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An International Analysis of Public Acceptance of Nuclear Power

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 Unless otherwise specified, the sources of figures and tables in this report are from the results of the study.

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Contents

List of Figures

List of Tables

Abbreviations

ASEAN	Association of Southeast Asian Nations
ERIA	Economic Research Institute for ASEAN and East Asia
ERIN	Energy Research Institute Network
JAERO	Japan Atomic Energy Relations Organization
MWe	megawatt electric
UK	United Kingdom
US	United States

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

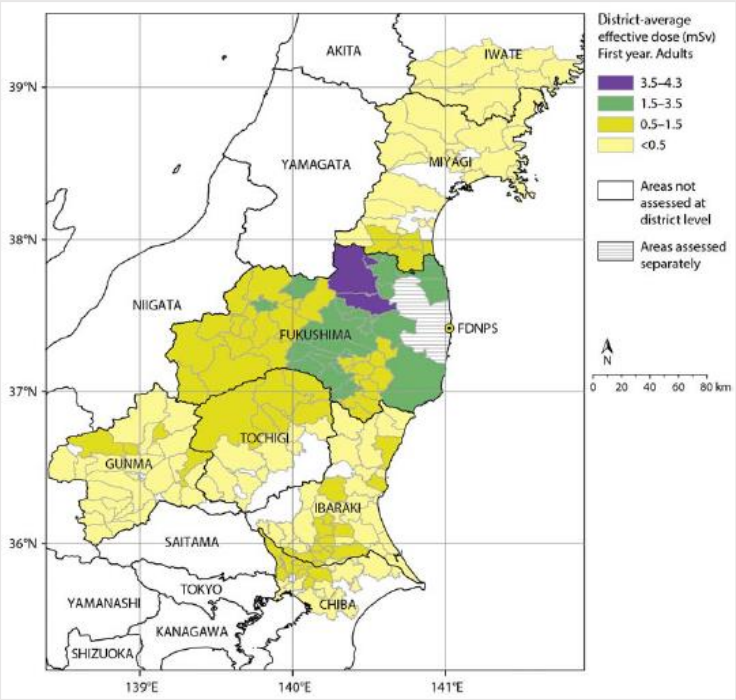
because the village has hosted nuclear power facilities for almost 50 years. Opinion leaders from the village spoke about the economic and social benefits that the establishment of nuclear power facilities in the area have brought to the regional economy. They also expressed a wish that both the workshop 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.

Chapter 1

Public View of Nuclear Energy Today

It is impossible to site or operate a nuclear facility without earning public acceptance from stakeholders including residents. There have been cases where construction plans were cancelled after a local referendum, such as the Maki and Ashihama nuclear power plants in Japan (Juraku, Ohkawa, and Suzuki, 2005). The underlying cause for opposition amongst the residents was a lack of information.

This chapter illustrates how the image of the nuclear energy has (or has not) changed in several countries. While indices of public trust towards nuclear energy drop after accidents, many countries have seen trust improve in the years that follow. The reasons behind this phenomenon are now examined.

1-1. Opinion Research by Japan Atomic Energy Relations Organization, Japan

1) Purpose and method of the opinion research

Since its establishment in 1969, the Japan Atomic Energy Relations Organization (JAERO) has strived to enlighten people on the benefits of the peaceful use of nuclear energy. Based on its belief that the promotion of nuclear-related information relies on a having a good grasp of the perceptions of its recipients, JAERO has conducted regular and repeated public opinion surveys since 2006.

JAERO's method of opinion research is as follows. A survey was conducted with 1,200 respondents aged 15–79 years old, of randomised sex, and from randomly sampled households resident in Japan. Six samples were taken from each of 200 sampling areas chosen in proportion with regional and municipal scale groups. The survey method used was the omnibus investigation personal visit detention method. Surveys were conducted during 4–16 October 2017.

2) Results

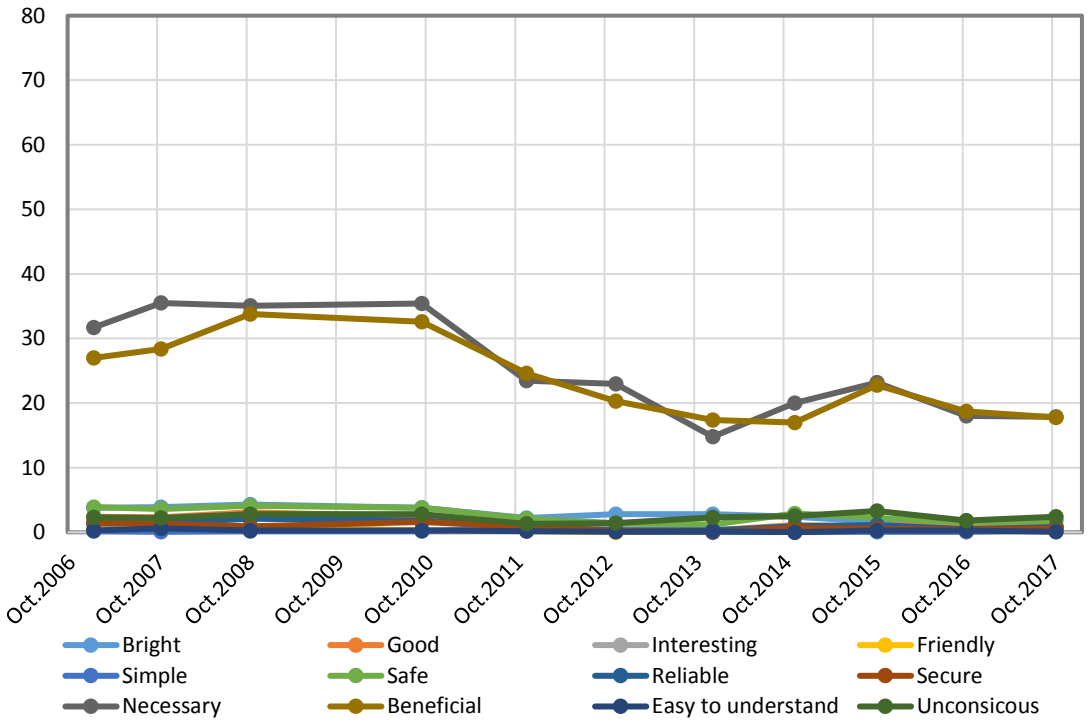
a. Comparison of positive and negative images on nuclear power

Figure shows the trends in the positive image of nuclear power, while Figure 1-2 shows the trends in the negative image. Table 1 compares these results. Overall, the negative images, such as 'bad', 'complex', 'dangerous', 'unreliable', 'insecure/causing anxiety', and 'difficult to understand', score higher than positive images. On the other hand, the positive image of being 'beneficial' was higher than the negative image of being 'useless'. The similar magnitude of the points for 'necessary' and 'unnecessary' may indicate a divide in opinions.

In addition, the results show that the public image of nuclear power tends to change (for the positive images) or fluctuate (for the negative images) after an accident.

Figure 1-1. Positive Image of Nuclear Power

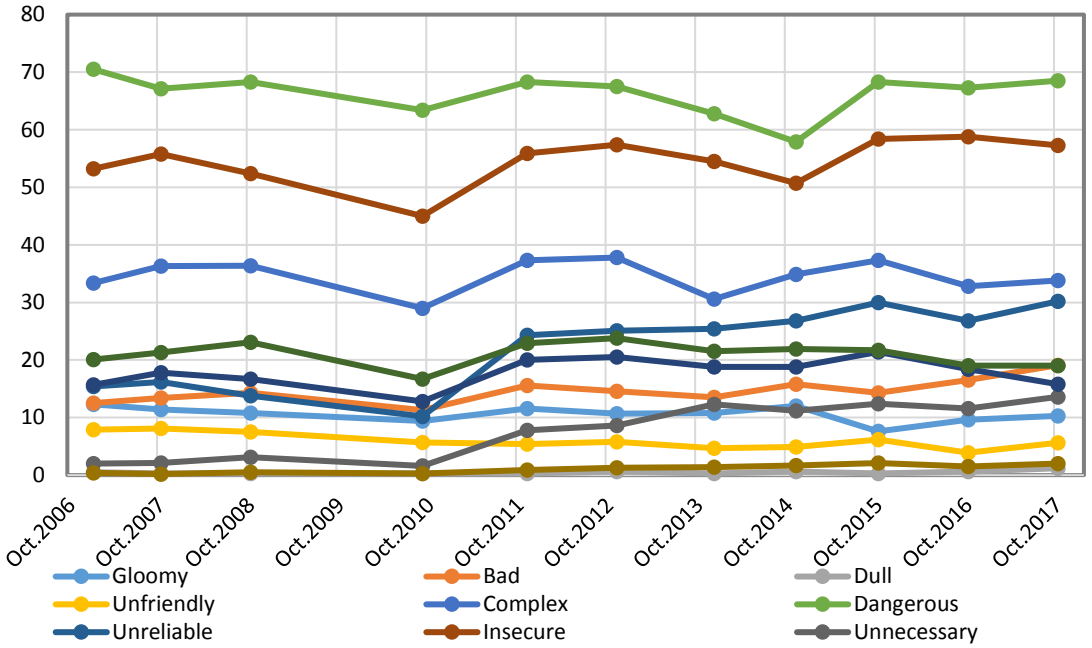
(% of respondents)



Source: Japan Atomic Energy Relations Organization (2018).

Figure 1-2. Negative Image of Nuclear Power

(% of respondents)



Source: Japan Atomic Energy Relations Organization (2018)

Table 1-1. Comparison of the Positive and Negative Images of Nuclear Power

(% of respondents)

Positive image		Negative image
Good (0.9)	<	Bad (19.1)
Simple (0.3)	<	Complex (33.8)
Safe (1.8)	<	Dangerous (68.5)
Reliable (0.8)	<	Unreliable (30.2)
Secure (1.4)	<	Insecure (57.3)
Beneficial (17.8)	>	Useless (2.0)
Easy to understand (0.1)	<	Difficult to understand (15.8)
Unconscious (2.4)	<	Disturbing (19.0)
Necessary (17.9)	>	Unnecessary (13.6)

Source: Japan Atomic Energy Relations Organization (2018).

b. Public acceptance of nuclear power

An overview of the results of the survey is as follows.

(i) Under benefit cognition (usefulness, economic efficiency, and contribution to solving global warming), a high percentage of respondents answered ‘cannot decide’.

(ii) Under risk cognition, most respondents acknowledged (to different degrees) that ‘nuclear power plants are dangerous in our earthquake-prone country’ and did not agree that ‘disaster prevention measures of areas surrounding nuclear sites have been established’.

(iii) Experts, utilities, the national government and local governments concerned with nuclear power are not trusted.

(iv) Most respondents feel that ‘we cannot help using nuclear power for a while but should gradually move towards phaseout’.

(v) The amount of knowledge concerning nuclear and energy matters has a relatively large influence on the judgement on whether to use nuclear energy; ambiguous answers such as ‘cannot decide’ decrease with increased knowledge.

(vi) The main reasons chosen for not restarting reactors are ‘unclear prospects for Fukushima Daiichi decommissioning’, ‘unclear prospects of radioactive waste disposal’, ‘anxiety concerning disastrous accidents’, ‘inadequacy of disaster prevention schemes’, ‘inadequacy of countermeasures against natural disasters’, and ‘sufficiency of electricity at present’.

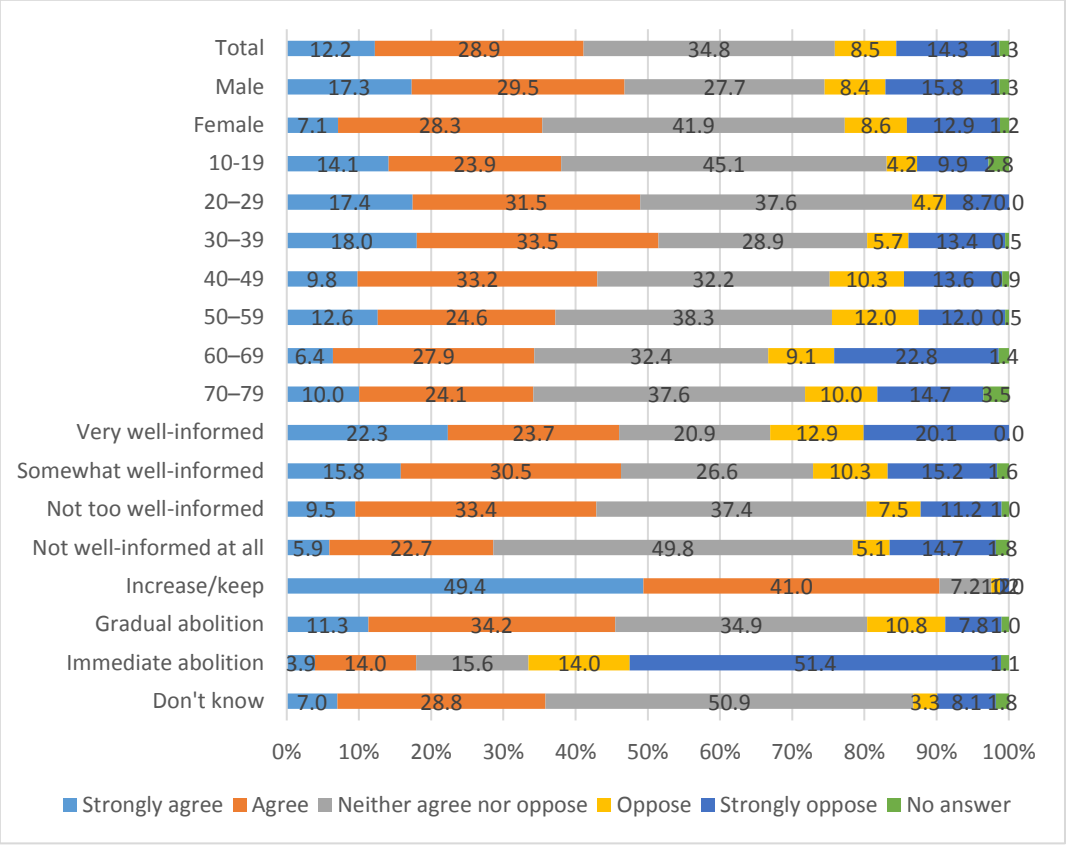
(vii) The most negative responses were towards siting a high-level waste final disposal facility nearby, although there was a level of recognition of the need of efforts for high-level waste disposal.

