Executive summary

In Asia, which began to develop nuclear power generation in the 1960s, several countries are considering the introduction of nuclear power. Countries that have been using nuclear power include China, India, and the Republic of Korea.

When neighbouring countries become new adopters and begin generating nuclear power, no country can avoid involvement in potential problems such as information sharing in the event of a nuclear accident, or the transportation of radioactive wastes. Hence, delivering information about nuclear power to people in a timely fashion, eliminating information asymmetry, and improving public acceptance of nuclear power generation are important issues.

This research offers policy recommendations for improving the public acceptance of nuclear power in Asia based on a direct exchange of views between opinion leaders in developed countries. For many years, these entities have successfully communicated with and served as a bridge between residents and business operators in areas where nuclear power facilities are located.

Whilst local opinion leaders have spoken about their experiences on public acceptance of nuclear power at many workshops and international symposiums, this workshop is unique in that it involves researchers in Asian countries as well. By listening directly to discussions between opinion leaders in countries that have introduced nuclear power, such as Europe, Japan, and the United States (US), policy researchers and advisers from Asia can grasp the issues surrounding the impending arrival of nuclear power facilities in their own country or neighbouring countries and can make the necessary preparations.

Before convening the workshop, a representative from the Institute of Energy Economics, Japan visited opinion leaders from the developed countries to gain a better understanding of the background of each opinion leader and thereby draw their views out more effectively. This preliminary exchange of views helped workshop participants focus on the major issues of this research and contributed significantly to the policy proposals of the workshop and to the acceptance of the recommendations. It also lent support to one of the policy recommendations: ‘Talking about personal stories is effective in facilitating understanding between stakeholders’.

Rokkasho village in Aomori Prefecture was selected as the workshop venue. Its residents have had much experience in engaging in dialogue with the government and other nuclear power stakeholders

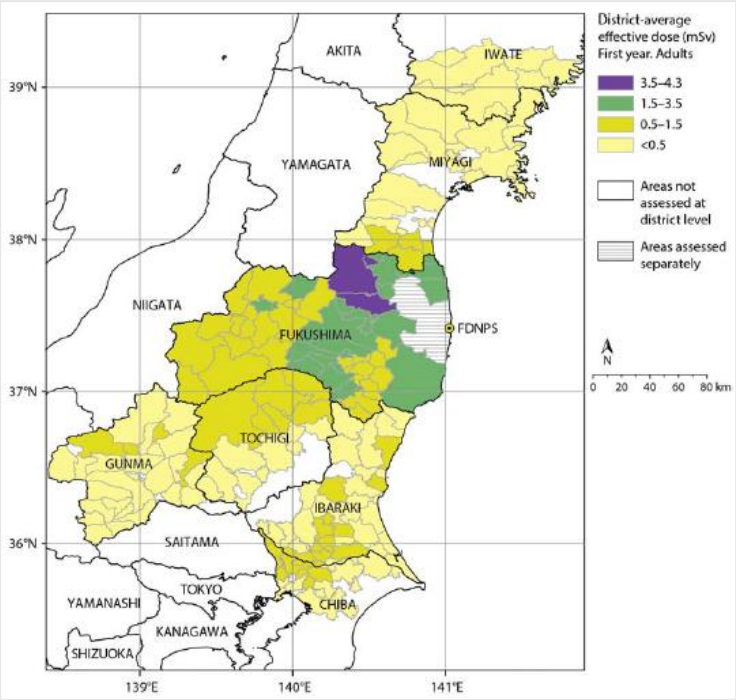
because the village has hosted nuclear power facilities for almost 50 years. Opinion leaders from the village spoke about the economic and social benefits that the establishment of nuclear power facilities in the area have brought to the regional economy. They also expressed a wish that both the workshop and the government should emphasise the benefits of nuclear power to people. The local government representatives of Aomori Prefecture pointed out that communication between the national government, regulatory agencies, local governments, business operators, and residents takes on greater importance when it comes to the timely sharing of information related to nuclear power facilities and the benefits and risks of nuclear power with stakeholders in the area. Considering these views, as well as the experiences and opinions raised by opinion leaders from the developed countries, participants from Asia pointed out that while timely information sharing and appropriate communication are important in building mutual trust, it is more vital that the media convey accurate information.

