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Public Perception and Acceptance of Nuclear Power: Stakeholder Issues and Community Solutions

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Public Perception and Acceptance of Nuclear Power:
Stakeholder Issues and Community Solutions

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List of Abbreviations

ASEAN	Association of Southeast Asian Nations
ERIA	Economic Research Institute for ASEAN and East Asia
ERIN	Energy Research Institute Network
IEEJ	Institute of Energy Economics, Japan
JAERO	Japan Atomic Energy Relations Organization
NPP	Nuclear Power Plant
PA	Public Acceptance
TEPCO	Tokyo Electric Power Company Holdings
UK	United Kingdom
UKERC	UK Energy Research Centre
US	United States

Executive Summary

Nuclear energy remains an important option for the Association of Southeast Asian Nations (ASEAN)+6 countries (the 10 members of ASEAN plus Australia, China, India, Japan, the Republic of Korea, and New Zealand), due to insufficient renewable resources and the increasing effects of pollution from coal. Nuclear power generation can provide these countries with energy security, and a solution to environmental problems such as climate change.

On the other hand, a negative perception towards the introduction of nuclear power has spread in many countries, including Japan, since the accident at the Fukushima Daiichi nuclear power plant (NPP). This background suggests a situation where social consensus cannot be obtained and there is no choice but to put the introduction of nuclear power on hold even if governments are contemplating bringing NPPs onto their soil. Improving public acceptance (PA), a way of forming social consensus, is effective for nuclear power introduction in ASEAN countries.

In some developed nations where nuclear power facilities have been in existence for many years, there are entities that have successfully served as a communication bridge between residents and the nuclear power business operators. To improve PA, methods used include public participation, incentives, and benefits. As one method, it is important to hold international symposiums where experts get together from all over the world. All the more important, however, is to invite leaders of regions and opinion leaders of municipalities of developed nations where nuclear power facilities are located to hold discussions at workshops, gathering requirements necessary for improving PA and coming up with policy proposals.

The purpose of this report is to clarify the issues of PA and the common and/or different points of recognition between the explainer and the recipient, and to compile policy proposals gathered from the discussions at workshops.

The compiled policy proposals are:

1)Matters on trust

●The government should announce a consistent national energy policy.

●The government and the operators should disclose information required by people in an honest manner.

●Information shall be sent by trusted bodies.

2)Matters on communication and transparency

●Independent third parties should be involved in the communication.

●It is important to share facts about climate change, energy security, and related economic issues for the benefit of the community.

●Technical terms should not be used in explanation of safety and risks.

●The government and the operators should appoint communication experts who stay in the same position for the long term.

●The government and the operators should respect various opinions from different people.

●Residents should be involved in decision making and have the right to refuse the policy implementation if necessary.

3)Matters on economic development

●There should be links between business opportunities of nuclear power and other sectors so that various kinds of businesses can expand in the region.

Chapter 1

Introduction

1. Background

In Asia, some countries began to develop nuclear power generation in the 1960s, and now several other countries are considering the introduction of nuclear power. Some East Asia Summit countries such as China, India, Japan, and the Republic of Korea already use nuclear power. 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 might begin to think about the introduction of nuclear power generation more positively in the future.

Nuclear energy remains an important option for the ASEAN+6 countries (the 10 members of ASEAN plus Australia, China, India, Japan, the Republic of Korea, and New Zealand), due to insufficient renewable resources (Nian and Chou, 2014) and the increasing effects of pollution from coal (Koplitz et al., 2017). Nuclear power generation can provide these countries with energy security, and a solution to environmental problems such as climate change.

On the other hand, a negative attitude towards the introduction of nuclear power has spread in some countries, including Japan, since the accident at the Fukushima Daiichi nuclear power plant (NPP) in March 2011.

In Japan, as of the end of April 2020, there were nine NPPs in operation, with 16 NPPs still under review or preparing to be restarted, although 54 NPPs were in operation before the Fukushima nuclear accident. Following the accident, permanent shutdown was decided at 21 NPPs (including Fukushima Daiichi Units 1–6 and Fukushima Daini Units 1–4).

Germany, Taiwan, the Republic of Korea, and Switzerland have changed course and are moving towards abandoning nuclear power generation. In Asia, whilst China and India are steadily pushing forwards with boosting the number of NPPs according to official energy policy, ASEAN member nations are still undecided. Negative voices were raised in Viet Nam and the Philippines, which had already started their pre-implementation activities; a plan to construct an NPP has come to a halt in Viet Nam, and a similar plan that had been promoted several times has been stopped in the Philippines. The introduction of nuclear power generation is being considered in

countries outside Asia, but efforts to win over citizens are still only halfway through, and opportunities are not ripe.

This background suggests a situation where social consensus cannot be obtained and there is no choice but to put the introduction of nuclear power on hold even if governments are contemplating bringing NPPs onto their soil.

Some ASEAN nations are concerned about electricity shortages associated with brisk economic growth. On the one hand, concerns about an increase in emissions of greenhouse gas are mounting, and each ASEAN member nation has set a greenhouse gas emissions reduction target. Each ASEAN country has also set a target for the introduction of renewable energy, although the situation varies for each country.

There are cases where the introduction of nuclear power, which is an option for low-carbon energy, was postponed due to the lack of social consensus. Forming social consensus is one of the effective methods to construct better understanding on nuclear power in ASEAN countries. Even countries that have no intention of launching nuclear power generation must prepare nuclear accident evacuation plans and drills because neighbouring countries may introduce nuclear power generation. All East Asian and ASEAN countries are involved in the discussion of the social acceptance of nuclear power.

In some developed nations where nuclear power facilities have been in existence for many years, there are entities that have successfully served as a communication bridge between residents and the nuclear power business operators. Methods to improve PA include public involvement, the giving of incentives, and benefits to stakeholders. As one method, it is important to hold international symposiums where experts get together from all over the world. All the more important, however, is to invite leaders of regions and opinion leaders of municipalities of developed nations where nuclear power facilities are located to hold discussions at workshops, gathering requirements necessary for improving PA, and coming up with policy proposals. The policy proposals are urgent because there is a long lead time to introduce nuclear power and to construct power plants.

In addition, the workshops will develop a model for better PA of nuclear power that can be adapted and applied to other low-carbon energy technologies, such as wind power,

hydropower, and electricity grid management. It is also expected that this method will contribute to find solutions for issues where PA is difficult to obtain.