Cross-tabulation of trends in benefit cognition

Figure shows 41.1% of respondents ‘strongly agree’ or ‘agree’ that nuclear energy is useful. On the other hand, 22.8% of respondents ‘oppose’ or ‘strongly oppose’ this idea. Younger people tend to have positive opinions, while the older generation tends to have negative opinions. The better informed people are about nuclear power, the smaller the percentage of people who answer ‘neither agree or oppose’.

Figure 1-3. Do You Think Nuclear Power Is Useful?

(% of respondents)

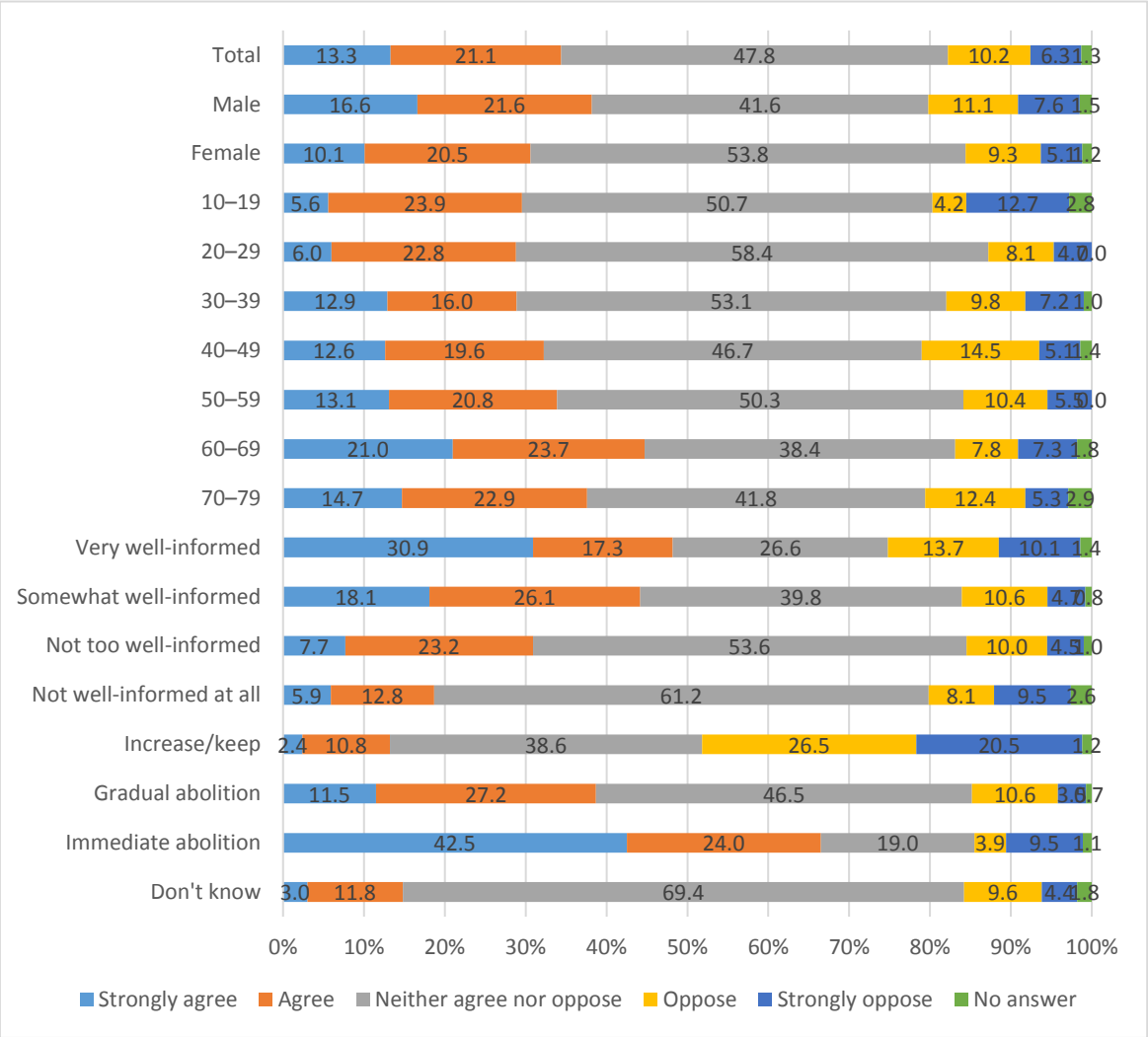


Source: Japan Atomic Energy Relations Organization (2018).

Figure 1-4 shows a total of 34.4% of respondents say that they ‘strongly agree’ or ‘agree’ with the idea that Japan’s economic growth is possible without nuclear energy, while 16.5% of respondents ‘oppose’ or ‘strongly oppose’ this idea. It should be noted that ‘agree’ indicates the belief that nuclear power is not necessary, in this case. The more information people have, the larger the proportion of people with positive opinions towards the potential for economic growth without nuclear energy.

Figure 1-4. Do You Think Japan's Economic Growth Is Possible Without Nuclear Energy?

(% of respondents)

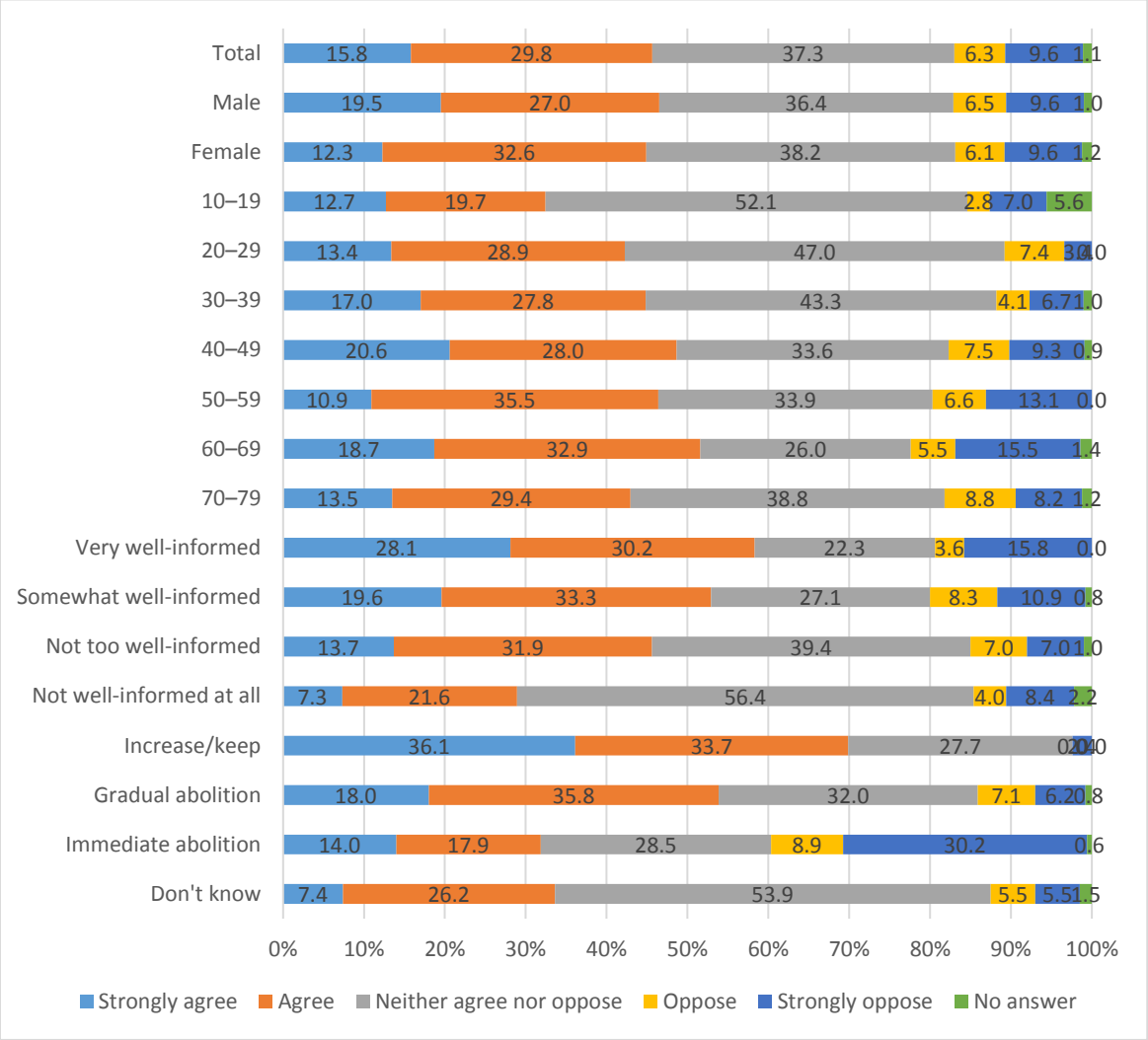


Source: Japan Atomic Energy Relations Organization (2018).

Figure 1-5 shows total of 45.6% of respondents 'strongly agree' or 'agree' with raising electricity charges to transition away from nuclear energy. On the other hand, a total of 15.9% of respondents 'oppose' or 'strongly oppose' this idea. The older generation tend to have more negative opinions. Again, the more information they have, the larger the proportion of people who hold positive opinions, in this case for paying more to phase out nuclear energy.

Figure 1-5. Do You Think Electricity Charges Should Be Raised to Transition Away from Nuclear Energy?

(% of respondents)

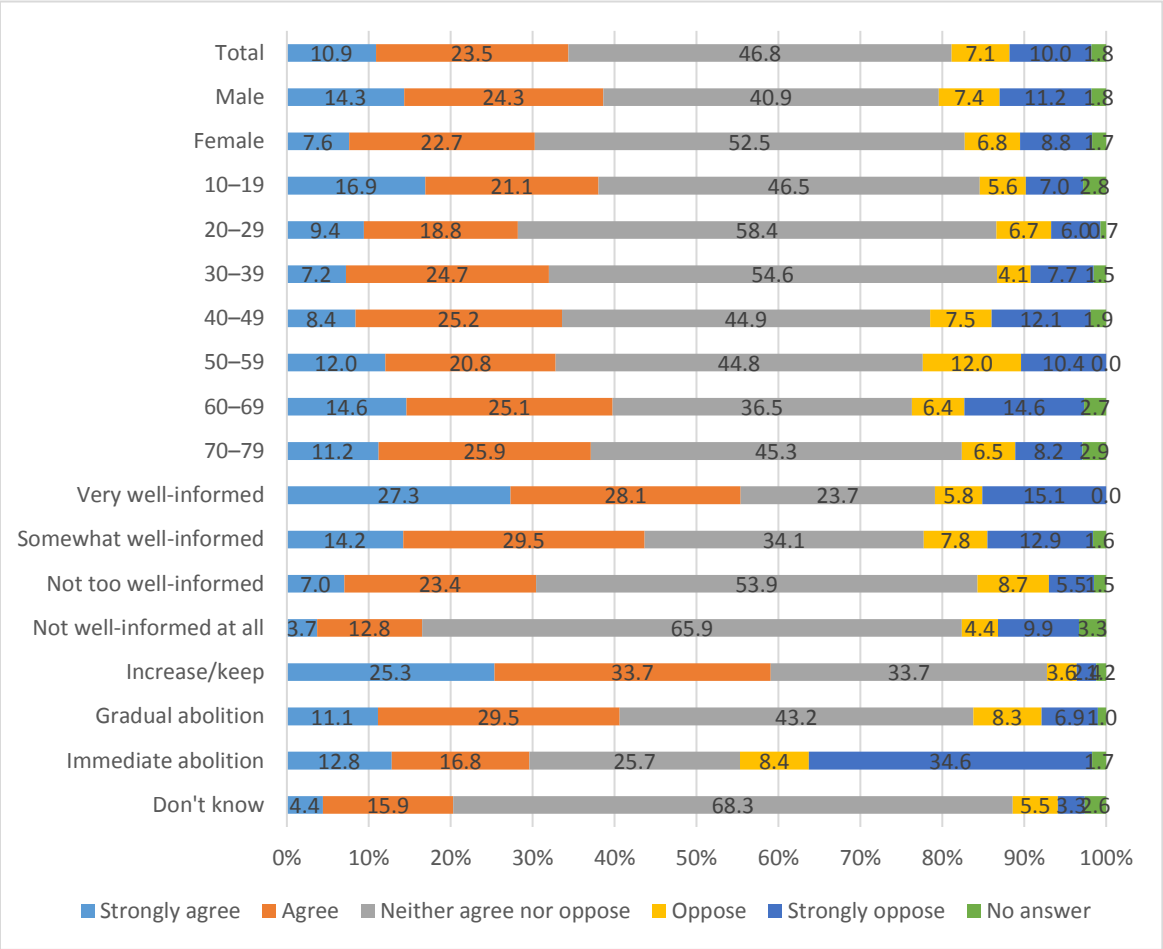


Source: Japan Atomic Energy Relations Organization (2018).

Figure 1-6. shows 34.4% of respondents ‘strongly agree’ or ‘agree’ with the idea that nuclear energy contributes to the prevention of global warming, while 17.1% of respondents ‘oppose’ or ‘strongly oppose’ this idea. Teenagers and the over-60 age group tend to have positive opinions. The more information people have, the larger the proportion of people who have positive beliefs about the advantages of nuclear energy in the face of climate issues.

Figure 1-6. Does Nuclear Energy Contribute to the Prevention of Global Warming?