Findings

The main findings obtained through the series of exchanges are summarised as follows.

- Most energy used around the world is fossil fuel-based. Fossil fuel usage is projected to continue increasing, especially in developing countries. Continued and increasing use of fossil fuels would cause air pollution, climate change, and most importantly, would threaten energy security in countries that lack natural resources. Meanwhile, nuclear energy provides opportunities for significant economic benefits, including jobs, business opportunities, human resources development, environmental sustainability, and energy security in countries that depend on imported fossil fuels.
- The most typical cries against nuclear are, ‘nuclear is dangerous’, ‘nuclear produces wastes’, and ‘we already have alternative energy sources’. The fact remains, however, that the radioactive release by Fukushima in 2011, one of the most severe nuclear accidents, did not impact public health as claimed. Rather, nuclear can be considered the safest and least environmentally damaging energy sources, providing electricity reliably and economically. In some countries, nuclear is not the cheapest power source, and the risks must always be recognised and managed to keep them under control.

Figure 1. Estimated District-Average Effective Doses in the First Year Following the Accident



Source: United Nations Scientific Committee on the Effects of Atomic Radiation (2013)

The United Nations Scientific Committee of the Effects of Atomic Radiation (2013) stated that 'the Committee's understanding of the exposures is that they fell well below the thresholds for deterministic effects. This was consistent with no acute health effects (i.e. acute radiation syndrome or other deterministic effects) having been reported that could have been attributed to radiation exposure.

- The real risk pertaining to nuclear power lies in constraining its widespread use, because this would lead to increased fossil fuel use, air pollution, and other environmental problems.
- It is useful to illustrate the economic benefits of nuclear power for both the residents and the municipality. The power plant site provides jobs for local people and the nuclear industry offers a substantial business opportunity to local firms. More employees will pay income taxes to the municipality, which in turn will contribute to sustainable economic growth.

Several policy recommendations have been proposed based on the workshop's findings. Experts invited to the workshop considered the question 'How could we convey relevant facts to the public and improve communication methods?' Their opinions were as follows.

- Nuclear communications have usually focused on technology. To build trust, however, nuclear communications need to include integrity, competence, and benevolence. Talking about the need for nuclear power, rather than describing the technology using technical jargon, is crucially important and effective.
- What works best is to share personal stories, be open, honestly admit to mistakes, and apologise when necessary. The role of the national, municipal, and local governments is also important to maintain a clear and firm position on commitment to projects.
- Local stakeholder involvement should be led by local people employed where the nuclear facility is located. These key individuals should understand and be sensitive to local issues, cultures, and attitudes. Industry, academia, government, and the education sector should work together with a clear vision and a common understanding of the need for mutual communication. Establishing a strong link between local schools, colleges, universities, and employment opportunities may be especially helpful for bridging communication gaps.
- Developing business projects and inviting investment is also important for enhancing the involvement of local stakeholders in the nuclear industry. This can be done by promoting opportunities to secure public and private investment and delivering projects and programmes to secure an ambitious economic legacy.
- The role of the media and how to provide information to media should be reconsidered. Media, including social media such as social networking services, can and should build public opinion and can often amplify trends. Communicating through social media is one method for achieving better public acceptance of nuclear power.

Introduction

As member states of the Association of Southeast Asian Nations (ASEAN) attempt to reduce their fossil fuel consumption in the face of rising electricity demand, they have come to view the introduction of nuclear generation under certain conditions more positively. However, especially after the Fukushima Daiichi nuclear power plant accident in 2011, a surge of public anxiety and the ensuing difficulty in securing societal agreement for nuclear power has led many governments to consider suspending installation of new nuclear facilities.