2. Purpose

The purpose of this report is to clarify the issues of PA and the common and/or different points of recognition between the explainer and the recipient, and to compile policy proposals from the discussions at the workshops.

3. Study method

1) Holding workshops

Opinion leaders of municipalities of developed nations where nuclear power facilities are located, were invited to hold workshops for participants including energy policymakers and government officials from member countries of the Energy Research Institute Network (ERIN)—an organisation consisting of the 10 ASEAN member nations and Japan, China, the Republic of Korea, Australia, New Zealand, India, the United States (US), and Mongolia (18 countries in total), and affiliated with the Economic Research Institute for ASEAN and East Asia (ERIA).

The workshop members visited Kashiwazaki City and Tsuruga City, hosting municipalities of NPPs in Japan, and participated in workshops with the opinion leaders of that region. In addition, discussions in Tokyo were held to draft policy proposals. The appendix shows the itinerary for the Public Acceptance Week for Nuclear Energy FY 2019. Rather than unidirectional talk about ideals like in typical symposiums, the workshops should be used as an exchange of opinions with those who went through similar experiences in their own countries and those for whom PA will be necessary in the future.

Before convening the workshops, a representative from the Institute of Energy Economics, Japan (IEEJ) visited the opinion leaders from the European countries and the US to gain a better understanding of their background and thereby draw out their views 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 compiled at the workshops.

2) Compiling policy proposals

Based on the discussions at the workshops, common necessary conditions were classified and analysed to be put together as policy proposals.

Chapter 2

Public Perception and Acceptance of Nuclear Power

In this study, IEEJ reviewed each country's perception of nuclear power, and the experiences and measures for building a consensus to contribute to the improvement of social acceptance of nuclear power, how society could accept nuclear power, and to propose policies. In this chapter, each country's public perception and the meaning of PA are described. Each country's experiences and measures for building a consensus are described in chapter 3. An analysis of chapters 2 and 3 and the compiled policy proposals are discussed in chapter 4.

Countries surveyed are selected by the reasons below:

United States (US)	The largest nuclear energy consumer in the world
Finland	A repository for the final disposal of spent nuclear fuel was accepted for the first time in the world
United Kingdom (UK)	The government supports and promotes nuclear power
Japan	The government promotes nuclear power even after the Fukushima Daiichi accident

Each country's history of nuclear power, and an overview of public perception before and after the Fukushima Daiichi accident are described in the following section.

1. Public perception of nuclear power

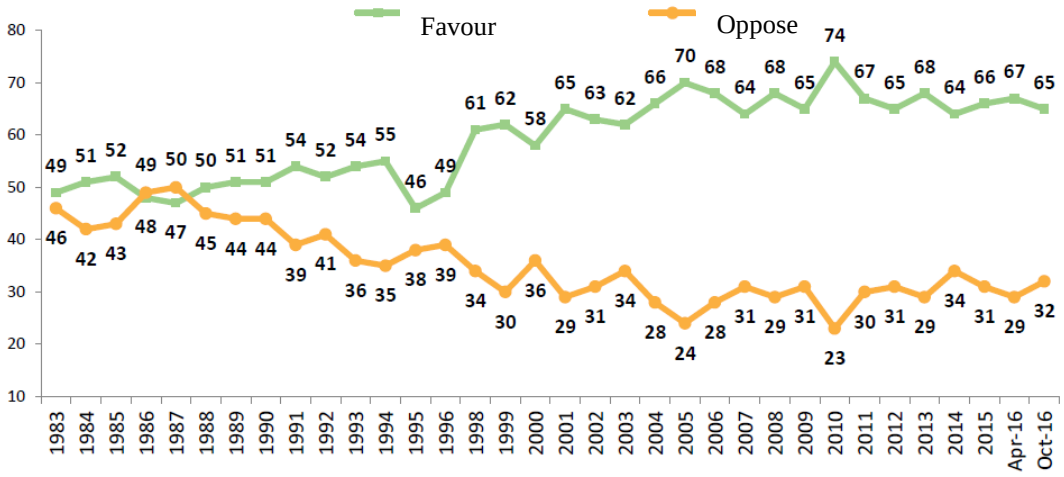
1) Status in the United States

In the US, the construction of nuclear power plants (NPP) rapidly expanded after 1957 when the Shippingport Atomic Power Station started operation and continued up to the end of the 1970s. However, an accident occurred at the Three Mile Island Nuclear Generating Station Unit 2 in

1979, which caused some distrust of nuclear power. After that, with the decrease of the cost of thermal power generation and the downwards adjustment of electricity demand estimates, the construction of new NPPs stopped. Nevertheless, with the California electricity crisis in 2001 triggering the need for a stable electricity supply and concerns of higher natural gas prices, the movement towards the construction of new NPPs began in full scale. As of 2019, nuclear power accounted for about 20% of electricity generated in the US. At present, 95 NPPs are in operation and two NPPs are under construction.

Figure 2.1 shows the percent of people in the US who favour and oppose nuclear energy from 1983 to 2016. The 2016 data are from surveys conducted by Bisconti Research Inc., at the request of the US Nuclear Energy Institute.

Figure 2.1: Percent Who Favour and Oppose Nuclear Energy, 1983–2016 (%)



Source: Nuclear Energy Institute (2016). 'Fall 2016 National Public Opinion Tracking Survey Memo'. https://www.nei.org/CorporateSite/media/filefolder/resources/reports-and-briefs/national-public-opinion-survey-nuclear-energy-201610.pdf (accessed 26 November 2019).

Figure 2.1 shows the number of people who opposed nuclear energy increased following the accident at Chernobyl Unit 4 in the Soviet Union in 1986. Following that, more people supported nuclear energy than opposed it. These results also show that public support for nuclear energy dipped after the Fukushima accident, but the foreign accidents have hardly affected public perception.

