



Japan's Nuclear Disaster and Plans to Export Reactors to Indonesia

Jeff Kingston and Tom Hyland

This report consists of two related articles. Jeff Kingston reports on Japan's Kashiwazaki nuclear disaster and Japanese plans to sell nuclear power technology to Indonesia. This is followed by Tom Hyland's report on Indonesian plans to build nuclear power plants.

Asia's Nuclear Problems and Prospects

Jeff Kingston

In Japan, Kashiwazaki has come to mean "close call". On July 16 a 6.8 magnitude trembler jolted beneath the world's largest nuclear power complex in a place that was not supposed to have a fault. This earthquake serves as a vivid reminder of the risks generated by nuclear power, especially in zones of seismic risk like Indonesia.



Kashiwazaki in Niigata Prefecture on the Japan Sea

The good news is that a mega disaster did not occur and, thanks to design safety margins, the seven reactors generating a maximum of nearly 8,000 MW were not damaged by an earthquake that exceeded assumptions in the design specifications. The three reactors in operation and a fourth in start-up mode did shut down automatically as designed.



The Kashiwazaki nuclear power plant

The damage appears to have been limited to non-nuclear safety equipment, structures, systems and components. In addition, there was significant soil subsidence and liquefaction that caused damage to the facilities and hindered road access. That is the preliminary assessment of the International Atomic Energy Agency issued on August, 17, 2007. [1] The inspectors stress, however, that they were unable as yet to inspect whether there was damage to the reactor vessels, core internals and fuel elements.

It is also clear, however, that there was leakage of some 2,000 tons of radiation contaminated water into the Sea of Japan as spent fuel water sloshed over its containment tank and leaked down to a discharge pump. In addition, human error left a damaged turbine gland steam ventilator on, spewing radioactive gas containing cobalt-60 and chromium-51 into the environment for two days following the earthquake.



Kashiwazaki after the quake

Also 438 drums of radioactive water toppled over as a result of the tremors, causing many to rupture and leak their contents. Underground water pipes also ruptured, making it impossible for plant personnel to fight a fire that broke out in one of the electrical transformers at the power plant. The IAEA also raised concerns about "...the potential interaction between large seismic events and accelerated ageing..." of components and safety equipment.



Burnt out transformer at the plant

TEPCO's reassurances about the negligible risk associated with these incidents rang hollow in a nation accustomed to the nuclear utility industry's lack of transparency, tardy notifications, frequent corrections, spinning, cover-ups and mishaps.

TEPCO informed local government authorities about the radioactive leakage nearly nine hours after the earthquake. Ironically, then PM Shinzo Abe, a man who can speak with authority about losing public trust, publicly chided TEPCO for raising the alert too late, suggesting the utility only had itself to blame for undermining the people's trust. The IAEA inspection team was informed that this delay in notification, "...was mainly caused by a lack of personnel after the earthquake due to evacuation and other priorities."

Industry advocates emphasize the effective functioning of nuclear-related safety equipment and the absence of damage to the reactor buildings. Critics have called on the government to shut down some one-third of the nation's 55 nuclear reactors for more robust inspections to investigate and reassess seismic risks in light of the lessons drawn from Kashiwazaki; the tremors were more than double the design benchmark. Nobody knows how many reactors may have been built on similarly flawed assumptions. The discovery of a fault beneath the nuclear reactors has also raised concerns about relying on power companies to select and assess site suitability. Akira Amari, the METI minister, acknowledged in the aftermath that the government was lax in evaluating TEPCO's pre-construction fault-line survey.



Buckled road at plant site

The bad news is that the crisis management systems at the plant proved inadequate and local authorities were not kept informed in a timely manner so that they could respond effectively. For nearly two hours TV viewers watched black smoke billowing out of the complex as plant staff abandoned fire hoses due to a lack of

water pressure caused by damaged underground water pipes. Eventually local firefighters were called in, but their response was delayed by poor communications and damage to the access road caused by soil subsidence. The soil subsidence—as much as 1.6 mtrs in some places—also caused other water leaks into a reactor building and caused the fire by damaging an electrical generator; leaking oil from the transformer was ignited by sparks from a short circuit.