(% of respondents)

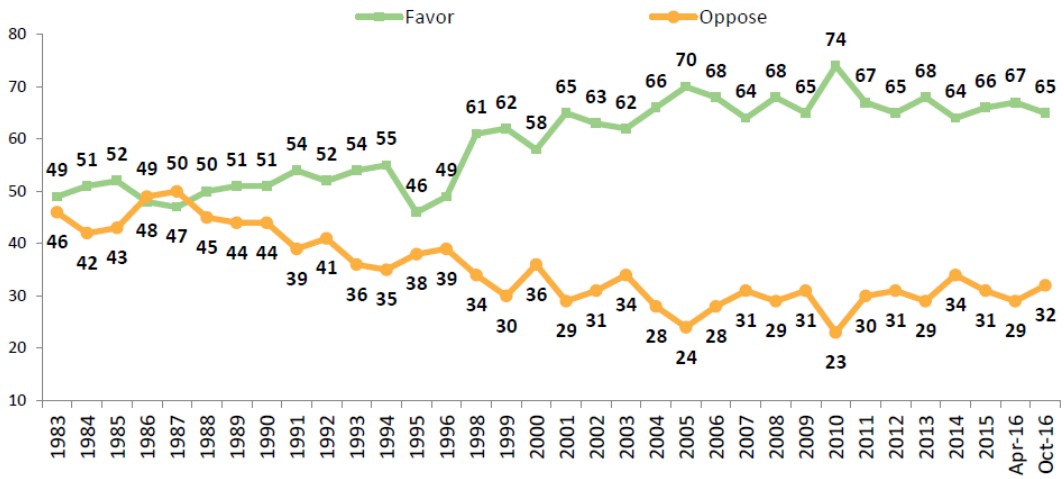


Source: Japan Atomic Energy Relations Organization (2018).

1-2. Status in the United States

Figure and Figure show the results of a public opinion survey with a nationally representative sample of 1,000 adults, conducted in 2016 by Bisconti Research Inc. at the request of the US Nuclear Energy Institute. The study shows that public support for nuclear energy dipped after the Fukushima accident, but subsequently recovered to pre-Fukushima levels (Figure 1-7).

Figure 1-7. Percent Who Favour and Oppose Nuclear Energy, 1983–2016

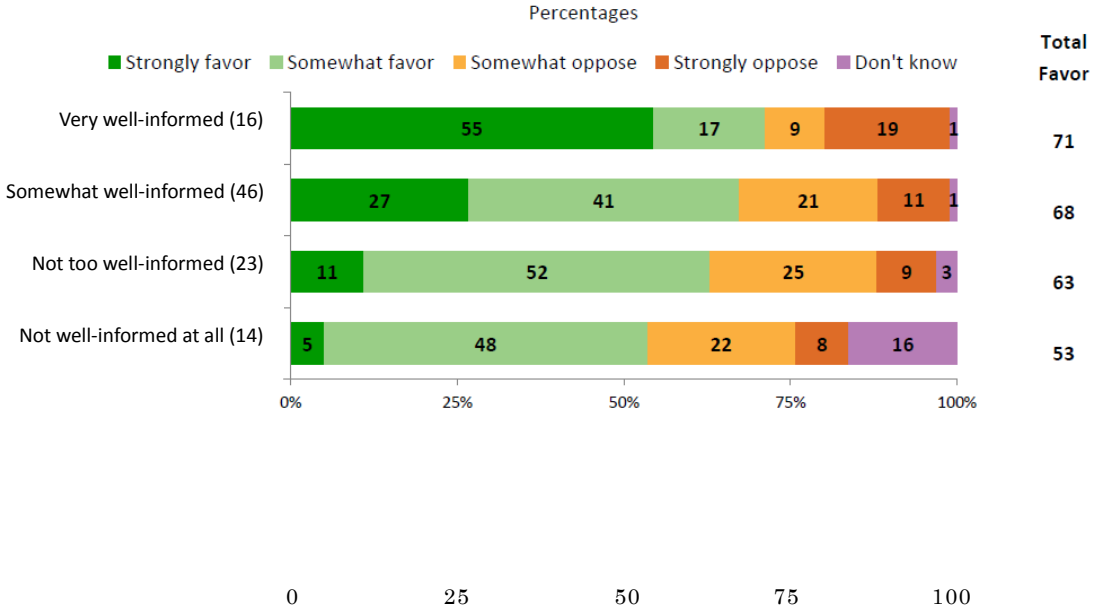


Source: Nuclear Energy Institute (2016).

Figure 1.8 shows that well-informed respondents are more inclined to favour nuclear energy, whereas those with less information are more likely to oppose it. It is important to note that the percentage of those who strongly oppose nuclear energy is much higher for the 'very well-informed' category than it is for the other three categories. If we could clarify why these people feel strongly opposed despite having abundant information, we might be able to improve current information provision.

Figure 1-8. Favourability towards Nuclear Energy, by Degree to which Respondents Feel Informed about It

(% of respondents)



Source: Nuclear Energy Institute (2016).

A poll taken by Harris Interactive in February 2012 shows that after the Great East Japan Earthquake and Fukushima accident of 2011, the percentage of those who answered that 'risks outweigh benefits' exceeded that of 'benefits outweigh risks' for the first time (Table). The proportion responding 'risks outweigh benefits' increases in the older age groups (Table).

Table 1-2. Benefits versus Risks for Nuclear energy

(% of respondents)

Year	**Benefits outweigh risks** (net)	**Benefits strongly outweigh risks**	**Benefits somewhat outweigh risks**	**Risks outweigh benefits** (net)	**Risks somewhat outweigh benefits**	**Risks strongly outweigh benefits**	**Not at all sure**
2012	40	15	24	41	19	21	20
2011	42	20	22	37	18	19	21
2009	44	21	23	34	17	17	22

Source: Corso (2012).

Table 1-3. Benefits versus Risks for Nuclear Energy by Age Group

(%)

Age group	**18–35**	**36–47**	**48–66**	**67+**
Percentage saying benefits outweigh risks	34	34	43	53

Source: Corso (2012).

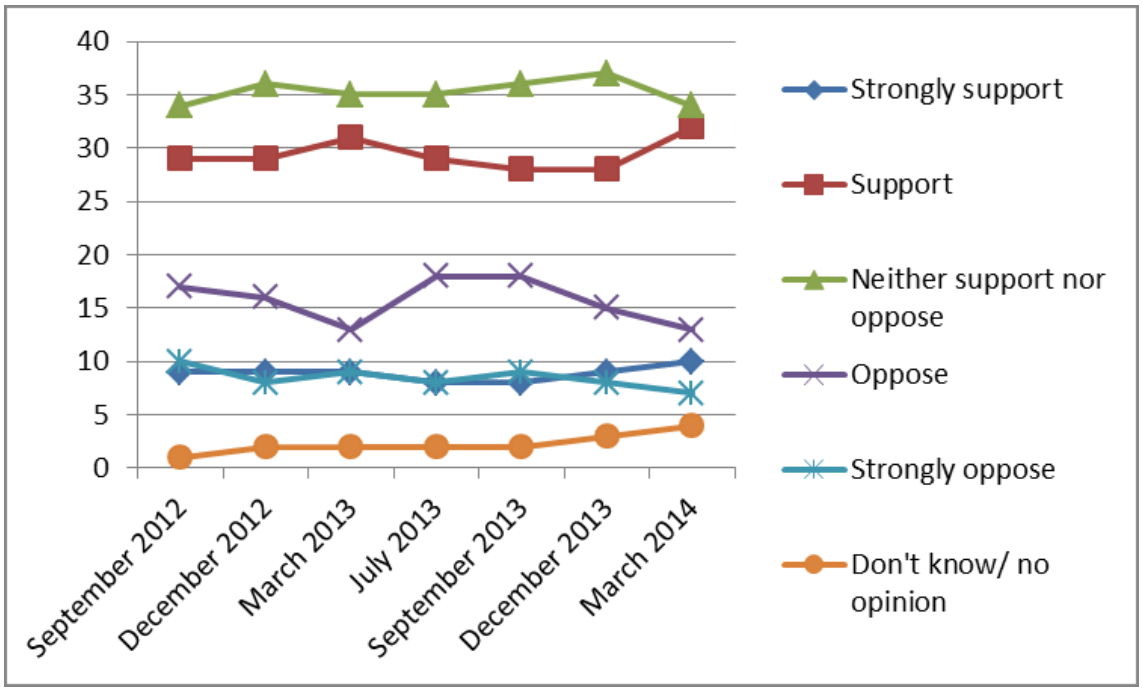
Following the Three Mile Island accident, the US conducted extensive accident investigations based on presidential initiatives. Upon receiving the investigation reports, the President issued a statement requiring the implementation of safety enhancements and announcing the organisational restructuring of the nuclear regulatory agency. Both houses of the US Congress carried out independent accident inquiries. The industry founded the Institute of Nuclear Power Operations to voluntarily expand safety campaigns efforts, and established the Nuclear Energy Institute to assume correspondence with congress, various media, and the newly organised Nuclear Regulatory Commission. Thus, the government and nuclear operators have partnered in their struggle to regain public trust.

1-3. Status in the United Kingdom

According to a regular study undertaken by the UK Department of Energy and Climate Change since 2012, public support for nuclear energy following the Fukushima accident has shown a constant positive balance (Figure 1-). There is also a trend for higher levels of support within the male group and the over-65 age group.

Figure 1-9. Change in Level of Support for Using Nuclear Energy in the United Kingdom

(%)



Source: Government of the United Kingdom, Department of Energy and Climate Change (2014).

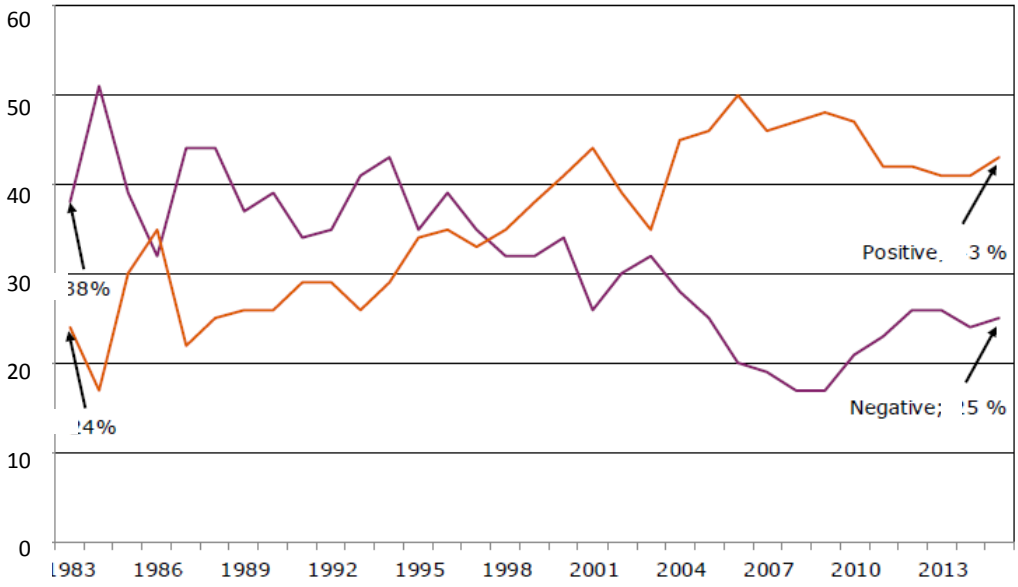
In the Government of the UK disclosed a document titled 'The UK's Nuclear Future' in 2013, declaring that 'Nuclear power is, and will continue to be, a key part of our low-carbon energy mix' (HM Government, 2013: p.3). This document was co-authored and jointly published with the industry and aims to establish a steady long-term approach for nuclear power, a vital power source for the country.

1-4. Status in Finland

In Finland, a debate on nuclear energy use arose in 2011. A public survey conducted immediately after the Fukushima accident by the US firm Gallup found that positive replies had dropped compared with pre-Fukushima levels, but they still outweighed negative responses. This supports the understanding that Finland remains pro-nuclear (Figure 1-). Reasons behind such attitudes may include the stability of the country's geological foundations; the fact that nuclear plants have continued to operate reliably, which has earned the public's trust; rising energy imports and future demand; ample information disclosure and public consultations on new builds based on a recognition of the need to comply with Kyoto Protocol standards.

Figure 1-10: Public Acceptance of Nuclear Power in Finland

(%)

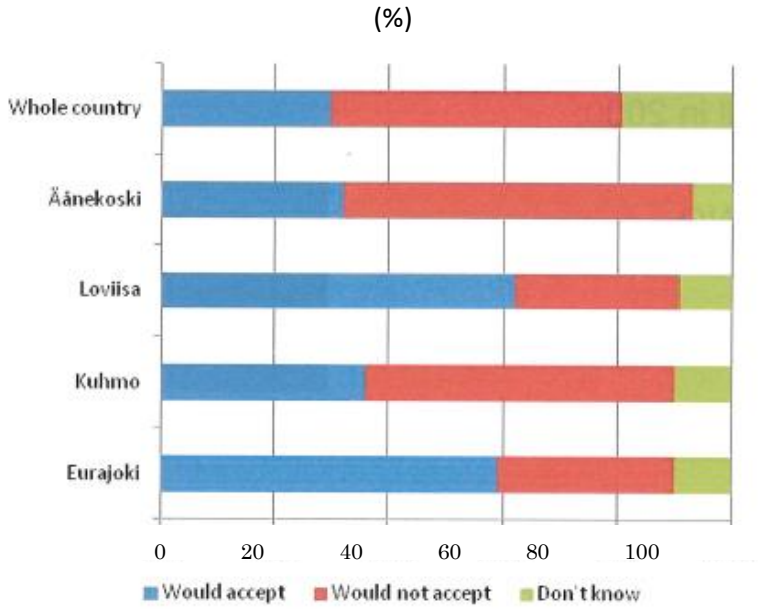


Source: Muranen (2015).

Another public survey, conducted in 1999, shows that the level of acceptance seen in areas hosting nuclear facilities, namely the municipalities of Eurajoki and Loviisa, are significantly higher than the

national average (Figure 1-11**Error! Reference source not found.**). In these areas, the combination of stable operations and information disclosure has won the residents' trust, and polls taken during the site selection process for a final repository showed a supportive majority.