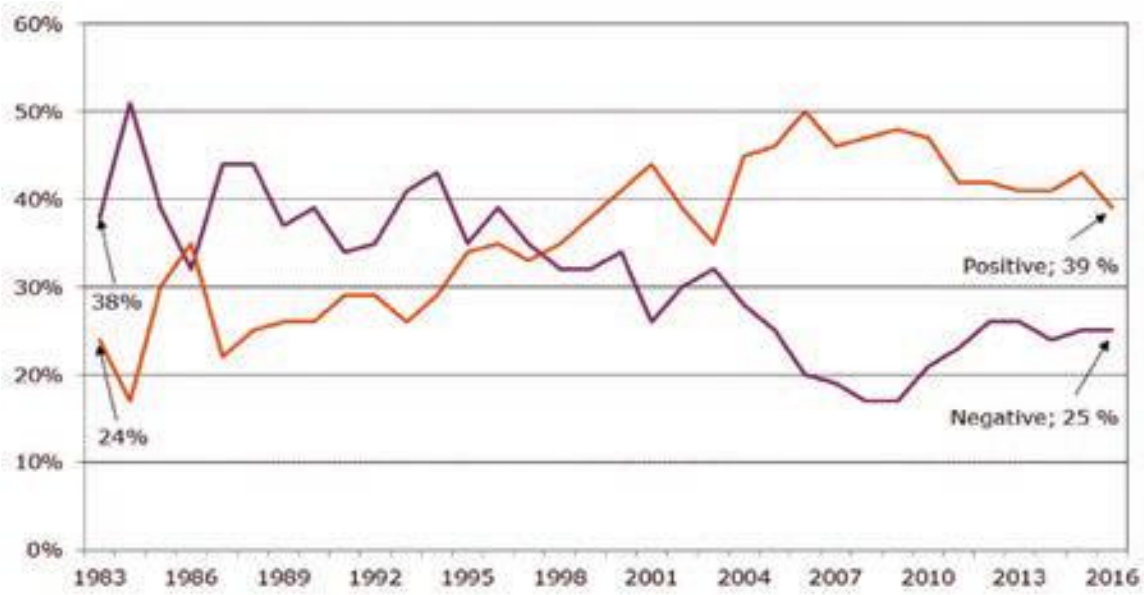
2) Status in Finland

Since the oil crisis in the 1970s, Finland has promoted nuclear power development in order to solve the excessive dependence on fossil fuels and Russia. During the Cold War, the Loviisa Units 1 and 2, which started operation in 1977 and 1981, respectively, were built using Eastern Bloc technology. The Olkiluoto Units 1 and 2, which started operation in 1979 and 1982, respectively, were constructed using Western Bloc technology. The consequent new construction plans were temporarily ceased following the Chernobyl accident in 1986 but have resurfaced to tackle issues including the chronic import of electricity and compliance with the target for reducing greenhouse gas emissions. As of 2019, nuclear power generation accounted for about 35% of electricity generated in Finland. At present, four NPPs are in operation and a new plant is under construction in Olkiluoto.

Finland is the only country in the world where a final disposal facility of high-level radioactive waste is under construction. Since the total amendment of Finland's atomic energy act in 1987, its people, the municipality hosting the radioactive waste facility, neighbouring municipalities, and regulatory organisations expressed their opinions on the project for introducing nuclear power facilities, including the final disposal facility, even before the application for construction was filed. For this reason, the planned construction site of the high-level radioactive waste final disposal facility was decided much earlier than the application for construction permission.

Figure 2.2 shows public opinion polls in Finland. According to World Nuclear News, in the 2010 survey, the opinion poll was carried out over 1 week in January, and 1,000 Finns aged 15 and over were interviewed on their general opinions of nuclear power in a Finnish context.

Figure 2.2: Evolution of Public Acceptance of Nuclear Power in Finland



Source: 'What People Really Think About Nuclear Energy' (2017), *ATW–International Journal for Nuclear Power*, 62(3), 157–163. https://www.kernenergie.de/kernenergie-wAssets/docs/fachzeitschrift-atw/2017/atw2017_03_157_What_People_Really_Think.pdf (accessed 26 November 2019).

The number of people who opposed the commercial use of nuclear power increased following the accident at Chernobyl in 1986. The ratio of supporters of nuclear power exceeded that of opponents in the second half of the 1990s and the results shows that even though public support for nuclear energy dipped after the Fukushima accident, as of 2016, the majority support nuclear power generation in Finland.

3) Status in the United Kingdom

In the UK, Calder Hall Unit 1 started nuclear power generation for commercial use in 1956, and it has since been a pioneering NPP. Whilst the UK's development of nuclear reactors progressed through trial and error, light-water reactors were introduced in the 1980s. The promotion of nuclear power resurfaced in the late 2000s due to the exhaustion of the North Sea gas fields, the need for a stable energy supply, and the ambitious target for reducing global warming gas emissions. As of 2019, about 18% of the country's electricity is generated by nuclear power. At present, 15 NPPs are being operated and one station is being constructed at Hinkley Point C.

The results of surveys by the UK Energy Research Centre (UKERC) are shown in Table 2.1. The 2013 survey was conducted with 961 respondents between 8 and 26 March 2013.

Table 2.1: Overall Support for and Opposition to Nuclear Power (%)

	2005	2013
Overall, I support nuclear power	26	32
Overall, I oppose nuclear power	37	29
I am not sure whether I support or oppose nuclear power	32	27
I don't care what happens with nuclear power	3	3
Other/None of these/ Don't know	1	9

Source: UKERC (2013), 'Public Attitudes to Nuclear Power and Climate Change in Britain Two Years after the Fukushima Accident,, 19 Sep. http://www.ukerc.ac.uk/publications/public-attitudes-to-nuclear-power-and-climate-change-in-britain-two-years-after-the-fukushima-accident-summary-findings-of-a-survey-conducted-in-march-2013-working-paper.html (accessed 26 November 2019).

Overall, the support for nuclear power has increased by about 6 percentage points since 2005, whilst opposition has decreased by about 8 percentage points since 2005. A similar number of people generally supported (32%) or opposed (29%) nuclear power in 2013. The number of people ambivalent about nuclear power (that is, being unsure whether to express support or opposition) dropped from 32% in 2005 to 27% in 2013.

