Nuclear Village and Risk Construction in Japan: A Model for Indonesia?

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Abstract

Japan's success in the development of nuclear energy cannot be separated from the role of the 'nuclear village', a pro-nuclear group comprising experts, bureaucrats, politicians and the mass media. The nuclear village created an image of nuclear energy as 'safe, cheap and reliable'. Using this nuclear village was one of the strategies used to construct a perception of the risk of nuclear energy. Thus, the acceptance by Japanese people of nuclear energy is an important factor in their support for economic development. However, the Fukushima nuclear accident changed the public's perception of nuclear energy and the Japanese Government was asked to end the operation of nuclear power plants. The government decided to change energy policy by phasing out nuclear power by the end of year 2030. Conversely, the Fukushima nuclear accident has not impeded the Indonesian Government's plans to build nuclear power plants. Thus, understanding how the Japanese Government managed nuclear risk is expected to raise Indonesian public awareness of such risks.

Keywords: Nuclear village, Nuclear energy, Risk construction, Japan, Indonesia**.**

INTRODUCTION

Development of nuclear technology in Indonesia has been planned since the 1950s. President Soekarno founded the Commission of Radioactivity Research, led by GA Siwabessy, to mitigate the effects of nuclear testing in the Pacific Ocean by the USA under President Eisenhower. The commission advised President Soekarno to develop nuclear capacity and in1958, he established Dewan Energi Atom (Council for Atomic Energy) and the Lembaga Atom Energy (Institute of Atomic Energy [LTA]); now called BATAN. Under Soekarno, Indonesia succeeded in building its first reactor in Bandung, funded by USD350,000 from the Atoms for Peace program.

Development of nuclear technology was continued under Suharto. In 1979, BATAN succeeded in building a small reactor in Yogyakarta with a capacity of 100kW for developing accelerator technology, material processing and for operator training. Another multipurpose reactor was built in Serpong with a capacity of 30 MW. By the end of 1980, the government had approved the feasibility of constructing a nuclear power plant on the Muria Peninsula in Central Java, and the proposal was approved in 1994 (Amir, 2014). The planning did not continue until the Suharto era ended in 1998.

In 2006, the Ministry of Energy and Mineral Resources promulgated policies for the development of nuclear energy. Thenceforth, planning would go ahead for the development of nuclear power plants to anticipate future needs for energy. However, the government's plans to build nuclear power plants led to public discussion of the pros and cons. On the one hand, the need for energy was increasing rapidly, mainly in the industrial and transport sectors, from 32 per cent and 33 per cent in 2001 to 33 per cent and 23 per cent in 2011, respectively. The main energy resource in Indonesia is oil, which supplied 47.5 per cent of the energy market in 2011 (ESDM, 2012: 29). It has been estimated that Indonesia's oil reserves are sufficient for 23 more years only, that gas reserves are sufficient for 50 more years, and coal for 80 years (Kompas, 2014). Therefore, the Indonesian Government has a national energy policy to decrease the consumption of oil for energy by

diversifying its energy sources. Oil is to supply 20 per cent of total energy needs in 2015. Thus, exploiting nuclear energy is considered to be a quick solution to the current dependency on energy from fossil fuels.

On the other hand, there is some public distrust of nuclear as an energy resource because of the risk of exposure to radiation caused by leakage from or by industrial accidents at nuclear power stations. Sufficient exposure to nuclear radiation can cause cancer, genetic modification and birth defects. Nuclear accidents, for instance, at Three Mile Island (1973), at Chernobyl (1986), which caused the deaths of 39 people, and at Fukushima (2011), the biggest nuclear accident in history, all go to show that nuclear power plants involve high-risk technology. The fear of nuclear radiation has caused the local people in the areas nearby the Muria Peninsula in Central Java, where the nuclear power plant was intended to be built, to oppose the plans for its construction.

This article explains the success story of Japan's construction of nuclear power plants to produce 'safe, cheap and reliable' supplies of energy—before the Fukushima nuclear accident. The good reputation of nuclear energy supported development of 54 nuclear power plants in several areas in Japan. However, the Fukushima nuclear accident changed public perceptions of nuclear energy. The public now believes that nuclear energy is not safe. In addition, the Japanese Government has changed the energy policy to one that favours gradually decreasing the use of nuclear energy. Knowing how Japan created its favourable image of nuclear energy is expected to enable us to understand the risks. It is important to raise public awareness of the risks of nuclear energy production.

