid-cant-cope/>, accessed 13 July 2012. *IEEE Spectrum*

⁹⁶ 'Petroleum products and city gas supply', *METI*, available at http://www.meti.go.jp/english/earthquake/oil_gas/index.html, accessed 27 June 2012.

⁹⁷ 'Japan Energy Brief', No. 18, *The Institute of Energy Economics, Japan*, March 2012, p. 3.

power plants but the increasing projections out to 2050 on which Japan's energy plans were based.

Several subcommittees of the Advisory Committee for Natural Resources and Energy have been discussing what shape Japan's energy policy should take, in the wake of Fukushima. These discussions will form the basis of the new Basic Energy Plan. The five options for Japan's energy mix into the future being discussed range from abandoning nuclear power completely, through reducing dependency on nuclear power to maintaining nuclear power generation at current ratios.⁹⁸

The arguments for retaining nuclear power in Japan...

The arguments for Japan to retain nuclear power, particularly in the short term, are clear: generating electricity from an established nuclear power plant creates no carbon dioxide or other climate-relevant emissions;⁹⁹ including nuclear in Japan's energy mix improves power source diversification; it is relatively cheap, especially after initial capital costs and even using the revised 2012 figures; it increases Japan's self-sufficiency ratio if reprocessed fuel is used; and the infrastructure already exists. There have been many vocal supporters of retaining a nuclear power capacity in Japan. Chairman of the Institute of Energy Economics Japan (IEEJ) said in February 2012, 'The contribution of nuclear energy to enhancing energy security is not small in view of its low cost, large scale, and high energy density.'¹⁰⁰ Japan's government has estimated that if Japan turns away from nuclear power altogether, the Japanese economy could shrink by five per cent by 2030. The OECD has been urging Japan to restart its nuclear power generating plants, assuming safety tests are passed. OECD Secretary General Angel Gurría told reporters in April 2012 that 'you cannot substitute 30 per cent of installed capacity overnight.'¹⁰¹

⁹⁸ Shigeru Suehiro, 'Discussions at the fundamental issues subcommittee of the advisory committee for natural resources and energy', in *IEEJ e-Newsletter No.2*, Institute of Energy Economics, Japan, 16 May 2012

⁹⁹ Ioannis N Kessides, 'Nuclear power: understanding the economic risks and uncertainties', *Energy Policy* (2010), p. 1.

¹⁰⁰ 'Japan Energy Brief', No. 18, *The Institute of Energy Economics, Japan*, March 2012, p. 3.

¹⁰¹ 'OECD urges Japan to resume operations of nuclear power', *The Mainichi*, Japan, 25 April 2012.

For Japan to turn away from nuclear power altogether would be very expensive, in the short and long term. As Japan moves into Summer 2012, electricity supply will not be able to meet demand, unless some of the nuclear power plants are brought back on line.¹⁰² Rejecting nuclear power would mean buying more expensive alternative energy resources, significant investment in infrastructure and, assuming there is still a gap in electricity production, likely lead to some form of economic downturn. As well as the obvious negative consequences of this for Japan's economy and society, it would also limit options available to Japan to address its longer term energy security.

...And those against

The 'not in my back yard' or 'NIMBY' factor is becoming relatively powerful in Japan, given the risks of nuclear power generation are real and recently demonstrated. Tens of thousands of Japanese people from the affected area still cannot return home. Japan's location in relation to the Pacific and Okhotsk tectonic plates almost guarantees another earthquake. Tsunamis are relatively common in Japan – so much so that they invented the word for them. Nuclear power plants need extremely conservative safety measures and they are very expensive to build. There is also the requirement to manage the spent fuel and to keep the highly toxic materials secure from possible theft or misuse. While nuclear plants have proven to be relatively safe over the decades, with minimal accidents, one single accident can have catastrophic effects. Radioactive fall-out from the Chernobyl accident was detected over 1000 miles away in Scotland. References to the '90 million people in the path of the very worst fall-out' are sobering.¹⁰³

Several commentators believe that the Japanese public are unlikely to accept the reintroduction of nuclear power in Japan but the people of Ohi have already agreed to restart two reactors, citing damage to the local economy and high levels of

¹⁰²Kae Takase, 'The Japanese energy sector, energy policies, and the Japan LEAP modelling effort', *Governance Design Laboratory*, 2012.