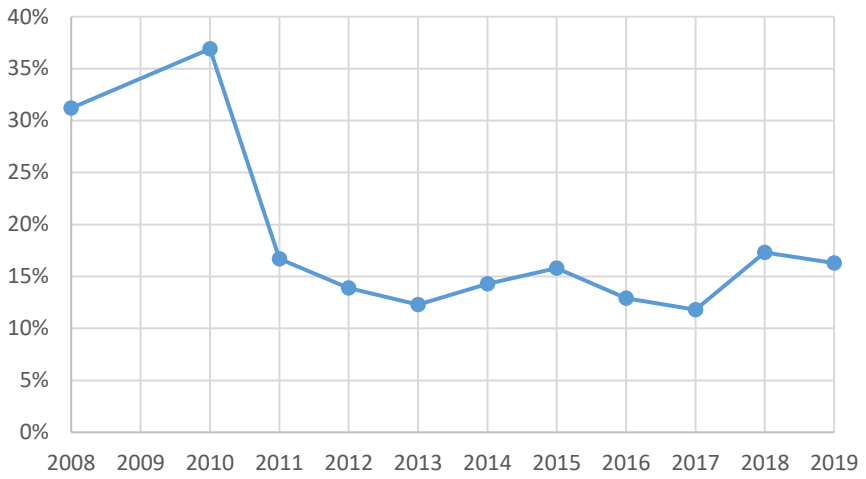
4) Status in Japan

Japan started commercial nuclear power generation in 1966 when the Tokai nuclear power plant opened using technology introduced from the UK. After that, Japan introduced a light-water reactor from the US in 1970. The construction of light-water reactors expanded to compensate for Japan's low energy self-sufficiency and the increase in domestic manufacturing in the 1980s. During the 1990s, several Japanese-type light-water reactors were constructed. In 2011, 54 NPPs were in operation and about 30% of electricity generated was from nuclear energy until the accident occurred at the Fukushima Daiichi NPP in 2011. However, the percentage of electricity generated by nuclear power remained at around 8% in 2019. At present, only nine NPPs are in operation.

The Japan Atomic Energy Relations Organization (JAERO) has conducted regular and repeated public opinion surveys since 2006. JAERO's survey was conducted with 1,200 respondents from 3 to 15 October in 2019.

Figure 2.3 shows the trends in the percentage of respondents who would like to use nuclear energy in the future.

Figure 2.3: Percentage of Respondents Who Would Like to Use Nuclear Energy in the Future

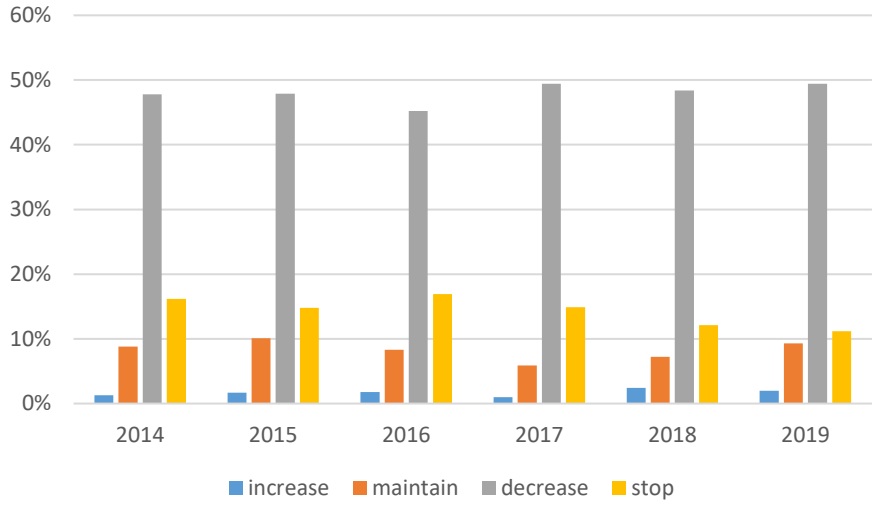


Source: Japan Atomic Energy Relations Organization (2020), 'Opinion Research on Nuclear 2019'. https://www.jaero.or.jp/data/01jigyou/tyousakenkyu2019.html (accessed 18 March 2020) (in Japanese).

The result shows that the public image of nuclear power has tended to decline after an accident.

Figure 2.4 shows 11.3% of respondents who answered 'increase' or 'maintain' think that nuclear energy is useful. On the other hand, 60.6% of respondents who answered 'decrease' or 'stop' think that nuclear energy is not useful in the future in Japan.

Figure 2.4: How Do You Think Nuclear Power Generation Should be Used in the Future?

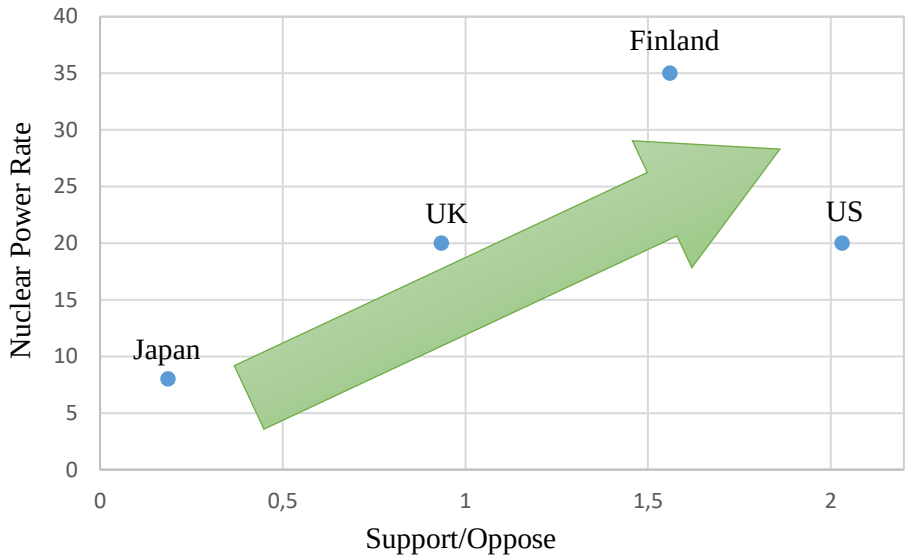


Source: Japan Atomic Energy Relations Organization (2020), 'Opinion Research on Nuclear 2019'. https://www.jaero.or.jp/data/01jigyou/tyousakenkyu2019.html (accessed 18 March 2020) (in Japanese).

5) Summary of public perception of nuclear power

Nuclear power has been generally accepted in the US, Finland, and the UK, although acceptance levels differ from country to country. Figure 2.5 shows the proportion between those who support nuclear power and those who do not, along with the share of nuclear power in each nation's electricity supply.

Figure 2.5: Is There a Correlation Between Public Perception and Nuclear Power Use?



UK = United Kingdom, US = United States.
Source: Prepared by IEEJ based on the results of surveys shown in Chapter 1.

These comparisons are not necessarily correct as they were made in different years, with questionnaires being inconsistent amongst the survey bodies. However, they indicate a rough correlation between the PA of nuclear power and its share in a nation's electricity supply. The higher the share in a nation's electricity supply, the greater the acceptance of nuclear power.

In this rough correlation, the US is in a somewhat specific situation. Whilst the share of support is much larger than the opposition, the share of nuclear power in electricity supply is not as large. The reason is assumed that the US has more energy resources, such as gas and coal, than other countries, but more detailed analysis is required.