NHK aired an investigation featuring interviews with the staff that were at the plant when the quake hit. The supervisor explained that the crisis control room door jammed because of the earthquake, meaning that he and his staff were unable to enter and monitor the situation. Instead they set up a whiteboard in the parking lot and used their private mobile phones to maintain communications and monitor the seven reactors spread over the complex. This helps explain why the ventilator was not shut down and the radioactive gas was emitted into the atmosphere. Communications with the local government were impaired because the landlines were not assigned any priority. The supervisor admitted that the absence of effective centralized crisis control and poor communications with local authorities could have turned a dangerous event into a more serious disaster. Sometimes it is possible to be lucky.

The government's credibility has taken a beating as a result of the Kashiwazaki disaster and its mishandling. In 2005 a judge ruled in favor of Tokyo Electric Power (TEPCO) in a case filed by local residents to revoke the license to install a nuclear reactor at the site. The judge opined that the scientific evidence overwhelmingly proved that the plaintiff's claim that the plant was vulnerable to an earthquake due to a hitherto undetected fault was baseless. So much for the seismic science and assumptions. Similar lawsuits have been filed to close four other reactors because of fault lines not detected in the utility companies' pre-construction surveys. In Japan, cases like Kashiwazaki fuel concerns that the government gives too much discretion to the utilities in selecting sites and determining whether they are safe.

Lessons and Prospects

What are the lessons of Kashiwazaki? Now we know that a fault does run beneath the reactors and that all earthquakes are not the same; safety designs assumed the quake motion would be sudden and short, with up-and-down shaking whereas the recent earthquake involved side-to-side swaying for a prolonged period. The design was made to withstand a 6.6 earthquake, but the additional 0.2 in magnitude meant a doubling of the energy released. We also learned that the science is shaky and in flux. Experts make mistakes and companies routinely fail to keep public officials informed about matters that put the public at risk. Japanese and Indonesians surely understand that a lack of transparency and lax monitoring are not a good mix when nuclear power is involved. Indonesia's seemingly good track record with its three small research reactors does not mean it can afford to underestimate the immense challenges and risks of a Muria-scale NPP.

With fossil fuel prices surging and growing concern about green house gases related to consumption of these fuels, the prospects for the nuclear power industry have brightened considerably globally. Advocates assert that nuclear power is the trump card in the battle to reduce emissions and curb global warming while critics suggest it is more of a wild card given the unpredictable radioactive risks involved. The US recently approved a plan to build a nuclear power plant for the first time in thirty years while the Swedish public also shows signs of changing its mind about the wisdom of mothballing its reactors. In Japan the government plans to raise the share of energy generated by nuclear power from the present 33% to 41% by 2014. Since 1998 two nuclear power reactors have started up with six more currently slated for installation or expansion.

The government is committed to maintaining advanced nuclear technology capability. But the annual growth in Japan's electricity demand is now only 1%, meaning that demand for new reactors will not be sufficient to keep Japan's three main NPP makers—Hitachi/GE, Mitsubishi Heavy Industry and Toshiba—busy and profitable. This means it is eager to help Japan's nuclear industry win contracts elsewhere in Asia where power demand is surging. In August 2006, METI released its Nuclear Power National Plan in which it signals its intention to support the global development of Japan's nuclear industry and commissioned JETRO to conduct a study analyzing the potential for introducing nuclear power to Indonesia and Vietnam.

There is a global boom in nuclear power with more than 100 under construction or in various stages of planning, including 42 in Russia, 30 in China, 21 in the US and 20 in India. Asia has 16 NPP under construction out of the world's current 29, most of which are in China. Vietnam plans to generate 4.7% of its electricity from nuclear power by 2015 and Thailand has ambitious plans to develop some 4 GW of nuclear power by 2021. The rogue junta in Burma also has nuclear ambitions and has reached agreement with Russia to build a research reactor that generates the kind of anxieties more often associated with North Korea in recent years. Not everyone is happy with this sudden embrace of the nuclear option. Concerns about safeguards led PM Lee Hsien Loong of Singapore to warn Asian leaders that civilian nuclear energy programs carry a risk for neighbors.