¹⁰³ John M LaForge, 'Chernobyl at ten: half lives and half truths' available at <<http://ratical.org/radiation/Chernobyl/Chernobyl@10p2.html>> accessed 12 July 2012.

unemployment should they remain shut down.¹⁰⁴ On 2 July 2012, one of these reactors was restarted, albeit among public demonstrations against its restart. Since the government considered restarting the nuclear reactors in Ohi there have been weekly public demonstrations in Tokyo. The demonstration on 29 June 2012 outside Prime Minister Noda's residence attracted several thousand protestors, with estimates varying from 17,000 to 150,000. But the most important point is that there have been demonstrations at all. Public protests are rare in Japan, illustrating the extent of public concern over the safety of nuclear power.

Addressing Climate Change

Replacing much of the nuclear capacity with fossil fuels in the short to medium term will have a significant effect on Japan's GHG emissions. Even before the triple disaster Japan was relying on coal for a significant amount of its electricity production, and coal emits a relatively high amount of GHG during burning.

While sustainability of energy sources is becoming increasingly important in long term energy security, access to sufficient energy resources may need to override environmental concerns for Japan in the short term, as Japan scrambles to address significant electricity shortages.

The nuclear accident has brought into sharp focus how Japan is lagging other OECD countries in the development of the renewable industry. In June 2011, then Prime Minister Kan outlined a plan to increase the contribution of renewables to power supply to 20 per cent by 2020. The 'Act on purchase of renewable energy sourced electricity by electric utilities' was passed by the DIET in August 2011 and a new feed-in-tariff scheme came into effect on 1 July 2012. In June 2011, the government announced a plan to put solar panels on 10 million roofs by 2030.¹⁰⁵

¹⁰⁴ 'Japanese town agrees to restart nuclear power plant', *Reuters*, 15 May 2012, available at <<http://www.globaltimes.cn/NEWS/tabid/99/ID/709466/Japanese-town-agrees-to-restart-nuclear-plant.aspx>>, accessed 24 May 2012; and 'Putting power over public safety? Japan to restart two nuclear reactors', available at <<http://www.rt.com/news/nuclear-japan-reactors-fukushima-196/>> accessed 24 May 2012.

¹⁰⁵ 'Japan's renewable energy feed-in-tariff regime', *DLA Piper*, available at <<http://www.dlapiper.com/australia/publications/detail.aspx?pub=7224>>, accessed 20 July.

Ability to pay for imported energy

Japan can't afford to keep importing so much energy. Japan's public debt to GDP ratio is the worst in the world, using IMF 2011 figures, at 230 per cent. By way of comparison, the EU's public debt to GDP ratio is 82.5 per cent¹⁰⁶ and Australia's is 23 per cent.¹⁰⁷ While most of this debt is owed to the Japanese public, it still creates a significant issue for fiscal management by the government. In January 2012, Japan's trade deficit was a record 1.48 trillion yen, due in part to large imports of LNG and other energy.¹⁰⁸ Japan's trade deficit the year before, in 2011, was the first in 31 years and attributed in part to rising crude oil prices, the increase in the price of LNG and the rise in LNG imports.¹⁰⁹ What was so notable about the trade deficit in 2011 was that Japan went from a trade surplus of 6.6 trillion yen in 2010 to a deficit of 2.6 trillion yen.

As demand for oil increases in the region, prices will increase. Oil consumption has increased more than twice as fast in East and Southeast Asia between 1999 and 2009 as the world average.¹¹⁰ This is mainly due to the high rates of economic growth in the region, with accompanying industrialisation, urbanisation, increasing numbers of cars on the road and increases in the standard of living. China accounted for 71 per cent of the increase in global energy consumption in 2011.¹¹¹

Oil consumption is so high in the region that Brunei, Malaysia and Vietnam are the only net exporters of oil. Global energy consumption in 2030 is anticipated to rise to 1.4 times its present level, with half of that increase caused by Asia.¹¹² In the early 1970s, Japan's oil demand was 60 per cent of Asia's entire oil demand. But with its

¹⁰⁶ 'Country comparison: public debt' *CIA World Factbook*, available at <<https://www.cia.gov/library/publications/the-world-factbook/rankorder/2186rank.html>>, accessed 17 July 2012.

¹⁰⁷ 'World economic outlook database', *International Monetary Fund*, available at <<http://www.imf.org/external/pubs/ft/weo/2012/01/weodata/index.aspx>>, accessed 17 July 2012.

¹⁰⁸ 'Japan Energy Brief No. 18', *The Institute of Energy Economics, Japan*, March 2012, p. 6.

¹⁰⁹ Akira Yanagisawa, 'Impact of rising oil price on the macro economy', *Institute of Energy Economics Japan*, May 2012, p. 2.

¹¹⁰ 'BP Statistical Review of World Energy', June 2010, available at <<http://bp.com/statisticalreview>>, accessed 14 May 2012.