Public acceptance of nuclear power

The International Atomic Energy Agency (2007, p.5) defines PA as follows:

> Public acceptance implies that a certain policy or a certain concrete measure is clearly or tacitly supported by members of the public who may be affected, positively or negatively, by its implementation.

Considering the four countries listed in section 2.1, if the proportion between those who support nuclear power and those who do not is almost the same or more, it is thought that nuclear power is clearly or tacitly supported by the public. In other words, it can be said that PA of nuclear power is achieved. Countries considering the introduction of nuclear power need to work for PA to create such a situation.

Chapter 3

Opportunities and Barriers for Enhanced Public Acceptance

In November 2019, IEEJ organised workshops to gain a better understanding of nuclear power in Japan with the participation of opinion leaders from the municipalities that have hosted nuclear facilities in Europe for a long time. The workshops in Japan took place in three locations: Kashiwazaki City in Niigata Prefecture and Tsuruga City in Fukui Prefecture which host nuclear facilities, and Tokyo. The Tokyo workshop compiled the opinions presented at the earlier two workshops.

Kashiwazaki City and Tsuruga City are hosting municipalities of NPPs. The approaches adopted by these municipalities could provide a helpful reference for future discussions on the introduction or discontinuation of nuclear energy facilities in Asia.

The five opinion leaders invited from the US, Finland, and the UK were:

1) From the United States

- A 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.

2) From Finland

- 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.
- A chairperson from the Eurajoki Municipality Council in Finland, which was the first in the world to accept a spent fuel final disposal facility (currently under construction).

3) From the United Kingdom

- A senior lecturer of the Nuclear Futures Institute at Bangor University, which is at the heart of the Menai Science Park in Wales.

- An advisor to governments, who has many years of experience working in the energy sector and strategic economic development issues across the world, and also who has been committed to the people and challenges of Cumbria in the UK.

Before the invitation, the project leader from IEEJ visited the three nations to discuss the major issues in the draft proposals with the invited opinion leaders, so that the workshop participants could focus on those essential issues to better promote nuclear PA. Opinion leaders from the three nations were invited to participate in the three workshops. The workshop participants included energy-related policymakers, local government officials, and researchers from Cambodia, China, the Lao People's Democratic Republic, Malaysia, Mongolia, and Myanmar. These countries are all members of ERIN, an organisation that includes the 10 ASEAN member states plus Australia, China, India, Japan, the Republic of Korea, Mongolia, New Zealand, and the US – 18 countries in all – and is affiliated with ERIA.

a. Workshop in Kashiwazaki

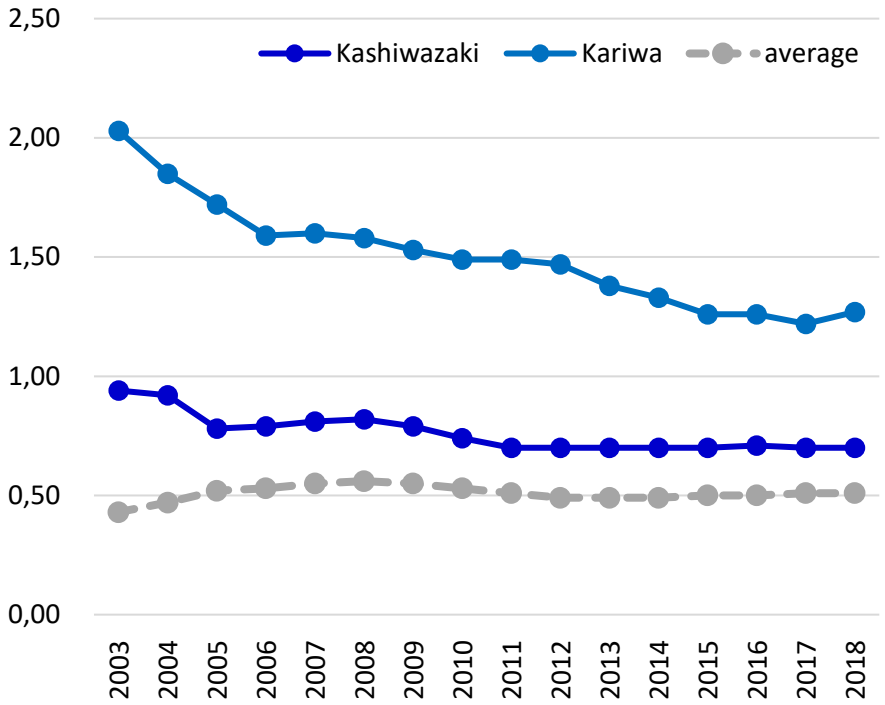
For about 50 years Kashiwazaki City and Kariwa Village in Niigata Prefecture have prospered in tandem with NPPs, which are located in the region. There are seven NPPs in the region of Kashiwazaki City and Kariwa Village. After the accident at Fukushima Daiichi NPP, all plants suspended operation, and Units 6 and 7 of the Kashiwazaki–Kariwa NPP are under safety review for compliance with the new regulatory requirements.

According to literature from Kashiwazaki City, the beginning of the relation between the region and nuclear power goes back to 1967. In that year, the decision was made to conduct a site survey for the location of the NPP, and the Tokyo Electric Power Company Holdings (TEPCO) officially proposed to enter the site 2 years after that. The construction of Unit 1 of the Kashiwazaki–Kariwa NPP started in 1978 and the operation began in 1985. In parallel with the movement of Unit 1, the construction of Units 2 and 5 began in 1983. The construction of Unit 3 started in 1985, and the construction of Units 6 and 7 started in 1991 and 1992, respectively. The operation of these units commenced accordingly as construction progressed, including the latest Unit 7 in 1997. The seven units had operated smoothly at the NPP for about 20 years. In 2002, inappropriate works of TEPCO concerning its self-inspection records were revealed, and

the operation of all units at the Kashiwazaki–Kariwa NPP stopped. Although all the units restarted operation once it was revealed that TEPCO falsified data and did not publish past troubles, the public was losing trust in the operator. Meanwhile, the Niigata Chuetsu-oki earthquake occurred in 2007 and all the units suspended operation. TEPCO installed aseismic reinforcement in the units, and accordingly they restarted operation after 2009. In 2012, after the accident at Fukushima Daiichi NPP, all units stopped operation. Although the review of compliance of Units 6 and 7 with the new regulatory requirements completed in 2017, the operator has not received agreement from the local governor and the operation has not restarted yet.