NUCLEAR POWER IN JAPAN: FROM HIROSHIMA TO FUKUSHIMA

The destruction caused by atomic bombs in Hiroshima and Nagasaki in August 1945 is still embedded in Japanese memory. At that time, both cities became hellish zones of fire, death and destruction. The two atomic bombs killed nearly two hundred thousand people immediately, and another thousand in the following months and years because of radiation exposure. The atomic bombing forced Japan to surrender to the Allied powers on 15 August 1945. After the war ended, Japan was under the control of the United States and it began its economic recovery. Japan's recovery and development was focused on heavy industry, especially iron and steel, which required enormous quantities of energy. Coal, the main energy source, could not meet the high demand for energy for the development of heavy industry. Therefore, the Japanese Government decided to develop nuclear power as an energy source. The development of nuclear energy in Japan was influenced by foreign governments, mainly the United States, which campaigned to encourage atomic energy for peaceful uses in the post-war era.

Nuclear reactor construction in Japan was initially challenged by various parties; for example by local communities, NGOs and academics. The Japanese Government used several strategies to change the Japanese people's perception of nuclear energy. The government, through the Ministry of Economy, Trade and Industry (METI) and the Ministry of Education, Culture, Sports, Science and Technology (MEXT), campaigned to persuade the Japanese people that nuclear energy was 'safe, cheap and reliable'. The government used various means; the education sector, mass media, seminars and exhibitions. Promoting nuclear energy as safe, cheap, and reliable was not only by the Japanese Government but was helped as well by the mass media, academics, politicians, political parties and bureaucrats.

The nuclear for peace campaign was successful and encouraged Japan to build its first nuclear reactor in 1960. It was built by the Japan Atomic Company in Tokai Village and began to generate power in 1967. The nuclear reactor industry developed rapidly after the world oil crisis in 1973. The oil crisis, triggered by the Yom Kippur war in 1973, caused interruptions to Japan's oil supplies. Approximately 42 per cent of Japan's oil came from Middle East countries (Kobori, 2009;

Nemetz, Vertinsky and Vertinsky, 1985). As a consequence of this disruption to oil supplies, Japan constructed many nuclear reactors from 1970 to 1980; at the end of the decade, 43 had been built (Aldrich, 2012). All told, Japan had 54 nuclear reactors before the Fukushima disaster of March 2011.

The Fukushima nuclear accident was caused by a huge earthquake and a tsunami, and the disaster raised public awareness of the dangers of nuclear reactors. After the Fukushima accident, many Japanese people participated in anti-nuclear demonstrations. The anti-nuclear demonstration in Yoyogi Park, Tokyo, with around 170,000 people, was the biggest demonstration in Japan's history. Anti-nuclear demonstrations show the public resistance to the Japanese Government's policy of nuclear reactor construction to maintain national energy security.

The Japanese people's knowledge of nuclear energy changed gradually over the period from the bombing of Hiroshima and Nagasaki to the Fukushima nuclear accident. This knowledge is the result of social constructions that involve individuals and institutions, and is also influenced by experience. Knowledge cannot be separated from the role of power; it is a result of power being exercised and hitherto power has created knowledge. This article is to throw light on relations between the actors in the production of knowledge of nuclear power as safe, cheap and reliable. The actors involved in this process were the Japanese Government (through METI, MEXT and the Nuclear Industrial Safety Agency [NISA]), nuclear companies, politicians, political parties, academics and the mass media. This grouping is known as the 'nuclear village' and it has actively promoted nuclear energy as useful and important for industrial development in Japan. This article also explains how foreign factors that have influenced the construction of public knowledge of nuclear power in Japan. How did the relations between the various agents help produce the accepted knowledge of nuclear energy as safe, cheap, and reliable? What means and strategies were used?

KNOWLEDGE PRODUCTION AND POWER

Hall (1997), in his article titled 'The work of representation', explained Foucault's ideas of knowledge production that is represented in discourse. Generally, discourse is used as a linguistic concept that denotes passages of connected writing or speech but Foucault gave a different meaning of discourse. He defined discourse as a system of representation. Discourse is group of statements that explain a particular topic at a particular historical moment, that is, that discourse is the production of knowledge through language. Foucault argued that discourse constructs a topic that defines and produces particular knowledge. Discourse can be identified and distinguished as that used by institutions and sectors of society (Oliver, 2010: 27). For instance, discourse in the medical field has been understood by the medical profession only. Therefore, the layperson or patient is excluded from participation in the discussion. Consequently, medical practitioners are able to exercise their power and influence to make decisions, draw conclusions or recommend treatment for patients. On the other hand, a patient or lay person must look for information related to the doctor's recommendation from other sources, such as books, the internet, friends, and other medical practitioners. It means that discourse is associated with power, and with the ability to exercise that power (Oliver, 2010: 29).

Foucault (1992) explained that there is close connection between knowledge and power. Knowledge is created by power, and knowledge creates power. Power is not understood as a group of institutions and mechanisms that cause people to submit to the state through laws and regulations or the domination of one party over others. Foucault asserted that power emerges in every social interaction, even in the most intimate and egalitarian relations. Power operates through ceaseless struggle and confrontation, to transform, to strengthen, or to reverse (Lynch, 2011: 19). Apparatus and technology are necessary for exercising power: apparatus for punishment, such as regulations, laws administrative measures, scientific statements, morality and philanthropy are inscribed in a play

of power and also linked to particular knowledge. Therefore, apparatus comprises strategies of relations, of forces supporting and supported by types of knowledge (Hall, 1997: 76).