The close call at Kashiwazaki came soon after a delegation of Indonesian anti-nuclear activists visited Japan to meet with government officials and industry spokesmen to lobby against the \$1.6 bn Mount Muria nuclear project. They know that price tag is merely the downpayment and does not include costly but necessary, maintenance, rigorous safety checks, mandatory shutdowns, spent fuel and waste disposal, and the inevitable accidents. They are also worried that the Japanese government is willing to risk the safety of Indonesians to prop up its nuclear industry by making attractive financing available. Japan already provides technical training programs in recognition of significant human resources obstacles to introducing a NPP to Indonesia.

Nuclear power plants are vulnerable to natural disasters and if one can learn anything from Kashiwazaki it is that site safety evaluations are unreliable, assumptions used for design specifications can be dangerously faulty, and human error can overcome failsafe systems. In a country that has the geothermal potential (20,000 MW) of more than 2 Kashiwazaki power complexes, and 5 Murias, Indonesia should consider tapping the benefits, rather than risk amplifying the dangers, of living in the Ring of Fire. Siting a nuclear power plant adjacent to a volcano, possibly over a fault line, in a densely populated island is playing with fire. If even a technologically advanced nation like Japan experiences such severe problems with its nuclear power industry, should the Indonesian government really take such an expensive gamble? It is instructive that METI (Ministry of Economics, Trade and Industry), the ministry responsible for overseeing the nuclear industry in Japan, washes its hands of safety related issues on nuclear facilities constructed overseas; never has caveat emptor resonated so powerfully.

Indonesia should first examine how it can boost energy efficiency which is about 20% of Japanese levels. In Indonesia, Japan can do better by promoting conservation and clean technologies, raising energy utilization efficiency, and promoting renewable energies.

[1] IAEA-Preliminary Findings and Lessons Learned from the 16 July 2007 Earthquake at Kashiwazaki-Kariwa NPP, Report to the Government of Japan 17 August 2007.] Jeff Kingston

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Indonesia's Nuclear Reactor Plan on Shaky Ground

Tom Hyland

It was, in a way, a case of taking the mountain to Muhammad — the mountain being a dormant volcano that looms over the planned site of Indonesia's first nuclear power station.

Last month, 100 clerics and scholars from one of the world's largest Muslim organisations, in the heart of the country with the world's largest Muslim community, met near Mount Muria in Java for two days of deliberations.

The unprecedented gathering considered Indonesian Government plans to build four nuclear power plants at the foot of Mount Muria, on the world's most populous island.

It also sits on the Pacific "Ring of Fire" that is prone to devastating earthquakes and volcanic eruptions.



Mount Muria, Java

The scholars, members of the 30-million strong Nahdlatul Ulama, met in the town of Jepara, where they heard from the Research and Technology Minister, the ANU-educated engineer Kusmayanto Kadiman, who urged support for nuclear power.

So did the head of the national atomic energy agency and other government experts.

They heard a different story from non-government groups, environmentalists, and representatives from the village of Balong, the proposed site of the nuclear plant.

At the end of their deliberations, drawing on Islamic traditions of jurisprudence, the scholars issued a fatwa, a religious legal edict, declaring the Muria plans haram — forbidden.

They declared Islam neither forbids nor recommends nuclear power. Their edict, instead, was specific to Muria, where they ruled the likely benefits were outweighed by the potential damage. Their main concern was safety.

"As far as we can tell, it's the first time there's been any mainstream Islamic expression of opposition to nuclear power, anywhere," says Richard Tanter, an Australian academic who observed the gathering.

Despite the fatwa, and a chorus of other critics, the Government is pressing ahead. It wants to let the first tender next year, with construction to start in 2010, and the first station operating by 2016.

Unease over the plan is not confined to Indonesia. Its neighbours are watching closely.

Australia's position is ambivalent. Indonesia is a potential market for Australian uranium and under the 2006 Lombok Agreement the two countries are committed to peaceful nuclear co-operation.

At the same time, Australia is concerned about potential risks, with studies showing a disaster in an Indonesian reactor would send massive fallout across northern Australia.

Earlier plans by Jakarta to go down the nuclear road were finally killed off by the financial crisis that brought down the Soeharto regime in 1998.

Now it's back on the agenda, backed by powerful and inter-connected business and political interests, including Vice-President Jusuf Kalla. Proponents argue Indonesia needs to diversify sources of energy for its 224 million people, more than half of whom are crammed onto Java, an island roughly half the size of Victoria.