Despite the heightened in public anxiety, nuclear energy remains an important option for the

ASEAN+6 [1] countries, due to insufficient renewable resources (Nian and Chou, 2014) and the increasing effects of pollution from coal (Koplitz et al., 2017). Once there is political willingness and public support, several ASEAN countries, including Malaysia, the Philippines, Thailand, and Viet Nam, are likely to proceed with their nuclear power programmes. Nuclear power generation can provide these countries with energy security, and thus the ability to tolerate high gas prices, and a solution to environmental problems such as climate change.

ASEAN countries have mainly expressed intentions to develop full-scale reactors for baseload electricity supply. For example, Viet Nam has planned the Ninh Thuan 1 Nuclear Power Plant (four 1,200 megawatts electric (MWe) water–water energetic reactor pressurised water reactors) and Ninh Thuan 2 Nuclear Power Plant (four 1,100 MWe reactors) (WNA, 2017), and the Philippines still maintains a mothballed nuclear plant (a 621 MWe Westinghouse pressurised water reactor) (WNA, 2018). However, these plans have been postponed due to economic conditions and growing public concern over the risks of radioactivity and accidents.

Economic issues could be solved by financial assistance from vendors or their corresponding governments (China, Japan, Republic of Korea, and Russia), or by reducing costs by using innovative technologies (e.g. the development of generation IV reactors). However, innovation in the fields of finance and technology cannot reduce public anxiety.

In addition to the Philippines and Viet Nam, five other ASEAN countries have sustained an interest in nuclear power. However, public acceptance is still a major issue in these countries too.

Myanmar. The Government of Myanmar considered purchasing a research reactor (10–15 megawatt thermal light water reactor) from Russia in the early 2000s, however, the plan was postponed in 2002 for economic and political reasons. In 2007, the two countries signed an agreement on the construction of a nuclear research centre with a 10-megawatt thermal light water reactor in central Myanmar (Khlopkov and Konukhov, 2011). Furthermore, in the same year, the two countries signed a memorandum of understanding to cooperate in nuclear technology for peaceful purposes (Myanmar Times, 2016).

Thailand. Thailand has had an operating research reactor since 1977. In 2008, feasibility studies conducted by the Electricity Generating Authority of Thailand listed five possible sites for the project, and the engineering firm Burns and Roe was commissioned to undertake a 20-month study to recommend siting, technology, and reactor size for the first plant. Public information and community

[1] ASEAN+6 refers to the 10 members of ASEAN plus Australia, China, India, Japan, Republic of Korea, and New Zealand.

consultation were identified as very high priority areas for attention. However, after the Fukushima accident, the plans were put on hold. The government's 2015 power development plan had two 1,000 MWe nuclear power plants coming on line in 2035–2036, but no site was mentioned (WNA, 2018).

Malaysia. The Malaysian Nuclear Agency has operated the Puspati Triga research reactor since 1982. In early 2010, the government had a budget of $7 billion to build a nuclear power plant, and in May the Ministry of Energy, Green Technology and Water was told to find a suitable site so the first unit could be built and in operation by 2021. Five locations on the Malaysian Peninsula were identified. The next steps were to appoint consultants to prepare a feasibility study, develop the regulatory framework and soft infrastructure, and gain the public's understanding. In 2014, the minister responsible for Malaysia Nuclear Power Corporation announced a feasibility study, including public acceptance, for building a nuclear power plant to start operation in about 2024 (WNA, 2018).

Singapore. No official plans have been made for nuclear power development because of siting constraints on the island (WNA, 2018). However, nuclear safety research programmes have been conducted since 2014.

Indonesia. Three research reactors have been in operation since 1964, 1979, 1987, and an experimental reactor has been planned since 2013. In March 2015, the government issued a white paper on national energy development policy up to 2050. It expects nuclear power to provide 5 GWe by 2025. However, the National Energy General Plan to 2050, which was signed by the president in January 2017, excludes major nuclear capacity, and anticipates large increases in oil, gas, and renewable energy. Although nuclear power development has been under consideration since the early 1990s, a steady focus has been lacking (WNA, 2018).