Like Foucault, Beck (1992) explained that the concept of risk is a result of a social construction involving experts, media, social organisations, governments, business groups and NGOs. The risks in the modern era are characterised as incalculable, unpredictable, unlimited by time and space, and have intergenerational effects. In particular, the risk of radioactive effects cannot be avoided and are invisible. Thus, the perception of risk can be changed, dramatised, maximised and minimised by knowledge. Risk is dependent on social construction and is open to other interpretations.

Experts have a crucial role in our understanding of risk by the production of discourse, for instance, the concept of hazard defined by the particular language of chemical formulae, biological context, medical diagnoses and statistics. This constitution of knowledge does not make the risk less hazardous. Knowledge and expertise are politicised. Economic opportunity is one of the factors that influences the construction of risk knowledge. To achieve higher productivity, the risks have always been and are still being neglected (Beck, 1992).

Mass media exercise power by producing knowledge through the use of technologies. Through the media, the actors define risk, disseminate knowledge, and predict the effects of the risk; therefore, the media are the places of contest about how that risk is to be interpreted. Society's interpretation of risk depends on what and how the media disseminate risk knowledge and information. Information provided by mass media is not only fact, but also it is the result of social construction that involves journalist, editors, and stakeholders.

PRESIDENT EISENHOWER, SHORIKI MATSUTARO AND THE MASS MEDIA: THE ATOMS FOR PEACE CAMPAIGN IN JAPAN AFTER WORLD WAR II

On 8 December 1953, the US president, Dwight D Eisenhower, gave a speech introducing the idea of 'atoms for peace' at a meeting of the General Assembly of the United Nations. The 'atoms for peace' idea was intended to promote the peaceful uses of nuclear energy in agriculture and medicine rather than to be used for its destructive power in weaponry. The 'atoms for peace' programs were to develop peaceful uses of nuclear energy, such as training technicians, setting up test reactors in foreign countries and providing nuclear materials for other countries. The campaign's purpose was to facilitate communications between Eastern and Western countries, and, in the pursuit of peace, to decrease the number of nuclear weapons in the world (Nelson, 2009: 6).

On the other hand, there had been a development of nuclear energy for military purposes by the US Government during the Cold War. On 1 March 1954, the USA tested a hydrogen bomb, Bravo, at Bikini Atoll, in the Marshall Islands. The bomb had a thousand times more explosive power than the atomic bombs that devastated Hiroshima and Nagasaki. The test caused a Japanese vessel, *Daigo Fukuryu Maru* to be exposed to radiation. There were 23 Japanese fishermen affected, some of them were hospitalised on 14 March 1954 (Aldrich, 2012; Onitsuka, 2011). Afterward, the Japanese Ministry of Health and Welfare stated that 856 Japanese fishing vessels and 20,000 crew were exposed to the radiation. Because of the radiation fear, the price of tuna plunged; 75 tons of tuna caught from March to December 1954 were destroyed as unfit for consumption (Screiber, 2012).

This event initiated an anti-nuclear movement. A group of wives in Suginami Ward in Tokyo started a petition to ban nuclear tests; the petition collected 23 million signatures from Japanese people in the following year. Considering the anti-nuclear movement's expansion, the head of the United States Information Agency (USIA) in Tokyo, Louis Schmidt, told the US Government in Washington that the *Daigo Fukuryu Maru* affair could disrupt implementation of the Atoms for Peace campaign (Zwigenberd, 2012). Hence, the US Government decided to campaign extensively

in Japan for nuclear energy utilisation. The USIA cooperated with Shoriki Matsutaro, the owner of the national newspaper, *Yomiuri Shimbun*, that had a daily circulation of three million (Uhlan and Thomas, 1957: 7).

Tetsuo Arima in his research concluded that Shoriki Matsutaro was a CIA agent whose job it was to campaign for nuclear energy utilisation in Japan (Zwigenberd, 2012). Matsutaro was the former head of the Metropolitan Police in Tokyo who was accused of being the person responsible for the riots after the Kanto earthquake in 1923 that victimised Koreans and, as a consequence, he was dismissed from his job. After his dismissal, Matsutaro bought *Yomiuri Shimbun* and developed it as a national newspaper. He was detained for three years in Sugamo prison for war crimes during World War II but later released without a trial. After his release, Matsutaro got an offer to help facilitate the US Government in its nuclear energy advocacy. Thus, through *Yomiuri Shimbun* and Nihon Terebi (Japan Television), Matsutaro campaigned for the Atoms for Peace program in Japan. Many articles in his media discussed nuclear energy as a safe and unlimited energy resource, and that is was the most modern technology that could be used in agriculture, medical research, industry and transport. Development of nuclear energy was believed to be the appropriate strategy to overcome the lack of energy resources in Japan. On the other hand, any discussion of the negative effects of nuclear energy was limited (Zwigenberd, 2012).