Kashiwazaki City and Kariwa Village financial indexes are shown in Figure 3.1. (A financial index is an indicator of the financial strength of local governments. If the index exceeds 1.0, the local government has strong financial strength).

Figure 3.1: Kashiwazaki and Kariwa Financial Indexes



Source: Ministry of Internal Affairs and Communications.
https://www.soumu.go.jp/iken/shihyo_ichiran.html (accessed 3 March 2020) (in Japanese).

Whilst their financial status is better than the nationwide average, it has been stagnant since 2011, when the Fukushima Daiichi accident occurred.

The five invited opinion leaders and seven ERIN member participants visited Kashiwazaki City in Niigata Prefecture, which has been hosting NPPs for about 50 years, to participate in a workshop with three local opinion leaders (Figure 3.2).

Figure 3.2: Kashiwazaki Workshop (NPPs hosting municipality)

Source: IEEJ.

The chairperson and two vice chairpersons of the Committee for Securing Transparency of Kashiwazaki–Kariwa Nuclear Power Station participated in the discussion in Kashiwazaki. The committee was formed with the aim of ensuring transparency of the power station and restoring trust in response to the falsification problem of TEPCO in 2002. It is operated based on the policies of not asking about the pros and cons of the nuclear power station itself, not having an authority, and disclosing information in principle. The committee consists of fewer than 25 members, who are recommended by groups and communities that are based in the area and approved by the committee. The central government, prefectural government, municipalities, and the operator also participate as observers and explainers. The committee has been in operation for about 15 years, during which about 200 regular meetings and management board meetings have been held, about 100 magazines have been published, and nine inspections have been carried out. So far, the committee has submitted a total of 17 proposals, written opinions, and requests on troubles in NPPs, national policies concerning nuclear power and energy, nuclear safety regulations and measures, and emergency response plans. It is desirable not to draw a conclusion but rather reflect findings derived from discussions on each role by sending supporting, opposing, and neutral information at the same time, sharing the information with local residents and observers in person, and carrying out calm and objective discussions with mutual respect.

Transparency became a topic in the discussion. Whilst it is considered that various opinions are necessary to ensure transparency, it is difficult to transmit information so that the general public can understand it. They discussed operators having set a position of risk communicator as a way to address this problem.

Trust was another topic discussed. Regulators are not trusted, and scholars are not considered neutral in Japan. One opinion suggested that operators should strive for obtaining the trust of local residents. The national government began to shift its responsibility to operators' shoulders after the Fukushima accident. Another opinion was that this is inconsistent with the fact that nuclear power has been considered a national policy and the government must be responsible for providing proper explanations.

b. Workshop in Tsuruga

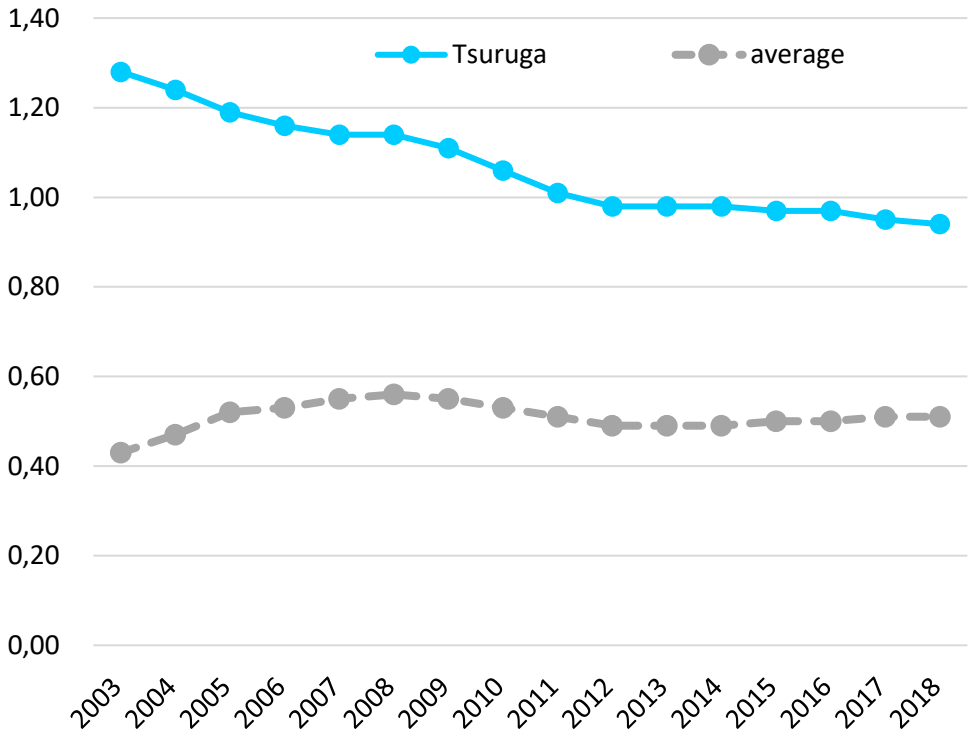
For about 60 years Tsuruga City in Fukui Prefecture has prospered in tandem with NPPs, which are located in the region. At present, Tsuruga City hosts four NPPs. One of them had commenced decommissioning before the accident at Fukushima Daiichi NPP, and the other two after the accident. The remaining Tsuruga nuclear power station Unit 2 is under safety review for compliance with the new regulatory requirements.

According to literature from Tsuruga City, the beginning of the relationship between the region and nuclear power goes back to 1962 when it was decided the location of a new NPP was to be on Tsuruga Peninsula. In 1970, Unit 1 of Tsuruga station started commercial operation. At the same time, in 1968, the land adjacent to Tsuruga station was selected for a candidate construction site of the advanced thermal reactor Fugen. The commencement ceremony was held in the same year as Unit 1 of Tsuruga station started operation. In 1982, the construction of Tsuruga station Unit 2 began and the operation started in 1987. Simultaneously, the construction of the fast breeder prototype reactor Monju started in 1985. Monju reached criticality for the first time in 1994. In 1995, the reactor was shut down due to sodium leakage from the secondary cooling system and had stopped operation for a long period until it commenced again 14 years later in 2010. Fugen discontinued operation in 2003 and decommissioning commenced, whilst the preparation work for the construction of Tsuruga station Units 3 and 4 started in 2004. In 2012, 1 year after the accident at Fukushima Daiichi NPP

occurred, all NPPs in Fukui Prefecture were shut down. The Nuclear Regulation Authority, which was established after the accident, said that the possibility of the crush zone, located right below Unit 2 of Tsuruga station, being an active fault cannot be denied (it had not previously been considered an active fault). Therefore, operation of the NPP in Tsuruga has not yet commenced up to the present day. Unit 1 of Tsuruga station, which had been in operation for over 40 years, stopped operation in 2015 and decommissioning commenced after that. An inspection omission of the facility was found in Monju in 2012 and the regulator recommended changing the operator. In 2016, the government decided to commence the decommissioning of Monju. The establishment of a new research and test reactor in the Monju site is being considered by the government, which will support nuclear power research and human resources development.