Figure 1-11. Public Acceptance for a Repository in Finland, 1999

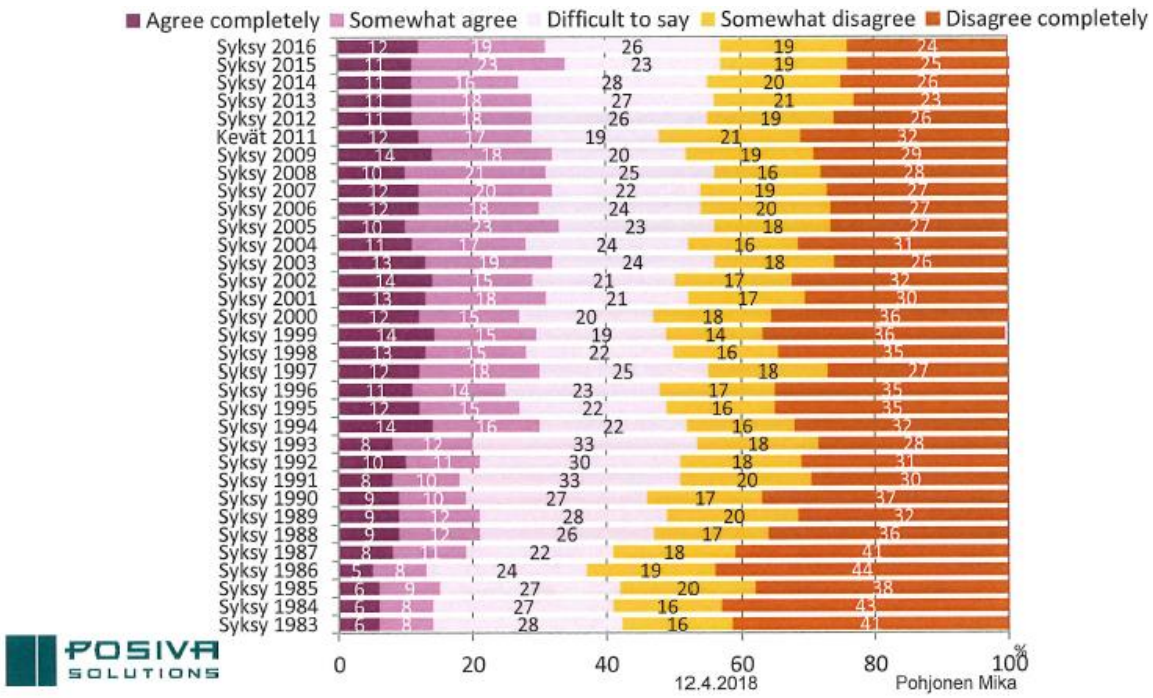


Source: Pohjonen (2018).

In addition, the results of an ongoing public opinion study initiated in 1983 show that the percentage of people who 'completely agree' or 'somewhat agree' with the statement 'nuclear waste can be safely stored in a final repository in the bedrock of Finland' rose from a total of 14% in 1983 to 31% in 2016 (Figure 1-12). The operator of Finland's spent fuel repository project, Posiva Solutions, identifies three 'shafts of success' to improve public acceptance: (i) trust and transparency, because it takes years to earn the trust and only minutes to lose it, hence trust and transparency should not be risked under any circumstances; (ii) independent and trusted authorities; (iii) people's own long experience of a reliable, job-creating, tax-paying, and transparent nuclear industry.

Figure 1-12: Annual Poll by the Finnish Energy Association, 1983–2016

(%)



Source: Pohjonen (2018).

1-5. Status in the Republic of Korea

By the end of March 2018, 24 nuclear power stations were in operation in the Republic of Korea, and the country has consistently promoted nuclear power, for example through public–private co-operation in promoting the export of nuclear power overseas. However, President Moon made a public commitment during the 2017 election period to establish a policy of moving away from the use of nuclear power. At the ceremony for the permanent shutdown of reactor No. 1 at the Kori Nuclear Power Plant, held in June 2017, he announced efforts towards abandoning nuclear power and expressed his intention to start with suspending the construction of reactors 5 and 6 at the Shin Kori nuclear power plant. It was then decided at a cabinet meeting that the fate of these units should be decided through a public debate in the form of deliberative polling. In July, the government established a public opinion committee comprised of nine members, including lawyers, to conduct the discussion on whether to resume construction of Shin Kori reactors 5 and 6.

Starting in August 2017, the committee contracted a Korean research company to commence telephone interviews with randomly sampled citizens. Of the 20,006 respondents, 500 who offered meaningful

opinions were invited to participate in a citizens' jury. Of this group, 478 accepted the invitation and participated in the debate.

In September, seminars organised by the Public Opinion Committee introduced the citizens' jury to opinions of experts from both sides of the debate – proponents of nuclear power as well as those opposing it. In addition, debate events were held on television and online, broadcast through the state media.

During October 13–15, a 3-day workshop was held in Seoul at which experts who were for and against the use of nuclear power delivered presentations. This was followed by group discussions. Of the 478 members on the citizen's jury, 471 attended this event. On the final day, the 471 members of the jury voted to resume construction of Shin Kori reactors 5 and 6 by a majority of 19 percentage points, with 59.5% in favour and 40.5% against. Concerning the future of nuclear power generation, 53.2% felt that it should be scaled down, 35.5% felt that the current status should be maintained, and 9.7% felt that nuclear power should be expanded (Yonhap News Agency, 2017). In light of these results, the Public Opinion Committee recommended that the government resume the construction of Shin Kori reactors 5 and 6 and scale down nuclear power generation in the future.

Based on these recommendations, the Office of the President announced President Moon's decision to resume preparations for the construction of Shin Kori reactors 5 and 6 on 22 October, and this was endorsed by the Cabinet on 24 October. The President also announced a policy of gradually reducing the country's dependence on nuclear power in the future, based the outcome of the citizens' jury. During the Cabinet meeting where it was decided to resume construction of Shin Kori reactors 5 and 6, proposals were also put forth to withdraw plans for new builds, including Shin Hanul reactors 1 and 2, to prohibit design lifespan extensions for 14 existing nuclear reactors reaching the end of their lifespans in 2038, and to prematurely retire reactor 1 at the Wolseong nuclear power plant (the second-oldest reactor).

Despite having decided not to expand the scale of nuclear power generation in the Republic of Korea, President Moon acknowledges that the strategy of exporting nuclear power technology benefits the Republic of Korea both economically and in terms of international relations, and he has declared a policy of continuing to actively promote the international expansion of nuclear power.

The adoption of a contradictory policy for domestic new builds and nuclear exports may be intended to avert criticism from citizens who are concerned about potential economic losses of phasing out nuclear power, while gradually fulfilling his commitment to his core group of supporters to phase out nuclear power at home.

The President has put particular focus on attracting the interest of the public during elections and has succeeded in winning the support of non-governmental organisations and those with a strong awareness of environmental issues through moves to phase out nuclear power. For this reason, he had no choice but to maintain the stance of abandoning nuclear power. However, the policy of phasing out nuclear power roused strong voices of concern – mainly from industry – that it would result in the loss of the foundation that underpins the domestic nuclear supply chain as well as the stable operation of domestic plants. As a result, the administration was caught in a dilemma. The overseas export policy allowed this deadlock to be broken, as even those who were opposed to the use of nuclear power within the country had indicated support for overseas exports from the perspective of economic benefits and increased employment, particularly for small and medium-sized enterprises.

In addition, the formalising in recent years of preparations to join an international bid to construct two large-scale nuclear reactors in Saudi Arabia is also considered to be one of the reasons why the administration intends to maintain its nuclear exports. Winning the Saudi Arabia deal would be on par with the United Arab Emirates' Barakah Project winning bid led by the conservative past administration. Hence, the current administration hopes to win the support of more conservatives in addition to the existing constituency.

1-6. Summary of public perception of nuclear power

Although the results of the poll vary considerably depending on the research method and the questions, framework, and other factors, it is clear that public opinion has had a significant impact on nuclear power policies in each country. The success stories in the West underline that continuous efforts by the reactor operators to improve safety is a prerequisite for such success, while each government needs to promote energy policies in a responsible manner. Furthermore, co-operation between the government and the private sector in disseminating information helps to gain the understanding of citizens. Data also show that if the government maintains a consistent policy and citizens receive adequate information, public acceptance of nuclear power will improve. Hence, it is important to disseminate information about policies and provide information in a continuous and consistent manner. Moreover, the information disseminated should not only emphasise the technical aspects or the safety of nuclear power, but also explain why nuclear power is necessary.

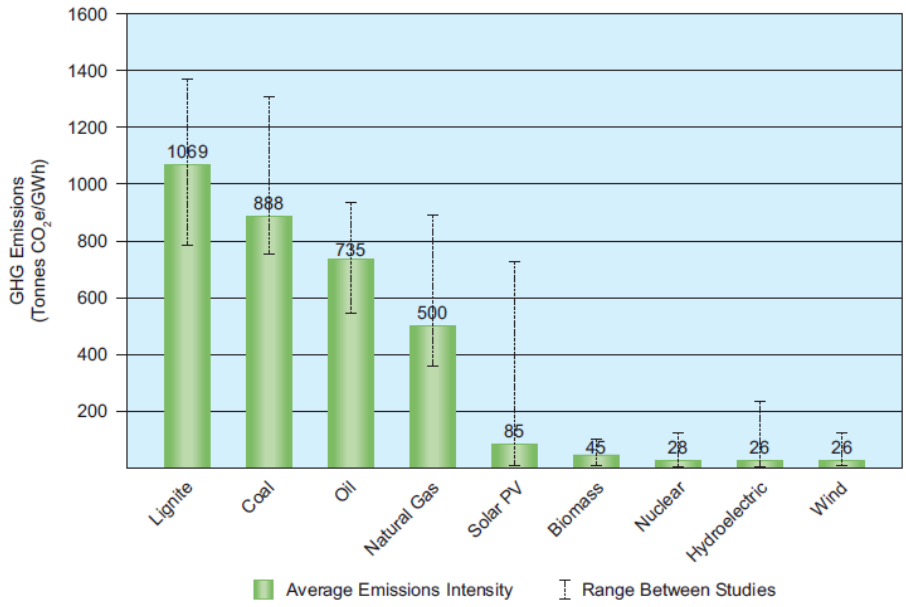
Chapter 2

The Benefits of Nuclear Power

Nuclear energy brings benefits to the national and local economy, while enhancing energy security and safeguarding the environment. This chapter explains the contributions of nuclear energy by briefly summarising country case studies by the experts who participated in the workshop. For example, nuclear had noticeably lower GHG emission compared to fossil fuels.

Figure 2-1. Lifecycle Greenhouse Gas Emission Intensity by Electricity Generation Method

(tonnes CO_2 e/GWh)



tonnes CO_2 e/GWh = tonnes of carbon dioxide equivalent per gigawatt-hour.

Source: World Nuclear Association (2011).

2-1. Lessons learned from experiences and cases in the United States

Public acceptance is a problem that relates not only to technological and economic issues, but also to sociological ones. Public acceptance calls for specialised knowledge, but communicating with the public using an issues-based approach, such as population problems, air pollution, and climate change, may be more effective than merely explaining the technical aspects. Global populations are increasing, and this will result in an increase in energy consumption. Fossil fuel energy use is growing in developing countries,

and the consequences of continued dependence must be considered. We should promote the use of low-carbon-emission energy. In the past, communication about nuclear power did not focus on these points, choosing to dwell instead on safety and technical issues.

Although the supply of clean (i.e. low-carbon-emission) and stable energy is important, the perfect power source that fulfils both criteria does not exist. Thermal, hydroelectric, renewable, and nuclear power generation all have their strengths and weaknesses. It is therefore necessary to create a desirable energy mix, while taking this big picture into account.

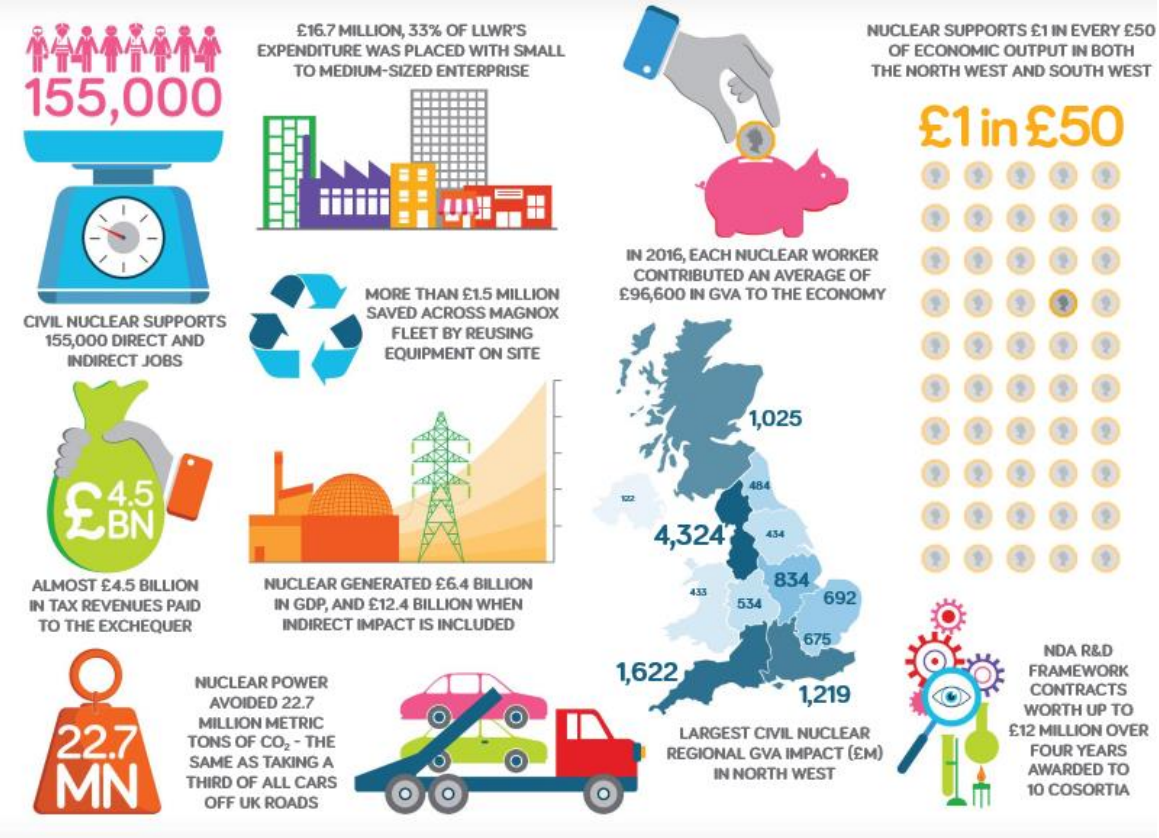
A harmonious relationship with the local community is vital to the construction of power plants and the installation of transmission networks. In the US, where consumers can choose to buy renewable energy, and it may also be a good idea to offer the option of nuclear power as a low-carbon energy source. Although individuals have a degree of choice as to their preferred power source, they have no choice when it comes to the risks of potential exposure. Therefore, building harmonious relationships while respecting the choice of individuals is an immense challenge.