The success of Matsutaro in campaigning for Atoms for Peace helped him to be elected to the Diet in February 1955, representing Etchu County. In April 1955, he assisted in the establishment of the Japan Atoms for Peace Council and, in the following month, he invited the president of General Dynamics Corporation, John J Hopkins, to introduce nuclear reactor development for industrialisation. On 16 December 1955, the Diet founded the Atomic Energy Commission and Matsutaro was elected the first Atomic Energy Commissioner. The Atomic Energy Commission later became the Department of Science and Technology (STA) (Uhlan and Thomas, 1957).

Another success of Matsutaro's in the nuclear energy for peace campaign was conducting an exhibition of nuclear technology in Tokyo, in cooperation with the USIA, for six weeks in November 1955. The exhibition attracted at least 360,000 visitors. On 27 May 1956, the exhibition opened in Hiroshima and attracted some 100,000 visitors. Later it was taken to other cities such as Nagoya and Kyoto. The exhibition was to change the Japanese perceptions of nuclear energy that had resulted from the bombing of Hiroshima and Nagasaki.

The Atoms for Peace campaign was successful in encouraging Japan to build its first nuclear reactor in 1960. It was built by the Japan Atomic Company in Tokai Village and began operating in 1967. The reactor was a Calder Hall type and used the latest technology imported from England. Initially, Japan planned to use a reactor from United States, but the advanced technology of the Calder Hall reactor at the end of 1955 attracted Matsutaro to use this technology (Okuda, 2012).

In the early nuclear reactor development, *Yomiuri Shimbun* was known as the national newspaper that actively promoted nuclear energy utilisation in Japan. Furthermore, *Yomiuri Shimbun* was the sponsor of an exhibition of nuclear for peace as part of the nuclear technology for peace campaign that had been initiated by President Eisenhower. Other national newspapers that promoted nuclear energy were *Asahi Shimbun* and *Mainichi Shimbun*, which had discussed nuclear energy use long before the start of the Eisenhower campaign. On 22 January1946, an editorial in *Asahi Shimbun* discussed the potential of nuclear energy for an industrial revolution and for advanced medical technology. In following editions, *Asahi Shimbun* discussed the advantages of nuclear energy although it was known as the destroying energy. Like *Asahi Shimbun*, editorials in *Mainichi Shimbun* in July 1946 advocated the potential of nuclear energy for industrial development, and that it would be unwise if the Japanese Government were to ban nuclear research (Takekawa, 2012).

Japanese media cannot be separated from the development of the nuclear industry. The media become effective tools for nuclear energy promotion, and earn high fees by promoting the nuclear

industry through advertising and articles. According to the Nikkei Advertising Research Institute, the biggest expenditure on advertising was by energy companies; JPY88 billion or more than USD1 billion. TEPCO's spending on advertising was half that of Toyota, achieving JPY24.4 million. Nuclear energy promotion by TEPCO was through *Asahi Shimbun* and amounted to JPY26 million. In addition, several journalists from *Yomiuri Shimbun*, Nikkei and *Mainichi Shimbun* worked for pro-nuclear organisations and publications (McNeill, 2012).

NUCLEAR POWER AND MONEY MACHINERY OF POLITICAL PARTIES

The destructive power of atomic energy, demonstrated by the bombing of Hiroshima and Nagasaki, inspired a young politician, Nakasone Yasuhiro, a member of the House Representatives from Gunma Prefecture and a member of the Japan Democratic Party, to develop nuclear energy. In 1951, Nakasone sent a petition to General Douglas McArthur and to John Foster Dulles (US secretary of state) to get permission for nuclear research in Japan. In addition, Nakasone visited the United States and consulted Japanese physicists to learn about nuclear energy (Dusinberre and Aldrich, 2011).

Nakasone's ambition to build nuclear power stations was also influenced by President Eisenhower, who first promoted peaceful uses of atomic energy at the United Nations in December 1953 (Aldrich, 2008; Dusinberre and Aldrich, 2011; Onitsuka, 2011). After hearing Eisenhower's speech, Nakasone told himself that 'Japan must not lag behind the United States. Nuclear energy is going to define the next era' (Takafumi, 2011). To realise his ambition, Nakasone proposed a budget for nuclear power station construction and he presented his plan at a meeting of the Diet on 14 March 1954. His effort resulted in a first budget allocation of JPY230 billion for nuclear reactor development. In 1955, the Japanese Government enacted the Atomic Basic Law to regulate the utilisation of nuclear energy. Then, in 1956, the Japanese Government established *Kagaku gijutsu-cho*, the Science and Technology Agency (STA), the Japan Atomic Energy Research Institute (JAERI) and the Atomic Fuel Corporation, all to support nuclear energy development (International Energy Agency, 1999: 54; World Nuclear, 2012).