Electricity demand is growing by about 10 per cent a year, while supplies of oil, its main energy source, are dwindling.

Indonesia has the backing of the UN's International Atomic Energy Agency, whose director, Dr Mohamed El Baradei, endorsed the plans on a visit to Jakarta last December. He pointed out that Indonesia was a party to the Nuclear Non-Proliferation Treaty and was committed to safeguards.

Global warming and the need to cut carbon emissions are also being used in support of the nuclear option — although most of Indonesia's emissions, the world's third highest, come from clearing and burning forests.

Government experts insist the Muria site is stable and that modern reactors are earthquake proof.

Such arguments have not silenced opponents, who point out that only last year an earthquake in southern Java killed more than 5000 people.



Antinuclear rally on June 13, 2007

Critics also point to Indonesia's poor safety record in industry and transport, a lack of transparency in Government decision-making and the potential for corruption in a project worth about \$US10 billion (\$A11.1 billion).

Japanese and South Korean companies are keen for the contract. The Indonesian firm Medco Energi Internasional, which has links to Vice-President Kalla, has already signed a preliminary deal with Korea Hydro and Nuclear Power Co Ltd to build the plant. Details of the deal are secret, adding to unease in a country where corruption remains endemic.

While the Government has decentralised power to provinces, the nuclear plant remains the last of the Soeharto-era big projects, imposed from above.

If it goes ahead, the local administration will have little say and no capacity to manage it, says Dr Tanter, senior research associate with the Nautilus Institute, a think tank that focuses on security and sustainability.

"At the local level the impact would be like a kid playing in the middle of a freeway with an 18-wheeler barrelling down on top of them," he says.

Safety is it at the heart of public anxiety, according to Rizal Sukma of the Centre for Strategic and International Studies, a Jakarta think tank.

"To be precise, there is strong doubt — even distrust — that whoever administers the nuclear plant will have the ability and absolute commitment to ensure the safety of a nuclear plant," he wrote in *The Jakarta Post*.

This doubt is shared by Indonesia's near neighbours, who already resent the choking haze they endure each year from the burning of Indonesia's forests.

At a seminar in Jakarta last month on energy and nuclear safety, Dr Sukma was joined by Simon Tay, chairman of the Singapore Institute of International Affairs, in declaring that the nuclear option was a regional issue.

"In addition to harm at the local and national level, nuclear energy plants can potentially cause trans-boundary harm to neighbouring states," they said.

The potential harm was highlighted by research by ANU experts, who warned in a 1998 report that a failure in a reactor on Java "could be a disaster" for northern Australia, Papua New Guinea and South-East Asia.

A failure during the summer monsoon would send radioactive gas across northern Australia within days, the report said. The north of Western Australia, the Northern Territory and Queensland would be at "substantial risk" of receiving potentially devastating fallout.

Critics of the Indonesian plans stress there is no evidence Jakarta wants to develop nuclear weapons. But some observers do see a long-term risk of nuclear weapons proliferation in the Indonesian project.

What they fear is an "A.Q. Khan scenario" — a reference to the founder of Pakistan's nuclear program who set up a secret network to supply nuclear technology to Libya, Iran and North Korea.

The fear held by some US analysts and officials is that a group of Indonesian technical experts could form a similar network, outside the control of the Jakarta Government and working with experts from Iran, which has launched a diplomatic offensive aimed at building ties with Indonesian nuclear researchers.

This is a nightmare scenario for Australia, given the mutual suspicion that complicates relations between the two countries.

This suspicion has been compounded by Prime Minister John Howard's call for a "full-blooded debate" on Australia developing its own nuclear industry, and his refusal to rule out uranium enrichment.

"The consequences of Indonesia and Australia pursuing their somewhat non-rational approaches to the nuclear fuel cycle could have very negative consequences for people who are already suspicious of each other," says Dr Tanter.

Even so, he says climate change and the nuclear issue present an opportunity for greater co-operation between environmentalists, scientists and non-government groups in the two countries.

"These are issues where Australia and Indonesia have common cause, where it's in our shared interests to encourage both governments toward less risky, less threatening energy alternatives. We are in the same boat on this one," he says.

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Posted at Japan Focus on October 20, 2007.