2-2. Lessons learned from experiences and cases in the United Kingdom

Oxford Economics estimated the economic value of nuclear power in the UK (NIA, 2017) (Figure 2-2). The report revealed the following facts.

- The UK's civil nuclear sector contributed £6.4 billion to the UK economy in 2016.
- This economic impact increases to £12.4 billion and 155,000 jobs when the sector's expenses on associated goods and services in the supply chain and the wages paid to employees are taken into account.
- Nuclear operations provide a saving of 22.7 metric tonnes of carbon dioxide – the equivalent of removing one-third of UK's cars from the roads.
- There was a 4.5 terawatt-hour increase in output from nuclear stations, meaning nuclear remained the largest single low-carbon source of electricity in the UK.
- Nuclear produced enough electricity to power 16.3 million homes.
- Constructions began on the first new nuclear power station in a generation at Hinkley Point C.
- Significant contracts in the UK and overseas were awarded to UK supply chain companies.
- Cost savings were made across all decommissioning projects, including more than £200 million at Sellafield.

Figure 2-2: Nuclear Contribution to United Kingdom Economy, 2016



Source: Nuclear Industry Association (2017), *Nuclear Activity Report 2016.*

Nuclear power is an important UK industry. Building a harmonious and co-operative relationship with local industries and local governments based on the country's industry policies is therefore of great importance. The Government of the United Kingdom has stressed the importance of nuclear power to the domestic industry, and therefore the industrial sector, the national government, and local governments are cooperating to realise policies established by the national government. A cross-cutting relationship needs to be established between industries, the education sector, and the government.

More than 180 nuclear-power-related organisations exist in the UK. Wales has successful experience in the stable operation of existing power plants, and residents are not anxious about the construction of new plants. Furthermore, the construction of new plants brings greater employment and business opportunities. Sites with existing nuclear power facilities are often selected for the construction of new nuclear power plants.

Safety and related costs, the impact on the local community, and the proportion of employment procured locally are some of the important factors to consider. It is vital to ensure that primary

contractors and operators are present at the plant's location, demonstrate support for the local community, and contribute to improvements in site safety.

2-3. Lessons learned from experiences and cases in Finland

For many years, those opposed to nuclear power have maintained that nuclear power is dangerous and causes problems in terms of the disposal of radioactive waste, and that investment should be made in renewable energy instead. However, various data and analysis counter these views. For example, data on the number of fatalities per unit of energy produced show that nuclear power fatalities are overwhelmingly low compared with other energy sources (World Nuclear News, 2010). Furthermore, while there are concerns about the health effects of radiation, it is not necessarily true that nuclear power poses a more serious health hazard than other hazards such as air pollution. The merits of nuclear power, such as its ability to supply a far higher volume of electricity than renewable energy for the same facility capacity, need to be explained in terms that are easy to understand.

2-4. Lessons learned from experiences and cases in India

The first nuclear power plant in India was built in 1963, and there are now 22 nuclear reactors and 7 nuclear power plants in the country. Furthermore, agreements have been concluded to construct 10 new 700-megawatt power plants.

There are three key reasons why nuclear power generation is important in India. First, it provides a stable supply of energy over the long-term. Second, it is perceived as an important baseload for coping with strong power demand. Third, it fulfils an important role in coping with long-term energy demand.

India faces challenges in fostering public acceptance, selecting sites and acquiring land, coping with fuel depletion, fostering responsibility in the private sector towards the Nuclear Damage Law, and ensuring safety. Despite such challenges, nuclear power is perceived to be of great importance to India's future.

Governance by the Central Electricity Regulatory Commission is key to ensuring safety, and citizens understand that the nuclear power plants are managed appropriately through such regulations. For this reason, they have continued to accept nuclear power plants of the same model as the one used at Fukushima, even after the nuclear accident. The government has imported power plants from Russia and is currently constructing the Kudankulam nuclear power plant. Although this was initially opposed by the local community, the government emphasised the need for energy, and eventually succeeded in commencing construction.

2-5. Lessons learned from experiences and cases in Thailand

Although there are no nuclear power plants in Thailand, debates about projects to construct nuclear power plants have been ongoing since the 1960s. However, after it was discovered that Thailand possessed rich natural gas resources, the debate subsided somewhat. Last year, however, the Government of Thailand conducted a survey on the safe use of nuclear power. In plans formulated based on the survey, public acceptance is positioned as one of the important elements. A survey conducted for every region in the country on the acceptance of nuclear power plants showed that there was a degree of acceptance mainly in the northern part of Thailand. Thailand must prepare itself for a possible shortage of its natural gas supply. To this end, it should consider the introduction of nuclear power as an alternative means of energy production.

2-6. Lessons learned from experiences and cases in Japan

Efforts to attract nuclear fuel cycle facilities (to process spent fuel) were initiated in Rokkasho village in 1980. A cold wind known as the 'Yamase' blows through this region, resulting in low agricultural productivity. Hence, about 4,000 of its population of 12,000 had left the village to work elsewhere. Although there was some opposition amongst the residents during the initial efforts to attract nuclear facilities, the nuclear fuel cycle project contributed to economic growth, employment, and the development of education infrastructure. Today, the residents do not have to move to other regions for work and there is a high level of acceptance of nuclear power in the village. As all energy sources have their strengths and weaknesses, there is a clear need for nuclear power as a component of the energy mix. However, it is natural to want operators to continuously improve safety and to interact and work closely with residents on aspects that impact their lives.

The spread of education activities is one of the benefits of nuclear power. In Rokkasho village, examples of the contributions to the village include initiatives for short-term homestays overseas for elementary and junior high school students to promote international understanding, and a fund to help its children continue their studies at university level. The Rokkasho branch of Tohoku University is also located in the village, and residents can study subjects such as quantum engineering at this institution.

Chapter 3

Public Communication on Nuclear Power

Amongst the members of ERIA, strong growth of nuclear capacity is expected in China and India (IEA, 2017). These countries should introduce nuclear energy in a harmonious way to respond to expected increase in energy demand. The experiences of European countries and the US are useful in this regard.

3-1. Experiences and cases in the United States

Instead of focusing only on the technological aspects, the social aspects related to nuclear power generation, such as health, air pollution, the environment, and the economy, should also be discussed. It is important to talk about nuclear power as a valuable resource, and to explain why it is necessary.

The media often create and propagate a negative image of nuclear power, instilling fear and panic in many people (Stieghorst and Hampel, 2014). We must change such images. To achieve public acceptance, trust is vital. To realise trust, it is necessary to understand its relationship with integrity, competence, and benevolence. How can we improve communication in order to realise trust? Instead of adopting a cold attitude like that of a university lecturer who harshly reprimands a student who has performed badly, it is important to approach the public with the same warmth that we use for our families. We should incorporate a diverse group of people, and it is important that mothers and children lead to promote a forward-looking attitude.

To foster public acceptance, it is useful to find out how an individual's opinion on nuclear power changes from opposition to approval, or the reverse. Rather than asking people for their general views, there is a greater possibility of generating interest by asking about personal experiences. Genuine discussions about one's experiences, for example, 'I began thinking about nuclear power in this way because of such an event, which led me to study nuclear engineering and finding a job in the nuclear field', are valuable. It is also important to convey information about nuclear power at elementary schools, junior high schools, universities, and other education institutions.

3-2. Experiences and cases in the United Kingdom

The Menai Science Park was established by the Welsh Government in 2013. Its decision to collaborate with the Government of the UK to deliver the project as part of the UK's new nuclear research programme was based on the importance it places on the legacies of nuclear facilities for the local community (Welsh Government, 2018). Established within Bangor University, the science park provides business support for energy-related projects, including ocean energy and nuclear power utilisation on the island of Anglesey. Not only is it directly related to the power plant, it also provides support for expanding related businesses (SPARC, 2015).

To achieve public acceptance of nuclear power it is important to ensure coordination and co-operation between diverse elements, including communities, economic organisations, the national government, local governments, education institutions, and nuclear power developers and managers. Trust is of particular importance in a community. Employing a member of the local community in a key position is also effective in gaining the understanding of the local community. Emergency evacuation plans must take into consideration not only the evacuation of people from the site itself, but also the evacuation of local residents.

It is also important to build strong co-operative ties with local schools and universities. Bangor University has established the Nuclear Futures Institute, which is engaged in a wide range of activities such as building a boiling water reactor network hub in co-operation with the Imperial College of Science, Technology and Medicine in London. Furthermore, the operation of a nuclear power plant not only requires nuclear engineers, mechanical engineers and electrical engineers, but also experts in fields such as law and economics. Hence, these experts need to be nurtured too. Activities will also be carried out to create experts within the local community and expand employment opportunities for them.

3-3. Experiences and cases in Finland

The municipality of Eurajoki in Finland has 9,400 residents, and 53% of the working population is employed in industry. The circumstances that led to the siting of a final nuclear waste repository in this municipality can be traced back to the 1970s. A geographical survey on disposal sites was commenced in 1978. In 1999, more than half of the residents (59%) indicated their approval of the development of a final disposal site in the municipality.

As ensuring safety was a matter of the highest priority, the focus was placed on formulating the legal means to ensure safety. Two laws were eventually enacted: the Act on Environmental Impact

Assessments and the Nuclear Energy Act. These laws included provisions related to transparency and acceptance of the local community.

The municipality of Eurajoki had been selected as a final disposal site because it had optimal technological and economic conditions and because the residents understood the positive effects that a repository could bring, including employment and economic benefits. Hence, most residents approved of the plan, and the local government also gave strong indications of its intentions to promote this development. On the strength of these factors, the municipality made the decision to become a final disposal site in 2000.

The case of the Eurajoki municipality illustrates how the safe disposal of waste is a prerequisite in the establishment of a new nuclear power plant and acceptance by the local community is an important element in the selection of a site. It is important to provide local residents with much more information than residents in other regions of the country receive, and to ensure that sufficient communication takes place.

One of the differences between Finland and other countries is its extremely hard and stable geological foundations. It has been technologically proven that in Finland, final disposal of used fuels is safer than intermediate storage. Another important characteristic is Finland's success in fostering understanding amongst its citizens about the technological aspects of the final disposal method.

To achieve public acceptance, the language used is of great importance. It is not necessary to use technical jargon, such as 'scram' (run away), 'trip' (an emergency stop when referring to stopping operations safely), or 'decommissioning' (measures associated with the shutdown of nuclear power facilities). Unfamiliar words like these can create negative images. Instead, familiar words that can easily be understood by everyone should be used, such as 'stop using' instead of 'decommissioning'.

Nuclear power facilities were constructed in Finland in 1993, 2002, and 2010. One of the experts invited to the workshop had been a philosopher who was opposed to the use of nuclear power. However, she described how her perceptions changed while observing the construction of nuclear power facilities, and how as an environmental specialist she now actively supports nuclear power. This is an example of how understanding the facts of nuclear power can utterly transform a person's attitude. It is important to facilitate such changes in attitude.

3-4. Experiences and cases in Japan

In Japan, when a nuclear power plant resumes operations, the power company must pass a safety-related regulatory review by the Nuclear Regulatory Authority, formulate an evacuation plan in preparation for an accident, and gain the understanding of the local government. Gaining the understanding of local governments entailed experts providing explanations about nuclear power to the local residents. However, this approach was not very effective in gaining residents' understanding, so interactive methods, such as dialogues, are being explored.

Efforts to gain the understanding of the local government need to consider (i) who would be the optimal individual or organisation to serve as a facilitator to promote long-term dialogue with the local community, and (ii) how to improve the financial assistance offered by the Ministry of Economy, Trade and Industry to the municipal and local governments for such purposes.

Concerning the first issue, there is a trend amongst the younger generation in Japan to support the use of nuclear power because of the cost savings in electricity charges that it brings. However, the support rate for nuclear power falls as people marry and age. The trends in the support rate also differ by gender. For these reasons, it is important to capture the characteristics of public acceptance by age group and gender. If the government carries out one-sided communication (from government to residents), residents will not believe that the government is being honest. Hence, the government is putting more effort into communication with local governments and residents.

As for the second issue, the government is reviewing ways to improve its financial assistance to local governments. It is considering introducing mechanisms to allow local governments that have accepted the resumption of nuclear power facilities to enjoy financial rewards. However, when introducing this method, it is important to realise that the population that shoulders the risks of nuclear power generation is different from the one that enjoys the benefits. In other words, the question remains how to reward the local community, which bears a higher burden.

While the general public's view is that nuclear power plants impose more risk on the local community than on the country at large in the event of an earthquake or tsunami, there are also instances where hosting a nuclear power plant has been advantageous in such situations. For example, Tohoku Electric Power Company's Onagawa Nuclear Power Station performed impressively during the 11 March disaster, withstanding the tsunami, achieving cold shutdown, and even serving as an evacuation shelter for residents living along the coast. Tohoku Electric Power Company's story comes amidst the loss of trust in the company. It is hoped that power companies will continue to make steady progress in gaining the trust of the local community.

Exchange of views with Aomori Prefecture. Aomori Prefecture's stance is to co-operate with the national government's policy in ways that contribute to regional revitalisation, based on the premise of assured safety. It has consolidated the views of 40 cities, towns, and villages within the prefecture. As described below, there are cases where it is preferable for a prefecture to adopt its own initiatives, as Aomori Prefecture has done, which are different from those of the national government and business operators.