Nuclear power plant construction in rural areas was used by the Liberal Democratic Party (LDP) to increase its vote because a majority of the LDP's constituents are in rural areas. Electricity companies cooperated with LDP politicians in rural areas to help in their nuclear power plant construction, particularly with negotiations for land acquisition and the transfer of fishery rights. *Dengen Sanpo* (Three Power Source Development Laws), enacted in 1974 under Prime Minister Kakuei Takeda from the LDP were used not only to promote nuclear power plants but also to attract votes for the LDP. *Dengen Sanpo* regulates compensation for communities that are willing to accept electricity-generating plants that use hydroelectric, fossil or nuclear fuel. Compensation for communities that host nuclear reactors is higher than for other power stations. The total compensation for the local communities is based on the amount of energy produced and sold. Therefore, the more energy produced and sold, the greater the compensation for the host communities. In addition, local governments received property tax revenue from the electricity company and subsidies from the central government. This policy, which was integrated with rural development, is one of the central government's strategies in promoting nuclear reactor construction (Lesbirel, 1998; Onitsuka, 2011).

The close relations between electricity companies and the LDP can be seen from the flow of donation from electricity companies to the LDP. The organisation that manages the LDP's funds, the People's Political Association, has noted that funds given to the LDP since the early 1990s have come from individuals connected to nine electricity companies: TEPCO, Chubu Electric, Kansai Electric, Shikoku Electric, Kyushu Electric, Chugoku Electric, Hokuriku Electric, Hokkaido Electric and Tohoku Electric (these last two companies became LDP donors). Although the donations were accepted as individual donations, the funds actually came from the companies. In 1976, the same amount was donated by each electricity company; for instance, a company's president donated

JPY360,000, the vice-president JPY240,000, and another executive JPY100,000. Donation to the LDP tended to increase yearly: in 2007, the donation from electricity companies reached 63 per cent of total individual donations and increased to 70.1 per cent in 2008. In 2009, donations from the nine electricity companies to LDP reached JPY47.02 million or 72.5 per cent of total individual donations of JPY64.85 million. The data also show that, of the nine electricity companies, TEPCO was the biggest donor and contributed JPY64.85 million or 30.3 per cent. In addition, there were 141 executives from a total of 153 executives in the nine electricity companies who made donations to the LDP (*Japan Times*, 24 July 2011). The monetary amount of donations from the electricity companies to the LDP can be seen in Table 1.

Table 1. Donations from electricity companies to the LDP from 1976 to 2009

Year and company	*Total* (JPY '000 000)
1976	17.58
1979	17.88
1989	23.03
1999	37.59
2007	56.69
2009	47.02
Company	
TEPCO	14.27
Chugoku Electric Power Co.	6.8
Chubu Electric Power Co.	6.15
Shikoku Electric Power Co.	6.12
Hokuriku Power Co.	3.13
Hokkaido Electric Power Co.	3.04
Kyushu Electric Power Co.	2.75
Tohoku Electric Power Co.	2.63
Kansai Electric Power Co.	1.86
Okinawa Electric Power Co.	0

Source: *Japan Times*, 24 July 2011. Executives from these utilities are major LDP donors.

THE JAPANESE GOVERNMENT AND ITS PROMOTION OF NUCLEAR ENERGY AS 'SAFE, CHEAP AND RELIABLE'

After the Japanese Government restructured government agencies on 1 January 2001, the implementation of its nuclear policy became the responsibility of the Ministry of Economy, Trade and Industry (METI) and of the Ministry of Education, Culture, Sports, Science and Technology (MEXT). METI has the authority to formulate energy policies, which include those for maintaining

stable and efficient energy supplies. Furthermore, METI, through the Natural Resources and Energy Agency (ANRE) has the authority to issue permits for the construction of nuclear reactors; permits are granted after consideration of site selection, power plant construction and its operation. The authority to regulate for industrial nuclear safety was held by Nuclear Industrial Safety Agency (NISA). MEXT is the merger of the ministries of Education, Science, Science, Sport and Culture (MOE) and the Science and Technology Agency (STA). MEXT is responsible for the development of nuclear knowledge and technology including the development of nuclear technology policies, safety regulations for nuclear research, radiation protection, and exploiting nuclear energy for peace.

METI became the central organisation for dealing with nuclear reactors, including nuclear energy promotion by the ANRE and nuclear safety control by the NISA. The organisational structure of METI was a cause of the weakness in government control of nuclear safety standards. NISA could not work independently because its budget and members of staff came from METI. Some of NISA's staff members came from ANRE whose mission was to promote nuclear energy, whereas the job of NISA's duty is to control and supervise the nuclear energy industry. On the other hand, the Federation of Electric Power Companies (FEPC), which represents the electricity companies, has great influence in the formulation of regulations for the nuclear energy industry. The FEPC lobbied academics and regulators to ensure that nuclear safety regulations did not harm its members' interests. As a result, Japanese nuclear safety standards were lower than international standards.