In view of these circumstances, the ASEAN Member States have set up an initiative to share and study the decades of developed country experience of nuclear energy to see what kind of information has been exchanged with the host communities. This body of knowledge is expected to help ASEAN in its efforts to introduce nuclear power.

Purpose of the workshops

When seeking to improve public acceptance, it is important to hold international symposiums to convene experts from all over the world. It would also be effective to invite regional leaders and opinion leaders from the municipalities hosting nuclear facilities in developed countries, such as the European nations and the US, to workshops in order to gather and analyse their experiences and formulate policy proposals. The preparation of policy proposals is urgent because of the time it takes to introduce, construct, and commission nuclear power plants.

Many workshops and international symposiums have been held by local opinion leaders speaking about their experiences. However, this event is innovative in that it involves researchers in Asian countries as well. By listening to discussions between opinion leaders in countries that have introduced nuclear power, such as European countries, Japan, and the US, policy researchers from Asia can gain a realistic grasp of the implications of nuclear power facilities in their own country or neighbouring countries and can make the necessary preparations. The policy researchers who participated in this workshop are expected to bring the outcomes and the policy recommendations back to their home countries and put them to use to improve understanding and acceptance of nuclear power.

In addition, this workshop developed a model for better public acceptance of nuclear power that can be adapted and applied to other energy technologies, such as wind power, hydropower, and electricity grid management. It is also expected that this method will contribute to finding solutions for issues where public acceptance is difficult to obtain.

Workshops and discussions

This project involved discussions amongst policy researchers and advisers in the East Asia and ASEAN countries and experts from countries of the Organisation for economic Co-operation and Development.

Two opinion leaders (e.g. local mayors and civil movement activists in regions hosting nuclear power plants) from each of three nations (Finland, the United Kingdom [UK], and the US), were invited to participate in a two-step workshop that aimed to compile a policy proposal draft. The workshop participants included energy-related policymakers, governmental officials, and researchers from India, Indonesia, Japan, Malaysia, Mongolia, New Zealand, Thailand, and the US. There countries are all members of the Energy Research Institute Network (ERIN), an organisation that includes the 10 ASEAN Member States plus Australia, China, India, Japan, Republic of Korea, Mongolia, New Zealand, and the US – 18 countries in all – and is affiliated with the Economic Research Institute for ASEAN and East Asia (ERIA).

Before the invitation, the project leader visited Finland, the UK, and the US to discuss the major issues in the draft proposals with the invited opinion leaders, so that the workshop participants could focus on those essential to better promoting nuclear public acceptance.

At the Tokyo workshop, the six invited opinion leaders and 10 ERIN member participants discussed the importance of nuclear power, successful cases of emergency preparedness in the developed countries, and the status of nuclear energy in the ERIN member states. ERIN member countries fall into three groups: those that already have nuclear plants, those that are considering them, and those that are not considering nuclear generation at present. Even for countries without nuclear plants, the possibility that neighbouring countries will construct them necessitates emergency preparedness measures. The discussions of successful cases by ERIN members and opinion leaders of developed countries can lead to valuable insights that ultimately promote effective public acceptance in the ERIN member countries.

Nine representatives selected from the Tokyo workshop members visited Rokkasho village in Aomori Prefecture, which hosts some of Japan's nuclear power facilities, to hold a second workshop with six local opinion leaders (Figure 2). At the Rokkasho workshop, discussions were held to refine the policy proposal draft compiled during the Tokyo workshop, and a final policy proposal was created.

The Rokkasho workshop was designed so that Rokkasho residents could voice their opinions and exchange views with residents of hosting communities in developed countries. It was hoped that this would lead to the design of a public acceptance scheme that would be desirable from the residents' viewpoint.

The participants also visited the office of the governor of Aomori Prefecture to hear about the situation regarding public acceptance there and to exchange further views (Figure 3). In addition to the programme in Aomori Prefecture, the participants toured the Tokyo Electric Power Company Fukushima Daiichi nuclear power plant and other facilities operated by Japan Nuclear Fuel Limited to further understand the situation in Japan.