For example, Aomori Prefecture is engaged in efforts to develop an environment for residents to think about nuclear power and make decisions at each stage of a project. It is not enough to simply leave the work of providing information to the national government and business operators. Rather, the prefecture needs to carry out information campaigns from the viewpoint of the residents to help them make independent decisions. Every type of nuclear facility can be found in Aomori, and this calls for publicity efforts of the highest level, in terms of type and scale, that can be found in Japan.

Besides providing information, Aomori Prefecture provides financial assistance to private corporations from its own budget and draws on the national government's subsidy systems to develop public infrastructure. In addition, prefectural staff members enter nuclear power facilities to conduct safety inspections. They also carry out disaster prevention drills and environmental monitoring, which includes the setting up of monitoring posts to measure radiation levels.

Aomori Prefecture's stance is based on the premise that the national government should ultimately take the responsibility for enacting and promoting nuclear power policies. At the same time, however, it also recognises that the intentions of the residents of municipalities where the nuclear power facilities are established are the starting point for considering nuclear power policies. To that end, the prefecture has adopted a procedure of carefully affirming the intentions of all municipalities in the prefecture, and ultimately, engaging in discussion at the Prefectural Assembly and having the prefecture governor make a decision based on the intentions of the residents. The prefecture's approach of verifying the intentions of all municipalities will remain unchanged in the future. There are no special, predetermined procedures that the prefecture follows in consolidating the consensus in the municipalities. There are also times when discussions are held at the Prefectural Assembly based on discussions carried out in the municipalities, or when discussions in the municipalities are carried out in parallel with discussions held at the Prefectural Assembly. The governor makes the final decision.

Sometimes the information the residents obtain is biased and the decisions they make can be emotional and short-sighted. On the other hand, the national government must make decisions from a long-term perspective, without being constrained or disproportionately influenced by short-term emotions. The

prefecture is positioned between the residents and the national government, and therefore must focus on the circumstances of both. It would face immense difficulties if the national policy were to be uncertain and changeable, and for this reason it needs the national government to take a firm stance. Correcting the bias in the information obtained by residents, while compensating for inadequacies in the information provided by the national government and business operators, are the two significant functions of the information activities at the prefectural level.

The attendance rate of residents at a public briefing held in the prefecture may be about 50 people for a municipality with a population of 10,000. Since the audience is limited to those who are interested in the topic, it is important to convey information properly to those who say they do not have a clear understanding of the issues.

Aomori Prefecture's initiatives in the area of nuclear power. Aomori Prefecture's relationship with nuclear power began with a bid to host a nuclear-powered vessel ('Mutsu') in 1970. Since then, many nuclear power cycle facilities and other facilities have been established in the prefecture. Despite serious efforts to prevent the potential risks of nuclear power from materialising, the Fukushima accident occurred and shocked everyone. Many Fukushima residents are still unable to return home. On the other hand, efforts to resume operations based on new regulatory standards are underway, and the national government, regulatory agencies, and local governments recognize that communication is even more import than before.

The responsibility for ensuring safety falls to the operators and regulatory agencies. However, the prefecture must also think independently, and not simply receive the information. Local governments engage in disaster prevention efforts that the regulatory bodies are not involved in. They carry out activities focused on securing residents' safety and responding in the event of a severe accident. During the current transition period, it is even more important to communicate with the residents to ensure that the safety standards for nuclear power facilities are determined in jointly with society.

To promote understanding by residents, the prefecture has (i) provided public relations brochures and pamphlets and carried out public relations campaigns through media such as newspapers, prefectural information magazines, and radio (Figure 3-1); (ii) provided learning experiences on the energy business, visiting schools to teach primary school students about energy (Figure 3-2); and (iii) held meetings to exchange of opinion on nuclear power, which residents of Aomori Prefecture can attend.

Figure 3-1: Public Relations Brochures and Pamphlets

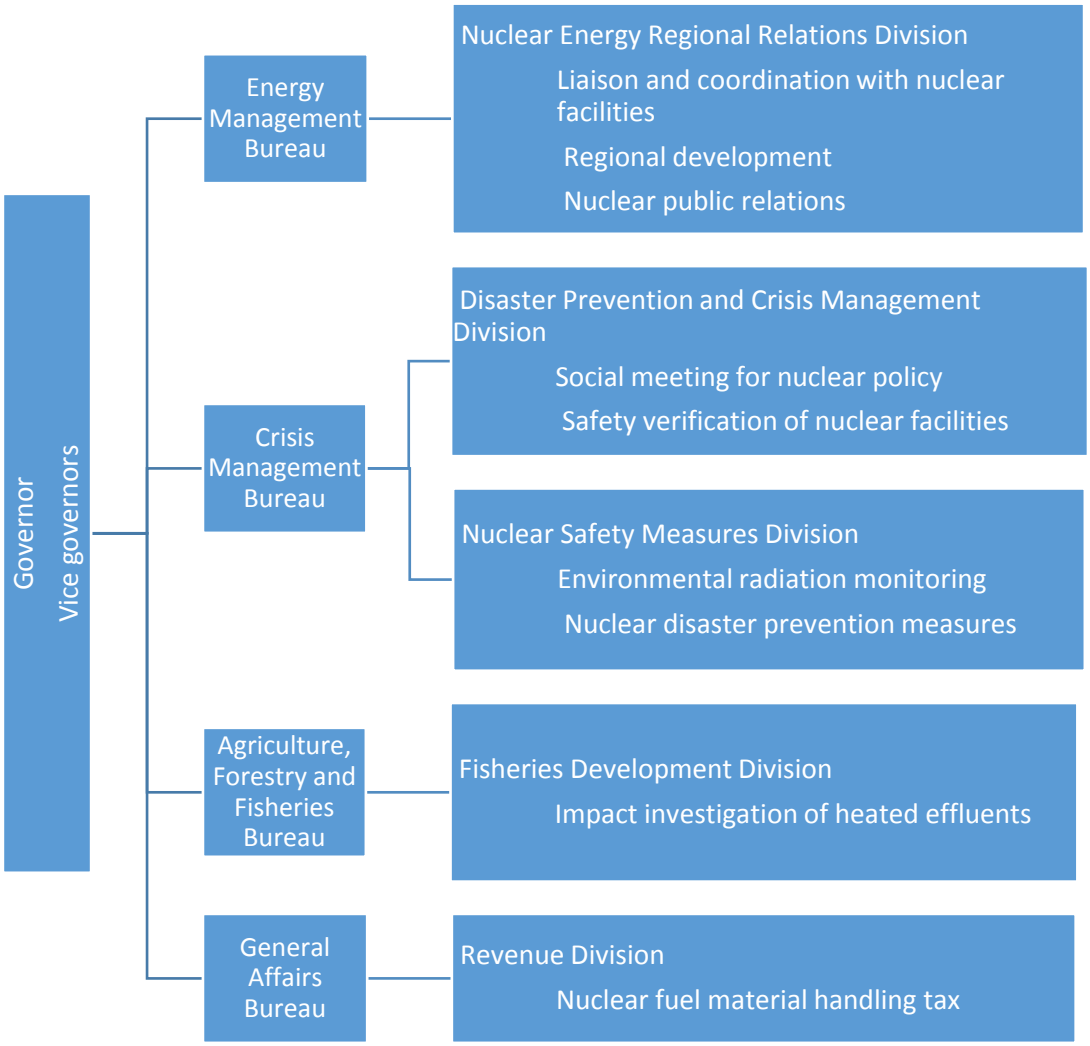
Figure 3-2: Energy Education for Primary School Students

Source: Aomori Prefecture*, Information on Electricity's Delivery Class*.

The prefecture hosts facilities such as the Higashidori nuclear power plant, the Ohma nuclear power plant, and the spent fuel interim storage facility. Other nuclear fuel cycle projects are also being implemented. Therefore, the prefectural government strengthened the administration's system for (i) conducting liaison and coordination, (ii) implementing regional development, (iii) securing the safety of the local residents and protection of the environmental, and (iv) instituting nuclear disaster prevention measures (Figure 3-3).

While it is important to publicise the useful aspects of nuclear power, such as its economic effects, this has become exceedingly difficult since the Fukushima accident. Aomori Prefecture faces a situation in which it must avoid putting too much emphasis on the contribution of nuclear power to the local community. From the perspective of developed country sensibilities, it may be difficult to understand why it is not a good idea to emphasise the benefits of nuclear power. In Japan, however, this has led to difficulties in gaining public acceptance, so the method of communication adopted by Aomori Prefecture are difficult to understand. Hence, the way in which public acceptance is promoted must be country- or region-dependent.

Figure 3-3: Aomori Prefectural Organisation Relating to Nuclear Power



Source: Aomori Prefecture, Nuclear Administration February 2017.

Chapter 4

Findings on Public Acceptance Improvement

4-1. Findings

Why is nuclear power important? Currently, the primary source of energy that global markets demand is fossil fuels (Figure 5-1). Growth in the fossil fuel use is expected to continue in developing countries, giving rise to problems such as air pollution, climate change, and energy crises in countries that do not possess natural resources. On the other hand, the use of nuclear energy offers benefits such as the reduction of greenhouse gas emissions; energy security (OECD, 2007); and economic benefits such as the creation of new businesses, employment, and human resources development (IAEA, 2014a). Hence, nuclear power generation has moved beyond being a means of supplying energy and now fulfils various other

1) Current situation

Those who are opposed to nuclear power assert that it is dangerous, generates radioactive waste, and can be substituted with other forms of energy. In truth, however, the adverse health impacts of nuclear power are comparatively small, and it could be described as the safest means of generating power with low environmental burdens. Nuclear power supplies energy to people in many countries in a stable and economic manner. While the risks related to nuclear power generation should be recognised and managed, the true risks lie not in the use of nuclear power, but in the environmental issues such as air pollution caused by the utilisation of fossil fuels.

important roles.

Figure 5-1: Demand for Oil and Liquids, Natural Gas, and Coal around the World

	2025	2030	2040
	Current Policies		
Oil and liquids demand (mb/d)			
North America	22.5	21.8	20.5
Central & South America	6.4	6.7	7.6
Europe	11.8	11.2	10.4
Africa	4.7	5.4	7.0
Middle East	8.8	9.5	11.9
Eurasia	4.3	4.5	4.8
Asia Pacific	36.2	39.5	44.0
OECD	39.9	38.3	35.6
Non-OECD	54.8	60.4	70.5
Bunkers	9.4	10.4	12.8
World oil demand	104.1	109.1	118.8
World biofuels	2.2	2.5	3.2
World liquids demand	106.3	111.7	122.1
Natural gas demand (bcm)			
North America	1 075	1 116	1 229
Central & South America	190	219	303
Europe	635	679	740
Africa	180	221	323
Middle East	586	691	886
Eurasia	596	616	685
Asia Pacific	998	1 161	1 501
OECD	1 826	1 911	2 098
Non-OECD	2 434	2 792	3 568
Bunkers	10	17	38
World	4 270	4 720	5 704
Coal demand (Mtce)			
North America	520	512	501
Central & South America	57	62	70
Europe	430	391	348
Africa	169	189	255
Middle East	7	8	9
Eurasia	229	234	238
Asia Pacific	4 539	4 979	5 786
OECD	1 200	1 152	1 094
Non-OECD	4 751	5 224	6 114
World	5 950	6 375	7 208

bcm = billion cubic meters, mb/d = million barrels per day, Mtoe = million tonnes of oil equivalent, OECD = Organisation for Economic Co-operation and Development.

Source: International Energy Agency, *World Energy Outlook 2017.* Paris: IEA.

2) Successful and unsuccessful cases

4-2. Factors for success

- The factors for success within a local government body include: increase in employment opportunities for residents, business opportunities for local companies, tax revenue to the local government from employees and workers, and economic contribution to both residents and the local government.
- Factors contributing to successful radioactive waste management as seen in Finland include clarification of accountability for the waste materials by the nuclear power operators, long-term and consistent policies for the management of radioactive waste, stringent safety regulations, and reliable independent safety regulatory authorities (IAEA, 2018).
- With regard to the degree of trust that local residents place in regulatory agencies, in the US, the Nuclear Regulatory Commission conducts public meetings and puts effort into communicating with the local residents (USNRC, 2017). The local residents, in turn, trust the Nuclear Regulatory Commission.
- The situation in the UK is similar to that in the US. Safety reviews for nuclear power are carried out in two phases: design reviews and environmental reviews. During the review phase, regulatory authorities listen to the views of the residents (Government of the UK, 2014).
- In Finland, the citizens place their trust in the high level of expertise of the regulatory agencies.

Unsuccessful cases

- There is a low level of trust in the Nuclear Regulatory Authority in Japan. There have been cases of prefectures conducting their own safety reviews based on their own set of criteria after approval by the Nuclear Regulatory Authority.
- In India, two factors are key to building trust between the citizens and the government: how efficiently communication is carried out, and how involved citizens are in the policymaking process. In both these areas, the building of trust in India has been inadequate.
- In Japan, the radiation levels that were used as criteria for evacuation in the Fukushima accident were far too conservative. The radiation levels for evacuation criteria in Finland are set higher (less stringent) than in Japan. In the UK, the standard is determined separately for each site, and there is no national standard. It is necessary to consider a diverse range of elements in deciding evacuation zones.

- The US issued an evacuation order during the Three Mile Island accident. This represents a case of failure in the technical sense, as evacuation was carried out even though the radiation levels were lower than the established standard for evacuation. As demonstrated by the cases of Japan and the US, when the government panics and takes a wrong step, the residents will become even more panicked, which in turn strengthens their negative responses to nuclear power.