The Natural Resources and Energy Agency (ANRE), a subsidiary of METI, is responsible for promoting the use of nuclear energy. ANRE used various strategies to promote nuclear energy: providing public facilities in the region where a nuclear reactor was constructed, designing public school curricula that focus on safety and the importance of nuclear reactors, conducting trade fairs to promote primary production of farmers and fishermen. METI also organised the program, *Dengen ricchi sokushin kōrōsha hyōshō* or the Citation Ceremony for Electric Power Sources Siting Promoters, that gives an award to heads of local government who actively promote nuclear energy and contribute to ensure the success of nuclear reactor construction. In July, winners of the award are invited to the prime minister's residence in Tokyo to accept their awards in the presence of many media. The program is to encourage the mayors to be active in promoting the construction of nuclear reactors. Another of the METI's programs was facilitating tours to nuclear reactor complexes for people from communities where nuclear reactors were intended to be built. By seeing the progress of regions that have established nuclear reactors, it is hoped that potential host communities will more easily accept nuclear reactor construction (Aldrich, 2005 2011).

Nuclear Safety Commission

The prime minister oversees the Japan Atomic Energy Commission (JAEC) and the Nuclear Safety Commission (NSC), which have a duty to advise the prime minister on matters related to nuclear energy. The JAEC resulted from the merger of two research and development organisations, the Japan Atomic Energy Research Institute (JAERI) founded in 1965, and the Japan Nuclear Cycle Development Institute (JNC) founded in 1998. The JAEC has responsibility for basic nuclear research and its application, and also to publish the results of research.

The NSC was established in 1978 to separate the authority for nuclear energy promotion from nuclear safety regulation: it was responsible for supervising and controlling nuclear safety then held by MEXT and METI. Unfortunately, the NSC did not function effectively; it underestimated the importance of nuclear safety standards and ignored the possibility of nuclear reactor damage from earthquakes and tsunamis. In 1981, the NSC produced a 'Regulatory guide for reviewing seismic design of nuclear power', revised in 2006. Then, the NSC applied the guide to review and check that regulations had met for all nuclear reactors in Japan concerning possible damage from earthquakes and tsunamis. An interim report, written by TEPCO in 2008, stated that nuclear reactor unit 5 would

be safe from earthquakes and tsunamis and this report was approved by NISA. However, in 2009, another TEPCO interim report concluded that nuclear reactor units 1 to 4 and unit 6 had limitations in dealing with earthquakes and tsunamis. TEPCO did not submit the final report in June 2009 and proposed extending the deadline until January 2016. TEPCO's proposal for an extension of time was approved by NISA. Nevertheless, the back checking did not happen until the nuclear accident at Fukushima. The Fukushima Nuclear Accident Independent Investigation Association (NAIIC) concluded that neglecting to check safety requirements was the one of the factors in the accident at Fukushima (NAIIC, 2012).

In addition, the possibility of a station blackout (SBO) or an electric power outage in the nuclear reactor complex had not been considered. Over the period from 1991 to 1993, the NSC formed a nuclear safety investigation team, and then held several meetings to examine new regulations, already implemented in the United States, that related to the possibility of an SBO in nuclear power plants. The meetings resulted in a report, 'Blackouts at nuclear power plants', dated 11 June1993. The report noted the possibility of serious problems if there were no backup or reserve AC electricity supply to take over should there be an SBO. However, the finding had not been followed up, the safety guidelines were not revised to anticipate this possibility. On 15 February 2012, the NSC chairman, Haruki Madarame, stated to the NAIIC that the one of the factors in Fukushima Daichi nuclear accident was unmet nuclear safety standards in the event of an SBO. The NSA tended to approve the actions of nuclear operators, such as TEPCO, that downplayed the importance of nuclear safety standards (NAIIC, 2012: 12).

TEPCO's strategies to develop nuclear power plants

TEPCO has operated nuclear reactors since 1971 in the Fukushima Prefecture and has become the largest nuclear operator in Japan. TEPCO owns 17 nuclear reactors, ten in Fukushima Prefecture and seven in Niigata Kashiwazaki-Kariwa with a total capacity of 17,308 MW. Before the Fukushima accident, TEPCO had persuaded the Japanese public to accept nuclear reactors as the safe technology to provide many benefits for society. TEPCO used several strategies to realise its goal; for instance, by providing job opportunities and constructing public facilities for local communities. TEPCO also concealed any reactor damage to maintain the public trust that nuclear reactors used safe technology. TEPCO was not the only a member of the nuclear village that constructed a knowledge base that would be used to lead the public to believe that nuclear technology was safe. Supported by the resources of big capital and by networking, TEPCO influenced the bureaucrats, politicians and local communities to accept nuclear reactors.