The financial index of Tsuruga City is shown in Figure 3.3.

Figure 0-1: Tsuruga Financial Index



Source: Ministry of Internal Affairs and Communications.
https://www.soumu.go.jp/iken/shihyo_ichiran.html (accessed 3 March 2020) (in Japanese).

The financial status of Tsugura City, as in Kashiwazaki–Kariwa, whilst better than the nationwide average, has been stagnant since 2011, when the Fukushima Daiichi accident occurred.

The experts visited Tsuruga City in Fukui Prefecture, which has been hosting NPPs for about 60 years, to attend a workshop with two opinion leaders (Figure 3.4).

Figure 3.4: Tsuruga Workshop (NPPs hosting municipality)

Source: IEEJ.

The Tsuruga City branch head and director of the Fukui Council for Peaceful Nuclear Use participated in the workshop discussions as local opinion leaders. When NPPs were constructed one after another in Fukui Prefecture, a campaign against nuclear power rose during the 1970s. In response, the council was established with about 300 members with the need of cooperation of not only municipalities but private and individual groups to promote people's understanding. The council consists of the headquarters located in Tsuruga and five branches including the Tsuruga Branch. The council aims to gain appropriate knowledge and deep understanding, build comprehensive energy to improve the economy and quality of life, and nurture local patriotism through their activities. It holds study sessions and discussions on the use of nuclear power for peace with operators and scholars, and performs inspections at nuclear-related facilities including NPPs and geological disposal research centres. The council also carries out public relations activities to enhance understanding for appropriate information on nuclear power generation and participates in symposiums in areas where electricity generated in NPPs is consumed. It promotes understanding of nuclear power and radiation throughout Japan, helps communities prevent harmful rumours in areas where NPPs are located, and promotes activities

to enhance young people's understanding of next-generation issues of energy, with the hope that people will eventually respect and appreciate the fact that areas in which NPPs are located support Japan's economy.

The economy of areas where NPPs are located was talked about in the discussions. Whilst NPPs provide an advantage of strengthening the local economy, political decisions are important in installing them (the government loses trust from inconsistency). The necessity of diversifying the source of income and examples of introducing a new industry were explained to prepare for the decommissioning of NPPs which will happen eventually.

The transmission of appropriate knowledge was another topic that was discussed. The use of visitor centres and camps to increase knowledge, and learning lessons from the past failures in communication were mentioned as examples, and some participants pointed out the importance of education for future generations, which will affect future public opinions.

Regarding the Fukushima accident, some foreign participants said there were no casualties from radiation, whilst local opinion leaders responded that saying 'no casualties, it is good' should be avoided, because people have not been able to return to their communities.

In addition, in Tsuruga, the participants toured the Institute of Nuclear Safety System, and Monju NPP owned by the Japan Atomic Energy Agency to give them a greater understanding of the situation in Japan. Participants of the tour grasped the following points:

- As a trend of Japan's public opinions after the accident at the Fukushima Daiichi NPP, negative opinions increased.
- A strong correlation can be seen between the sense of insecurity towards nuclear and the thought in the use of NPPs. On the contrary, the sense of insecurity has decreased over the long term, whilst the use of NPPs in actual numbers has not changed much.
- Research on public opinions implies that they are also affected by individuals' values.

Other knowledge grasped on the tour included measures against coolant leakage at NPPs taken by operators, measures against terrorism such as a plane crash, and the idea of risks during decommissioning procedures.

c.Workshop in Tokyo

The findings of the two workshops in Kashiwazaki and Tsuruga were summarised and led to the draft policy proposals considered at the final workshop in Tokyo (Figure 3.5).

Figure 3.5: Tokyo Workshop

Source: IEEJ.

1) Experiences and cases in the United States

As an opinion leader and expert from the US, the founder of the environmental group that promotes communication concerning nuclear power and environmental preservation participated in the local discussion meeting and the Tokyo workshop. She made comments from the viewpoint of an engineer at Diablo Canyon NPP in California, and of a mother.

Comments of opinion leaders and experts in the US that were heard during the visit in advance and the outline of explanation in the Tokyo workshop are as follows:

- More than 1 billion people in the world still have no access to reliable electricity. There are advantages and disadvantages in different sources of electricity, and it is impossible to solve all problems with a single source. This means that a balanced energy mix is necessary.

Renewable energy, which has a clean image, is considered hopeful. However, in reality, occupied valuable plots of land are needed to install renewable energy facilities. Renewable energy is an intermittent power source, and it requires backup power supplies. Most of the supplies emit carbon dioxide and are covered by thermal power generation that causes air pollution. Nuclear power can save valuable land as the energy density is large. It can generate power without depending on time and wind conditions, with low carbon emissions (Table 3.1: Emissions of Selected Electricity Supply Technologies (gCO2eq/kWh)) and at reasonable cost (Table 3.2: Total Electricity Supply Cost).

- The most difficult issue concerning nuclear power is the low level of support from the public and problems provoked by anxiety. In order to deal with the issue, it is important to promote discussions on the value of nuclear power with many different people and make a shift from anxiety to hope.
- Because of a lot of continuous trouble, the Rancho Seco Nuclear Generating Station in California was decommissioned in 2009. In addition, solar power generation was initiated in a neighbouring larger site. However, electricity was in short supply and power generation had to depend on a natural gas power plant in the vicinity. This is the reality, which is not known to people.
- It is important to diversify advocates who can speak about nuclear power and energy by exchanging opinions with various groups including politicians, social groups, environmental activists, and academia. In the US, only the operators have implemented PA activities of nuclear power for a certain period and various values have not been shared.
- Nuclear power PA depends too much on technical experts. Technical communication makes people feel concerned. Nuclear power PA requires economists and marketing.
- PA should be connected with what people think is important for efficiency. It is also necessary to understand the fears which opposing people feel.
- It is also useful to use various communication channels and employees of NPPs should try to communicate by themselves.
- In the future, it will be important to have communication between various people by sharing availability, low carbon, and high reliability as common values. It is also important not to

use energy policy issues as materials for political ideals.