3) Possible countermeasures

- It is vital to recognise that an information asymmetry exists, and to ensure that anyone who wishes to obtain information can obtain it accurately.
- Some facts are revealed for the first time during an accident, and these should be spread worldwide and the countermeasures feedbacked to mitigate risks. Since the accidents at Chernobyl and Three Mile Island, the safety of nuclear power plants has improved through the implementation of various measures, making it less likely that the mistakes will be repeated. In the US, the Institute of Nuclear Power Operations shares information and carries out benchmarking activities, while the power plants co-operate with each other to improve safety. Such information and efforts should be disseminated not only within each country but also internationally. Use of accident databases to show such activity is helpful for enhancing transparency toward the public.
- In Japan, construction costs are rising as the industry reflects on its experience of severe accidents. Although Japan has taken measures against risks since the Fukushima accident, such as strengthening the probabilistic risk assessment system by studying its use in the US, it is not possible to reduce the level of risk to zero. The Government of Japan aims to improve safety as far as possible and achieve the highest level of safety in the world, but it faces difficulties in doing so because of the financial implications. It is necessary to explain the need to optimise the balance between safety measures and cost.
- Nuclear power plant safety levels must improve continuously and constantly. To convey this attitude to the public, relationships of trust must be built. It is of course important for nuclear power plants to be safe, but this is not enough. Misunderstandings and scepticism may rise amongst residents if communication begins with the pre-concluded arguments and technological theories. Communication in the field of nuclear power is extremely difficult and continuous efforts are needed to improve it.
- For consensus building at different levels, trust in the regulatory authorities and the local

government leadership is important. The political considerations that tend to infiltrate key messages must be eliminated to gain the residents' trust and to disseminate a message that conforms to realistic and practical needs.

- The perspective of cost should be incorporated in discussions. When purchasing power from a power producer, consumers can choose from various options including nuclear power and renewable energy. It should be explained that charges are lower when electricity is generated from nuclear power.
- In the US, schools offer lessons to give students a factual understanding of radioactivity and an explanation of emergency plans. It is important to strike a balance between these two aspects when delivering education on nuclear power.
- When describing the safety culture of nuclear power plants, it is important to take responsibility for ensuring the transparency and accuracy of the content delivered.

4) Challenges

- While residents stand to benefit from nuclear power, how should we explain to the public that other areas that do not receive direct benefits may face a degree of risk? The direct benefits of nuclear power reach only as far as the local community. It is not realistic to provide sufficient compensation to all assumed risk. It is important to considerate the dimensions of the estimated risks.
- In Fukushima, people are still unable to leave temporary homes and return to their hometowns. This could risk the collapse of the communities that the people originally belonged to.

3-1. Policy recommendations

1) Points to note about communication

Currently, communication about nuclear power often focuses on the technological aspects. To gain trust, communication must have integrity, competence, and benevolence. To improve communication, take note of the following points:

- Do not talk only about technological theories.
- Talk about the need for nuclear power.
- Discuss matters that the other party is concerned about, such as health, air quality, nature, and the

economy.

- Involve diverse groups of stakeholders and focus on the values that these groups can share.
- Talk about personal experiences and be open and honest.
- Acknowledge mistakes and apologise when necessary.
- Replace technical jargon with words that are easy to understand.

2) Role of the government

- Take clear and firm responsibility for projects.
- Explain the benefits of nuclear power to the public: economy, jobs, infrastructure, and human resource development.
- Rethink the role of the central government concerning risk communication. Debates about how the burden should be shared between the central government and other actors should be carried out in Japan, the central government attempts to control all the information. However, residents do not trust information released by the government.

3) Involvement of local stakeholders

- All stakeholders, including industry, research institutions, government, and educators, should be involved and should have a clear vision and common understanding. It is necessary to communicate directly with them through local liaison groups and public relations magazines. Relationships should also be strengthened with local schools and universities. It should be conveyed to them that nuclear power provides job opportunities and enhanced regional security.
- The government and the private sector should promote business and investment opportunities. Lasting economic benefits are assured through the implementation of projects. The kinds of projects are not limited to nuclear industry. It is important to think comprehensively about existing, developing, and future projects and assets taking local circumstances into consideration, and to deliver explanations consistently.
- To ensure the key messages are communicated effectively, local employers who are well acquainted with the local community should become key persons in soliciting the involvement of local stakeholders.

4) Role of the media

Many people utilise various kinds of media to collect information or make their own opinions known. Media are clearly becoming increasingly important in our lives. On the other hand, in the field of policymaking or governance, the role of media and communication in development is rarely prioritised by researchers or think tanks, and there is substantial divergence amongst actors about what the media, in governance terms, is expected to deliver to support development (Deane, 2015). This is also the case with nuclear energy policies. We should be considering the role of the media. Deane (2015: 267) cites the following four reasons why development actors invest in media support or believe support for media is important:

1. To build an independent media sector as an intrinsic good in and of itself, essential to the functioning of a democratic society and a key platform for freedom of expression (democratic and human rights objectives).
2. To enhance the accountability of governments to citizens, often in order to improve service delivery and state responsiveness, improve state-citizen relations, support more informed democratic/electoral decision-making, or shift social norms to decrease public tolerance of corruption or poor governance (accountability objectives).
3. To improve debate, dialogue and tolerance especially in fragile or conflicted societies, increase the availability of balanced, reliable and trustworthy information, reduce the likelihood of hate speech or inflammatory media likely to exacerbate conflict, enhance social cohesion or build the legitimacy of weak governments in fragile contexts (conflict and stability objectives).
4. To create demand for services (such as health or agricultural services) and use the media as an instrument to achieve development objectives including working to shift behaviours (e.g. improving uptake of immunisation) or changing the social norms that prevent such uptake, such as distrust of vaccinations (communication for development objectives).

These four points not only underline the importance of providing people with information about nuclear energy policy or what is happening in nuclear power plants, but also highlight the need to collect the opinions of various kinds of social actors and facilitate fruitful discussions, eliminating violent discourse if necessary. If the policymakers were to utilise such an approach in the decision-making process, they could achieve a more acceptable mode of nuclear energy governance.

From such a viewpoint as mentioned above, we should analyse the function of the social media in promoting open policy discussion and consider how to better use it to gain public acceptance. Although its use in this field is still at an exploratory phase, social media is believed to offer a potentially effective means of advancing the understanding of nuclear power. For example, Mothers for Nuclear uses social media; and while there are some negative comments amongst the posts, the moderators respond to them courteously and carefully. The traditional media, such as TV, newspapers, and radio, might find it difficult to play such an interactive role.

Chapter 5

Considerations and Policy Proposals

This chapter makes several recommendations and defines stakeholders and coexistence and co-development with surrounding communities, taking into account the following documents on stakeholder involvement: 'Stakeholder Involvement in Nuclear Issues' (IAEA, 2006), 'Stakeholder Involvement Throughout the Life Cycle of Nuclear Facilities' (IAEA, 2011), 'Communication and Stakeholder Involvement in Environmental Remediation Projects' (IAEA, 2014b), and 'Stakeholder Involvement in Decision Making: A Short Guide to Issues, Approached and Resources' (OECD and NEA, 2015).

5-1. Requirements for improving the current situation

1) Who is a stakeholder? – a flexible approach

Targets should be approached individually, because it is difficult to exert influence if you take a whole-country approach. Advertisements aimed at everyone tend to be boring and interest no one.

It is important to identify the targeted stakeholder to determine the appropriate means of involvement. Once the stakeholder has been defined, it is necessary to examine what channels of information the target is familiar with, such as newspapers, magazines, or the Internet.

Concentrating on one target will produce an effect, and it is also possible that individuals who feel that nuclear power is trustworthy will be a positive influence on others.

Women are highly motivated to learn and tend to be more concerned with issues of safety than necessity. It is often beneficial to provide them with opportunities for experience-based learning. They are easily approached through local group activities. If the opinion leaders of these communities are convinced of the merits of nuclear power, they will become powerful advocates for the nuclear cause.

The topic of food is a good place to start for approaching housekeepers who have an aversion to nuclear energy. On the other hand, many of these people feel that nuclear power is none of their business, especially if their homes are far away from nuclear facilities. Is it therefore necessary to consider whether it is worth calling the attention of this group to nuclear power.

Often, fathers are moved by the appeal of necessity and safety. Approaches should also be tailored to their occupational backgrounds, for example agriculture or independent businesses.

2) Promote understanding about nuclear power

While we should appeal the strengths of nuclear power, generally, the emphasis is placed on the weaknesses. The media often features weaknesses because there is no interest in the strengths. Hence, the public will often be more familiar with the disadvantages of nuclear power.

To counter such tendencies and promote a balanced understanding, efforts should be made to deliver topics to the media that throw a different light on nuclear energy. The obvious strong points were the focus of attention in the early years of nuclear development. Nowadays, these points are well known and therefore are not considered newsworthy.

Public acceptance activities tend to conclude with 'let's think about this together' and offer no conclusions. On the contrary, direct appeals like 'X is the strong point' should be made. Sufficient information should be provided to the public so that they can think about nuclear issues as their own problem. It is ideal to provide transparent information on both the strong and the weak points and let the public make comparisons for themselves.

Most people do not have a good understanding of the issues, and this ignorance worsens anxiety levels. It is therefore crucial to deliver elementary and necessary information to promote an informed understanding of nuclear energy.

3) Convincing dialogue

Unidirectional public relations methods have limitations (IAEA, 2014b). This effect expands when the audience is large and mixed. Discussions held in small groups, where participants can talk with more ease, are more effective than lecturing a large group of people, unless the speaker is very skilled. It also helps to find good advocators. People may feel frustrated if they cannot freely ask specific questions or make comments during the lecture. Trust can be nurtured if people experience the satisfaction of asking questions and hearing from others. Discussion is more effective than a lecture format, especially for people who are hostile to nuclear power. If more people understand and accept nuclear power, eventually word should spread that 'nuclear is necessary after all'.

4) Build mutual reliance

It is important that the government is reliable, respectable, honest, sincere, strives to explain as best it can, and when it faces trouble, provides transparent information, and knows the site well. It is important that utilities build relationships of trust with residents on a daily basis, rather than only when a

conducting a special event, such as a briefing meeting or networking event with local inhabitants.

5) Revise methodologies for providing information

Information for nuclear public acceptance should be based on the assumption that 'nuclear power is dangerous' rather than 'nuclear power is safe', and explain how dangerous phenomena are handled safely. In the past, safety was emphasised too much, giving people a reason to complain that 'nuclear is not reliable' or 'nuclear is not always safe' whenever something happened, however trivial. It is nonsense to require perfect safety only for nuclear energy when no such state exists in any human endeavour.

Nuclear opposition groups are good at voicing peoples' concerns because their claims focus on only on the disadvantages of nuclear power. Nevertheless, we have much to learn from their communication techniques. Our information tends to be lengthy because we try to explain everything.

Since the terrorist attacks of 11 September 2001, public visits to nuclear power stations are less welcome. This has created a greater divide between the public and nuclear facilities. Events should be held to familiarise the public with nuclear power, even if site visits are no longer possible.

5-2. Timely and frequent stakeholder involvement

1) Timing

Timely advertisement and communication have a larger effect than regular small notices, which are unlikely to attract the attention of people with no interest in nuclear power. Promoting stakeholder evens at times when public attention is focused, for instance right after the Chernobyl accident, will be most effective. Incidents should be seen as an opportunity to advertise events, and such timings should not be missed. Large-scale accidents like Fukushima are an exception. At such times, any advertisement will have a negative effect and may fuel public antipathy. Besides accidents, public referenda against nuclear power (e.g. in the Republic of Korea or Switzerland) and energy crises also draw attention, especially during winter and summer consumption peaks. At such opportunities, information on the necessity and safety of nuclear generation should be provided in addition to topical information.

It is crucial that precise information is provided to the media from the start. Articles released sometime after the incident that start with a 'It turns out that there was a problem with. . .' or a 'The cause of the trouble was actually. . .', are particularly damaging. Such correction articles will not gather as much attention as the first sensational piece. However, if there are mistakes in any reports, it is better to correct them late than never.

In contrast, during normal operations, delivering textbooks, lectures, and workshops are better than newspaper advertisements. Newspaper articles will not be read at such times, because nuclear power is not an issue that attracts a great deal of a positive interest.

2) Frequency

Advertisements and communications should be repeated because readers quickly forget information. Short and simple yet repeated and continuous advertisements have an imprinting effect.

5-3. Regional development

To obtain permission for the construction and operation of a nuclear facility, the contribution to the local economy is key. This includes employment of residents, local procurement and contracting of business to local firms, organisation or co-organisation of and participation in local events, and participation in local volunteer activities. While local procurement is important, it is also vital that the developers, main contractors, and the operating company exert a strong local presence. If people feel that the promoters of nuclear power are managing things from a distance, they will regard the project with suspicion. This can lead to a feeling in the local community that there is no real commitment in the area.

5-4. Support and advice by third-party advisers

It is commendable that advisory bodies and other third parties provide support and advice. Examples of mechanisms to promote this objective include the following:

Stakeholder involvement. Stakeholder involvement schemes should be supported by third party advisers (e.g. professors in local universities).

Training and skills. Training and skills both at the technical and advanced level is important, in addition to having good relations with local professional training services and universities.

Involvement of national and local governments. Governments should make their stance towards nuclear energy clear, as it helps instil a sense of trust amongst the public. It is imperative to train experts to be good spokespeople, including executives. The main spokespeople in the administration are the chief cabinet secretary and press secretary of Ministry of Foreign Affairs. Effective representatives create a favourable impression of the government. Once journalists acknowledge and trust such people, they will seek their opinions and quote them in articles. Hence, the influence of these people will gradually

impregnate the media, and their knowledge and personalities will make an impression on journalists.

To promote trust with the media, it is helpful to secure permanent posts for successful spokespeople. Current public attitudes towards the judgement of experts or authorities are always questioning; therefore it is unwise to depend excessively on experts or authorities when attempting to gain the public's trust. The leverage provided by good advertisements and spokespeople should be recognised in this regard.

1) Educational curricula

We need to examine how to include nuclear power and energy issues in the educational curricula. In Japan, the Atomic Energy Society of Japan set up a working group that has been making annual proposals such as 'The proposal regarding the description of energy in elementary and secondary education textbooks (Atomic Energy Society of Japan, 2009, 2010, 2011, 2012, 2013).