Providing subsidies, facilities and employment for local communities

The Daichi Fukushima reactor was Japan's second reactor. The Fukushima governor, Sato Zenchirō, who was ambitious for a nuclear reactor to be built his reg5'ion took his hopes to TEPCO in 1958. A feasibility study was carried out to decide the location for building a nuclear reactor; the area chosen was between Okuma and Futaba Counties. In 1961, the Fukushima Prefectural Office and TEPCO called mayors and assembly members for Okuma and Futaba to inform them about the development plan for a nuclear reactor. Building a nuclear reactor in Fukushima was expected to raise economic development, especially in Okuma, which had financial burdens. In the autumn of 1961, the assemblies of Okuma and Futaba invited TEPCO to build a nuclear reactor at Fukushima (Onitsuka, 2011).

The Japanese Government decided to build a nuclear reactor at Fukushima without involving public participation. The project was kept from public awareness because the authorities knew there would be opposition and resistance from the local people. The Fukushima Prefecture government formed the Fukushima Prefecture Development Public Corporation as the agency to be in charge of

land acquisition and negotiations with fishermen to transfer fishery rights. In addition, TEPCO recruited a local farmer, Hashimoto Tetsujiro, to promote nuclear development and employed him in TEPCO's office. As a result, land acquisition in Futaba and Okuma Counties was relatively smooth and was completed in 1968. TEPCO built public facilities for Futaba and Okuma Counties as compensation for the construction of a nuclear power station in those regions, and also as compensation for private land. In addition, the local government accepted tax revenue from TEPCO. In 1978, tax revenue from the nuclear reactor company accepted by Okuma County was JPY1.7 million or 88.5 per cent of total tax revenue. By 1979, the budget of Okuma County had increased to be 26.6 times greater than in 1965 (Onistuka, 2011).

TEPCO also constructed a nuclear reactor complex in Kashiwazaki-Kariwa in Niigata Prefecture. Nowadays, there are seven nuclear reactors are in operation, and two more nuclear reactors have been constructed. Kashiwazaki-Kariwa has becomes the home for the biggest nuclear reactor complex in the world. Each year the owners of the nuclear reactors contribute 14 per cent of the government budget of Kashiwazaki and 30 per cent of the government budget of Kariwa each year. In addition, it also creates jobs for the local people. There are about 4000 people working in the Kashiwazaki-Kariwa nuclear reactor complex (Yomiuri Shimbun, 2012).

Subsidies by nuclear companies to local governments cause a dependency by those governments on such financial assistance. When the local government budget is no longer sufficient to finance expenditure; for example, for public facilities maintenance, then constructing another nuclear reactor becomes the strategy to overcome this problem. It is done under the assumption that additional nuclear reactors will increase tax revenues for local governments. In addition, local people have more opportunities for another income by working in the nuclear reactor complex.

The myth of safety: hiding nuclear reactor damage

Explosions at four Daichi Fukushima nuclear reactors managed by TEPCO are the tip of the iceberg: there are many more instances of the consequences of nuclear safety standards being downplayed. The electricity companies, supported by the government, create a myth of safety to persuade local communities, and to mould public opinion, that nuclear energy is safe energy. When the accident occurred, against all predictions, the company's lack of preparation meant that nothing had been done to anticipate any disaster. For instance, TEPCO did not anticipate for the loss of external power to the reactor. The conviction that the nuclear reactor would be safe, no matter what, led to the neglect safety standards.

Procedural errors and negligence of safety standards by TEPCO were common long before the Daichi Fukushima incident. In August 2012, NISA held a press conference to reveal the falsification of inspection reports of nuclear reactor safety written by TEPCO in 2001. In 2000, the workers for General Electric International Inc. (GE), a contractor company that built nuclear reactors, informed METI that TEPCO had covered up a voluntary inspection result that reported that cracks were found in six nuclear reactors at Fukushima I, in four nuclear reactors at Fukushima II and in seven nuclear reactors at Kashiwazaki-Kariwa. Moreover, TEPCO edited the record of repairs to the reactors. These cases were not followed up by METI until two years after the GE report.

The case was followed up by NISA, in cooperation with GE, and TEPCO's nuclear reactors, and also all other reactors in Japan, were inspected. It was found that there were 29 falsifications related to nuclear reactor damage. The cracks to the nuclear reactors were found after 1993: for ten years TEPCO had not disclosed instances of reactor damage. NISA also found damage to nuclear reactors owned by the Chubu Electric Company and the Tohoku Electric Company. Consequently, TEPCO was sanctioned, 17 nuclear reactors were closed, including reactors in Kashiwazaki-Kariwa Niigata.