Figure 2. Rokkasho Workshop

Source: Institute of Energy Economics, Japan.

Figure 3. Visit to Governor's Office, Aomori Prefecture

Source: Institute of Energy Economics, Japan.

At the Rokkasho workshop, several panel discussions were held with some ERIN members on a series of subtopics. The invited representatives and opinion leaders from municipalities in developed nations were asked to share their experiences with experts in Asia and to discuss how to promote public acceptance.

Rather than using a lecture format, this workshop was structured so that people going through similar experiences or those who may require public acceptance in the future could jointly deliberate a policy proposal for nuclear public acceptance.

The six invited opinion leaders included

(i) the co-founder of 'Mothers for Nuclear', a US-based environmental non-profit-making organisation focused on building a global community of support for nuclear energy from the standpoint of mothers and nuclear engineers;

(ii) the director of the Menai Science Park in the UK, who is also an environmentalist and a member of the National Assembly for Wales, where retired nuclear power plants and a planned construction site are located;

(iii) the nuclear coordinator of the Heart of the South West Local Enterprise Partnership, which aims to secure a wider South West regional economic legacy from the Hinkley Point C project and other nuclear activities;

(iv) a member of the steering committee of Innovation for Cool Earth Forum (an international organisation working to prevent global warming) who was formerly against nuclear energy but has recently been involved in its promotion; and

(v) the chair of the Eurajoki Municipality council in Finland, which was the first in the world to accept a spent fuel final disposal facility (currently under construction).

The aim of this workshop was to gain insight into future nuclear public acceptance by looking at experiences of acceptance and coexistence with nuclear facilities shared by environmentalists, people who had once held anti-nuclear views, and people who are not nuclear operators.

The ERIN members and invited opinion leaders participated in the Tokyo workshop on 6 February 2018 then attended the second workshop, in Rokkasho village, with local opinion leaders on 8 February 2018. The main themes and discussion points were as follows.

(i) Why is nuclear power important for the state and the communities?

Discussion points: Advantages of nuclear power; power plants versus reprocessing

and disposal facilities; regulation schemes, tolerable risk levels, and minimisation of risk; and economic contribution to communities.

(ii) Can we be 'safe enough' against accidents?

Discussion points: Evacuation plans and evacuation drills for neighbouring nations, emergency care, and contact systems.

(iii) What was the status of the regions hosting or introducing a nuclear power plant and how did each country's dialogue with stakeholders proceed?

Discussion points: Why is nuclear power important for the country and communities? Can we prepare sufficiently for accidents?

(iv) How can we develop a common understanding between stakeholders?

Discussion points: Advantages of nuclear power plants, regulation schemes, and the risks of nuclear power plants during operation.

The discussions led to the following important insights into public acceptance of nuclear power:

(i) Public acceptance of nuclear power is likely to be positively affected by the necessity for energy security and the presence of stable geological conditions;

(ii) younger people and more-educated people tend to accept nuclear power more than older people and less-educated people;

(iii) public acceptance of nuclear power tends to be more difficult to achieve in societies with high living standards, decentralised power, and a high risk of natural disasters; and

(iv) maintaining permanent cooperation with nuclear power plant suppliers can contribute to transparency in relation to nuclear safety in each ASEAN Member State.

Policy proposals

Based on the discussions at the two-stage workshop, some common conditions for a successful public acceptance undertaking were classified and analysed. In addition, participants investigated the rationale for nuclear power, the benefits of hosting nuclear facilities, and key factors for success at the local government level. Based on these examinations, policy proposals to the operator, the central

government, and the local government were compiled.

The policy proposal compiled at the two-stage workshop and the opinions exchanged with the staff of the Aomori Prefecture office have been summarised and will be disclosed in the form of policy briefs on the ERIA website.

Figure 4. **Press** C**onference after Wrap-**U**p** M**eeting**

Source: Institute of Energy Economics, Japan.