¹¹¹ 'BP Statistical Review of World Energy 2012', available at <<http://www.bp.com/sectiongenericarticle800.do?categoryId=9037128&contentId=7068555>>, accessed 8 July 2012.

¹¹² 'Energy in Japan 2010', p. 13.

stagnating population, sluggish economic growth, especially when compared with regional neighbours, Japan is now a much less influential purchaser of oil.¹¹³ But while it has lost much of its influence as a big market player, for the moment, it remains the world's third largest oil consumer and the third largest net oil importer.

Conclusion

The next ten years will be very important for Japan in establishing a regime to ensure its energy security for the longer term. Failure to act in this timeframe risks exacerbating the problem and causing unnecessary damage to the economy. In terms of Japan's nuclear power dilemma, policy makers must decide what percentage, if any, nuclear power should contribute into the future. If there is any reduction of nuclear energy from the 2010 energy plan, Japan's government must commit to robust measures to encourage the production of renewable energy. Japan has the natural resources required for many renewable types of energy, such as sunlight, wind, tidal and flowing rivers, and has the technology to develop the industry. Serious government support would result in a notable increase in the percentage of renewable power being used.

In the short term, the arguments for retaining nuclear power generated electricity are overwhelming. Japan's economy is already relatively fragile, with the largest public sector borrowing requirement in the world. Switching on at least some of the reactors would help guard against power shortages that would have a negative effect on the economy. One option could be ranking the reactors in terms of safety risk factors and location (East versus southwestern Japan) and switching them back on in this order until a suitable level is reached. But Japan must retain nuclear power in the short term, at least until Japan's renewable energy sector is sufficiently developed to contribute to power generation in the country, or until alternative supplies of fossil fuels and accompanying infrastructure are established. This will take time but Japan's position as the world's third largest economy ensures it has the power to achieve this, as long as the political focus is appropriate.

¹¹³ Peter C Evans, 'Japan', *Energy Security Studies*, The Brookings Foreign Policy Studies, December 2006, p. 1.

If Japan decides against recommissioning a significant number of the nuclear power plants then it will continue to rely on an increased amount of imported fossil fuels to fill some of the gap in electricity supply. If this is the case, Japan will need to actively and openly address the ramifications for attainment of its GHG emissions targets. It will be very difficult to reduce GHG emissions while substituting low carbon emitting nuclear power with relatively high emission fossil fuels.

In the longer term, the issues with Japan's electricity grid must be addressed and the infrastructure required to share electricity between the two separate halves must be developed. Achieving a commonality of electricity standards (50 or 60 hertz), or at least an effective method of converting electricity between the two sectors, would ultimately provide opportunities for efficiency and greater flexibility and resilience of electricity supply.

The race to secure sufficient energy resources to plug the gap left by the nuclear accident should be a shot in the arm for Japan's international engagement strategy but ironically the accident has left many Japanese policy makers looking inwards, instead of outwards, focusing domestically instead of regionally or internationally. Along with being an economic superpower, and Japan is still the world's third largest economy, comes a certain expectation that it will contribute positively to at least regional, if not global, security. Japan has an opportunity to reach out across East Asia while addressing its energy security. This would also provide an opportunity to improve relations bilaterally and multilaterally. Former Executive director of the International Energy Agency Nobuo Tanaka recently said '...abundant and cheap energy is a thing of the past now. Japan has to formulate its energy policy based not solely on domestic context but on energy security for the whole of Asia.'¹¹⁴ While Japan has been engaging many of its neighbours as part of its resource diplomacy it could be much more active, especially with regional neighbours such as Russia and Burma. Japan has a real opportunity to not only secure beneficial energy deals with Russia but to improve relations with its largest neighbour at the same time. Japan could also be more active in sharing its technology in areas such as energy

¹¹⁴ 'Japan Energy Brief No. 18', *The Institute of Energy Economics, Japan*, March 2012, p. 3.

conservation, diversification, renewable energies and oil stockpiling with other Asian countries. If Japan widely shares its energy saving technology, especially with developing economies, there will be benefits across the region, in the shape of easing demand pressures and making Kyoto targets more achievable.

As Tomoko Murakami of Japan's Nuclear Energy Group wrote in May 2012, 'Japanese policy chiefs must remind themselves that the whole world is watching how Japan deals with this issue.'¹¹⁵ Japan's efforts to reduce its reliance on oil following the oil shocks of the 1970s were laudable and effective – the world is now watching to see if Japan can bounce back from Fukushima in a similar manner.

¹¹⁵ Tomoko Murakami, 'Latest developments concerning the restarting of nuclear power stations', *IEEJ e-Newsletter* No.2, Institute of Energy Economics, Japan, 16 May 2012

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