Unlike in the past, when textbooks contained factual errors or biases regarding nuclear energy, current science textbooks offer the facts in plain writing. Civic textbooks are the most enthusiastic, with sections on nuclear use in relation to energy issues. In some of these textbooks, opinions for and against restarting nuclear power plants are described side by side and students are encouraged to debate their merits. All textbooks describe the Fukushima accident associated with the Great East Japan Earthquake in an objective manner without bias and point out that there are safety concerns. While many paragraphs are devoted to the topic of renewable energy, most textbooks do not promote anti-nuclear views. This kind of transition is very desirable.

5-5. Models for information provision

1) Media relations

Why is it necessary to provide understandable information to the media when incidents occur? The reason is based on the French experience following the Chernobyl accident, where support for nuclear energy plummeted because of poor media relations. In an opinion poll after the accident, 93% of respondents expressed their belief that 'we are not being informed of the situation', while 79% answered that 'we are not being informed of the facts'.

An investigation clarified that neither the government nor the electric utilities covered up the facts. Information was disseminated, but it was too technical and difficult for the media to understand. Hence,

the outcome was the same as if they had not provided information at all.

Simple graphs and figures are more effective than verbose texts. For instance, providing a table of the amount of radioactive substances found in food is effective.

2) Spokespeople

It is very productive to offer a clear, considerate explanation to the media about an incident once it occurs. If the spokesperson displays a sincere but hospitable attitude, the media will be prompted to ask honest questions as much as they want. This has the power to change what the media will broadcast. Articles can become more accurate and cease to be intentionally malicious.

The nuclear industry should secure a few permanent personnel who are skilled at communication with the media. It is preferable that such personnel belong to neutral organisations, such as universities or research institutes, for example the Japan Atomic Energy Agency.

5-6. Implications and policy proposals

How could we convey the facts to the public and improve communication methods? The experts invited to the workshop gave the following opinions.

- 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, instead of talking about technology using technical jargon, is crucially important for effective communication.
- The most effective approach is to share personal stories, be open and honest, admit mistakes, and to apologise when needed. The roles of the national, municipal, and local governments are also important to maintain a clear and firm commitment to projects.
- Local stakeholder involvement should be led by locally employed personnel from the vicinity of the nuclear facility (key persons) who understand and are sensitive to local issues, culture, and attitudes. All sectors – industry, academia, government, and education – should work together with a clear vision and a common understanding for mutual communication. A strong link with local schools, colleges, universities and employment opportunities can be helpful for establishing communication bridges.
- Developing business projects and investments is also recommended to enhance the reliability of

the nuclear industry and the government. This can be achieved by promoting opportunities to secure public and private investment and delivering projects and programmes that secure an ambitious economic legacy.

- In addition to these actions, the role of the media should be reconsidered and firmly re-established. Media, including social networking sites, can and should build public opinion and can often amplify trends. Communicating through the social media is one method for improving public acceptance of nuclear power.

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Appendix 1. Itinerary for the Public Acceptance (PA) Week for Nuclear Energy FY 2017

Workshop on 'How to improve public acceptance for Nuclear Energy in referring to the experience in the respective countries'

1. Date and venue

Date: 6 February 2018

Venue: Institute of Energy Economics, Japan in Tokyo

Language: English

2. Draft timetable

08:30	Doors open and Registration
9:00–9:10	Opening Address President and CEO, IEEJ
9:10–9:230	Keynote Speech and Welcome address: Senior Energy Economist, ERIA
Session 1: Why is nuclear power important for the country and communities? Significance of nuclear power plants（3E), Power plants versus reprocessing and disposal facilities, regulation schemes and minimizing risk to tolerable level, and economic contribution to community (Moderator: IEEJ)	
9:20–9:30	Introduction: Introduce speakers by moderator
9:30–9:50	Co-founder, Mothers for Nuclear, United States
9:50–10:10	New Nuclear Coordinator, The Heart of the South West Local Enterprise Partnership, United Kingdom
10:10–10:30	Delegate, Consultative Commission on Industrial Change European Economic and Social Committee, Finland
10:30–10:50	Q&A
10:50–11:00	Coffee break
11:00–11:20	Director, Office for Regional Relations for Nuclear Facilities, Nuclear Energy Public Relations Office, Japan
11:20–11:40	Research Associate, Electricity and Fuels Division, The Energy and Resources Institute, India

11:40–12:20	Q&A and panel discussion
12:20–13:30	Lunch Break
Session 2: Can we prepare for the accident safely enough? Evacuation plans and evacuation drills as neighbouring nations, emergency care, and contact system (Moderator：IEEJ)	
13:30–13:40	Introduction：Introduce speakers by moderator
13:40–14:00	Researcher, Energy Research Institute Chulalongkorn University, Thailand
14:00–14:20	Co-founder, Mothers for Nuclear, United States
14:20–14:40	Executive Director, Menai Science Park Limited, United Kingdom
14:40–15:00	Chair of Eurajoki Municipal Board Eurajoki Municipality, Finland
15:00–16:00	Q&A and free discussion
16:00–16:20	Coffee break
Session 3: Policy Proposals (Moderator: IEEJ)	
16:20–16:50	Wrap-up of proposals, free discussion
16:50–17:00	Closing address

CEO = chief executive officer; ERIA = Economic Research Institute for ASEAN and East Asia; IEEJ = Institute of Energy Economics, Japan; Q&A = question and answer.

Work shop on ‘Live in the neighbourhood of nuclear facilities

– Public Meeting with opinion leaders from three countries and Japan‘

1. Date and venue

Date: 8 February 2018

Venue: Rokkasho-mura Cultural Exchange Plaza SWANY

Language: Japanese/English (with simultaneous interpretation)

2. Draft timetable

12:00	Doors open and registration
12:30–12:40	Opening remarks: President and CEO, IEEJ
12:40–12:50	Opening address: Representative, Rokkasho Village
Session 1: Status of region hosting or introducing a nuclear power plant and dialogue with stakeholder in each country; Why nuclear power is important for the country and communities? Can we prepare for the accident safely enough? (Moderator：IEEJ)	
12:50–13:20	Co-founder, Mothers for Nuclear, United States
	New Nuclear Coordinator, The Heart of the South West Local Enterprise Partnership, United Kingdom
	Chair of Eurajoki Municipal Board Eurajoki Municipality, Finland
	Chair of Rokkasho-mura Nuclear facility invitation promotion council, Japan
Session 2: Reaching common understanding, significance of nuclear power plants, regulation schemes and risks of nuclear power plants in operation (Moderator：IEEJ)	
13:20–13:50	Co-founder, Mothers for Nuclear, United States
	Executive Director, Menai Science Park Limited, United Kingdom
	Delegate, Consultative Commission on Industrial Change European Economic and Social Committee, Finland
	Organiser, Thinking Energy Future Academy
13:50–14:10	Coffee break

Session 3: Policy Proposals (Moderator：IEEJ)	
14:10–14:30	Report results of workshop in Tokyo: President and CEO, IEEJ
14:30–15:30	Q&A and wrap-up of proposals
15:30–15:40	Closing address: Senior Energy Economist, ERIA

CEO = chief executive officer; ERIA = Economic Research Institute for ASEAN and East Asia; IEEJ = Institute of Energy Economics, Japan; Q&A = question and answer.

Meeting with Governor of Aomori Prefecture

1. Date and venue

Date: 9 February 2018

Venue: Aomori Prefectural Office

Language: Japanese/English (with consecutive interpretation)

2. Draft timetable

9:30–9:35	Greeting
9:35–9:45	Policy proposals reporting
9:45–10:30	Free discussion opinion exchange with official

Wrap-Up Meeting

1. Date and venue

Date: 9 February 2018

Venue: Hotel

Language: Japanese/English (with consecutive interpretation)

2. Draft timetable

16:00–16:05	Greeting

16:05–16:35	Comments from Euro-American speakers
16:35–6:50	Comments from Energy Research Institute Network member
16:50–17:00	Wrap-up

Appendix 2. Fiscal Year 2017 Public Acceptance Week Minutes

Schedule 5–9 February 2018		
Day	Events	Venue
Monday 5 Feb	Fukushima Daiichi nuclear power plant technical visit	Fukushima Daiichi nuclear power plant
Tuesday 6 Feb	Workshop on 'How to improve public acceptance for nuclear energy referring to the experiences in the respective countries'	Tokyo
Wednesday 7 Feb	Japan Nuclear Fuel Limited Rokkasho technical visit	Japan Nuclear Fuel Limited Rokkasho
Thursday 8 Feb	'Live in the neighbourhood of nuclear facilities –Public meeting with opinion leaders from three countries and Japan'	Rokkasho
	Press conference	
Friday 9 Feb	Meeting with Governor of Aomori Prefecture	Aomori
	Wrap-up meeting	Tokyo
	Press conference	

Workshop on 'How to improve public acceptance for nuclear energy in referring to the experiences in the respective countries'

1. Date and venue

Date: 6 February 2018

Venue: Institute of Energy Economics Japan, in Tokyo

2. Outline

Session 1: Why nuclear power is important for the country and communities?

Significance of nuclear power plants(3E), Power plants versus reprocessing and disposal facilities, Regulation schemes and minimized risk to tolerable Level, and Economic contribution to community

Presentations:

1. Nuclear Technology with Moral Purpose, Mothers for Nuclear
2. The Economic Contribution of Nuclear to Communities
3. Nuclear Energy: The Pros and Cons and the Public
4. Japan's Plant Restart and Public Communication
5. Why Nuclear Power Is Important for India and to Its Communities

Session 2: Can we prepare for the accident safely enough?

Evacuation plans and evacuation drills as neighbouring nations, Emergency care, and Contact system?

Presentations:

1. Can We Prepare for the Accident Safely Enough?
2. Mothers for Nuclear
3. Menai Science Park
4. Local Community Involvement – The Finnish Example

Live in the neighbourhood of nuclear facilities

Public meeting with opinion leaders from three countries and Japan

1. Date and venue

Date: 8 February 2018

Venue: Rokkasho-mura Cultural Exchange Plaza SWANY

2. Outline

Session 1: Status of region hosting or introducing a nuclear power plant and Dialogue with stakeholder at each country; Why nuclear power is important for the country and communities? Can we prepare for the accident safely enough?

Session 2: Reaching common understanding; significance of nuclear power plants, regulation schemes and risks of nuclear power plants in operation

Meeting with Governor in Aomori

Date: 9 February 2018

Venue: Aomori Prefectural Office

Prefecture's Efforts Regarding Nuclear Power

Wrap-Up

Date: 9 February 2018

Venue: Dai-ichi Hotel Tokyo

Findings

- Why nuclear is important

The majority of energy use around the world is fossil-fuels-based. Fossil fuel usage is projected to continue increasing especially in developing countries.

Continuous and increasing use of fossil fuels would cause air pollution and climate change, and threat to energy security in countries without natural resources

Nuclear energy provides:

- Opportunity for significant economic benefit and environmental sustainability
- Energy security in countries dependent on imported fossil fuels
- Economic benefits such as new high-level jobs, business opportunities, and human resources development

- Facts on benefits of nuclear energy

The most typical anti-nuclear arguments are:

- Nuclear is dangerous!
- Nuclear produces wastes!
- We have already alternative energies!

The facts are:

- Radiation did not impact public health as has been said.
- Nuclear is the safest and least environmentally harmful energy, which provides reliable and economic electricity in most countries.
- The risks must be recognised and managed so that they are under control.
- The real risk of nuclear is NOT using nuclear – because it would lead to increased use of fossil fuels, air pollution, and other environmental problems.

- Success factors in hosting municipalities

Municipalities with nuclear energy facilities provide economic benefits for both local residents and the municipality.

- A lot of local people get jobs and work around the site.
- Business opportunities are served to local companies.
- Employees and workers pay income taxes to municipality.

Success factors of the Finnish nuclear waste management:

- Nuclear power generators have clear responsibilities of for their waste.
- There is a long-term and stable policy on nuclear waste management.
- Safety requirements are strict.
- The safety authority is credible and independent.

Policy recommendations

- Communication methods, role of governments
  - Nuclear communications usually focus on technology.
  - To build trust, however, nuclear communications need to include integrity, competence, and benevolence.

How can we improve communication?

- Do not talk about technology using technical jargon.

- Talk about the need for nuclear energy.
- Discuss issues that people care about, e.g. health, air quality, nature, and economics.
- Include diverse stakeholder groups and focus on shared values.
- What works best is to share personal stories, to be open and honest, to admit mistakes, and to apologise when needed.

What is the role of the government?

- Keep a clear and firm commitment on projects.
- Explain the benefit of nuclear energy – economics, jobs, infrastructure, and human resources development – to the public.

- Local stakeholder involvement

To transmit key messages,

All sectors – industry, academia, government, and education – should work together with clear vision and common understanding.

- Communicate directly through a local liaison group and newsletters.
- Create strong links with local schools, colleges and university, and employment opportunities, as well as safety and security.

Develop business projects and investments by:

- promoting the opportunity to secure government and private investment;
- delivering projects and programmes that secure an ambitious economic legacy; and
- bringing together existing and developing projects, programmes, and assets to speak with one voice and present a coherent story.

Local stakeholder involvement should be led by locally employed personnel (key persons) who understand and are sensitive to local issues, culture, and attitudes.

Comments from Aomori Prefecture and Rokkasho Village

– The national government should decide on and carry out a consistent policy on nuclear use.

– Residents of Aomori Prefecture and Rokkasho village have a lot in common with communities in the neighbourhood of nuclear facilities in Europe and the United States. We should share and use the experience in the future.

– Information on economic benefits and stable energy supply are necessary in addition to explanations of safety and risks of nuclear energy.

Q&A at press conference

Q. I understand the necessity of nuclear energy, but we have 'Not in my backyard' attitude. How did you overcome the problem?

A. In Wales, there are old operating plants. Therefore there are established systems to support nuclear energy.

A. We have been continuing to explain that nuclear is one of the options when we think about air pollution and global warming.

Q. What are the preferable methods for municipalities to become involved in decision-making?

A. In Eurajoki, we chose to accept to build final disposal site in a referendum. Transparent information from the national government and utility and 40 years of stable plant operation were important determining factors.