Construction network through amakudari

Amakudari was one of the factors contributing to weaknesses in the government's control of nuclear safety standards (Aldrich, 2011). The practice of *amakudari* (which tranlates literally as 'descent from heaven') is the glue that assures close relations between bureaucracy and business. *Amakudari* is the informal networking that connects government and business, it is the medium for conflict resolution and negotiation. This networking can decrease transaction costs between institutions and overcome uncertainty about government policy (Usui and Colignon, 1995). *Amakudari* is the transition of senior bureaucrats, aged about 50 to 55 years, from various departments, especially those departments that have great authority on policy formulation, such as the Ministry of Finance (MOF), METI and the Ministry of Construction, to private companies, to public companies and to political parties, where they are given senior positions. Establishing such strong relations is the one of the strategies of companies to protect their interests. The networking established by an *amakudari* group allows companies to influence policy made by a government department.

Over the past fifty years, there have been 68 former elite bureaucrats who, after they retired from METI, were given top positions in 12 electricity companies. From 1959 to 2010, there have been five vice-presidents of TEPCO who came from NISA. The former head of ANRE, Toru Ishida, resigned from METI in the summer of 2010 and in January 2011 was recruited by TEPCO as a senior consultant (Fukue, 2011). Moreover, there are strong connections between ANRE, TEPCO and the Liberal Democratic Party (LDP), especially in promoting nuclear energy.

THE FUKUSHIMA NUCLEAR ACCIDENT AND IMPLICATIONS FOR PLANNING AND BUILDING NUCLEAR POWER PLANTS IN INDONESIA

After the Fukushima accident, Japan has an anti-nuclear movement that has spread to many regions in Japan. This social movement has claimed to have organised the biggest demonstration in Japanese history. The movement has not only involved the anti-nuclear activists but also common people who had never participated before in mass movements: housewives, employees, artist, experts, etc. Their concern about nuclear risks that cannot be felt or smelt, and the negative effects of nuclear radiation has encouraged them to participate in the anti-nuclear movement to fight for a healthier environment. In September 2012, the Democratic Party of Japan led by Prime Minister Yoshiko Noda, announced that the Japanese Government would phase out nuclear power by the end of year 2030 (Aldrich, 2013). Then, the next Japanese Government, lead by Prime Minister Shinzo Abe, revised Japan's energy policy by decreasing dependency on nuclear energy, and replacing it by developing other energy resources. After the Fukushima nuclear accident, all of Japan's 48 operable commercial nuclear reactors were shut down. Only two reactors, at the Sendai plant 1000 kilometres southwest of Tokyo in Satsumasendai, are to be restarted after the Nuclear Regulatory Authority issued a safety clearance in September 2014 (Hamada, 2014). Although the Japanese Government is to phase out nuclear power plants in Japan, nuclear technology will be exported to other countries such as Vietnam, South Korea, Turkey, Saudi Arabia and Indonesia.

The Fukushima accident encouraged Germany to revise its energy policies for the future by developing other energy sources. Unlike Germany, which is decreasing nuclear energy use, the Indonesian Government is insisting on the construction of nuclear power plants. There have been feasibility studies to find new places for power plants. The Indonesian Government has announced Bangka Belitung Island as the new location for a nuclear power plant. Bangka Belitung is claimed to be a safe place, not vulnerable to earthquakes and tsunamis. The nuclear power plant is expected to resolve the lack of electricity in this island. The previous location for nuclear power generation, Muria Peninsula, is not politically feasible because of the strong opposition from local people (Amir, 2014). The Indonesian Government argues that nuclear energy can supply much of the energy for important industrial development. In addition, nuclear energy is claimed to be green energy because it does not produce greenhouse gas emissions. However, nuclear energy generation can expose the

environment and the population to nuclear radiation through leakage and accidents. Different from the fossil fuel pollution, radiation is odourless, invisible and cannot be felt, but it is no less a danger for human life and the environment.

Like Japan, Indonesia is on the 'Ring of Fire', the edge of the Pacific Ocean crustal plate that is vulnerable to earthquakes and volcanic eruptions, which increases the risk of a nuclear accident. The safety of a nuclear power plant is a vital aspect of its management. Although the Fukushima nuclear accident was triggered by an earthquake and a tsunami, the investigation by the Fukushima Nuclear Accident Independent Investigation Association (NAIIC) found that the main factor was downplaying nuclear safety. Japan is known as the country that has best practice on risk management, but the Fukushima nuclear accident proved that Japan was not fully prepared.

In summary, Japan had succeeded in persuading the public that generating nuclear power was 'safe, cheap and reliable' energy, and this allowed the construction of 54 nuclear power plants in several areas, including Fukushima. However, the image is questionable after Fukushima, and the public has begun to distrust nuclear energy as safe energy. Learning how Japan constructed nuclear risk by creating a good image of nuclear energy is important when raising the Indonesian people's awareness of nuclear energy's effects. In addition, Indonesia should be learning from the Japanese case that creating a good image of nuclear energy should not overlook the drawbacks.

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