Table 3.1: Emissions of Selected Electricity Supply Technologies (gCO_2eq/kWh)

Options	Direct emissions	Infrastructure & supply chain emissions	Biogenic CO_2 emissions and albedo effect	Methane emissions	Lifecycle emissions (incl. albedo effect)
	Min/Median/Max	Typical values			Min/Median/Max
Currently Commercially Available Technologies					
Coal—PC	670/760/870	*9.6*	*0*	*47*	**740/820/910**
Gas—Combined Cycle	350/370/490	*1.6*	*0*	*91*	**410/490/650**
Biomass—cofiring	n.a.[ii]	–	–	–	**620/740/890**[iii]
Biomass—dedicated	n.a.[ii]	*210*	*27*	*0*	**130/230/420**[iv]
Geothermal	0	*45*	*0*	*0*	**6.0/38/79**
Hydropower	0	*19*	*0*	*88*	**1.0/24/2200**
Nuclear	0	*18*	*0*	*0*	**3.7/12/110**
Concentrated Solar Power	0	*29*	*0*	*0*	**8.8/27/63**
Solar PV—rooftop	0	*42*	*0*	*0*	**26/41/60**
Solar PV—utility	0	*66*	*0*	*0*	**18/48/180**
Wind onshore	0	*15*	*0*	*0*	**7.0/11/56**
Wind offshore	0	*17*	*0*	*0*	**8.0/12/35**

gCO_2eq/kWh = grams of carbon dioxide equivalent per kilowatt-hour.
Source: Intergovernmental Panel on Climate Change (2014), Annex III Technology-specific Cost and Performance Parameters, Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the IPCC. https://www.ipcc.ch/report/ar5/wg3/ (accessed 26 November 2019).

Table 3.2: Total Electricity Supply Cost

	% of Total Supply	% of Total GA	Total Unit Cost (cents/kWh)
Nuclear	57%	41%	7.7
Hydro	23%	12%	6.2
Gas	8%	14%	18.8
Wind	9%	15%	15.9
Solar	2%	15%	51.3
Bioenergy	1%	2%	23.6

Note: Percentage (%) of total GA excludes CDM costs.
CDM = conservation and demand management, GA = global adjustment, KWh = kilowatt hour.
Source: Ontario Energy Board (2018), *Regulated Price Plan Supply Cost Report.*
https://www.oeb.ca/sites/default/files/RPP-Supply-Cost-Report-20180501-20190430-correction.pdf
(accessed 26 November 2019).

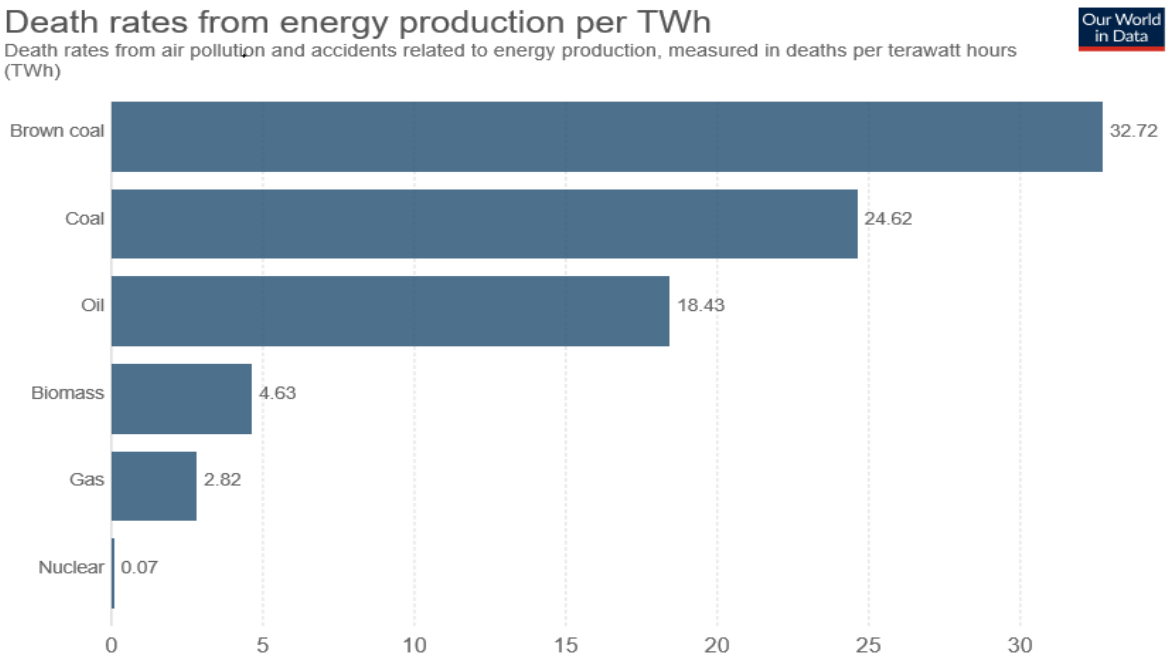
2) Experiences and cases in Finland

Representatives from NPPs and areas of final disposal sites and environmental experts with experience as a European Commission member participated in the local discussion meeting and the Tokyo workshop as opinion leaders and experts from Finland.

An NPP started operation in 1978 and has continued for about 40 years in Olkiluoto, Eurajoki. In the early 2020s, the first final disposal site for spent nuclear fuel in the world will commence operation. The planning of the final disposal site started during the 1980s and investigations were conducted for research and development and site selection. In 1999, local residents supported final disposal and the government agreed with the disposal. In Finland, each municipality has the right to veto. The percentage of supporters was smaller than that of opponents when the planning first started, but surpassed opponents at the time of agreement. The stance of residents has not changed much since.

The support rate for nuclear power in Finland is high, as mentioned in Chapter 1. Most people consider nuclear power dangerous. However, damage from air pollution caused by fossil fuels is obvious. Nuclear power does not pollute the air and the death rate per unit power generation is considerably smaller compared to that of fossil fuels (Figure 3.6). Although the opposition party overstates the impacts of radiation from an accident, the natural radiation dose in Finland is slightly higher than the world's average, and it is self-evident that the radiation level in areas where the evacuation order was lifted after the accident at Fukushima Daiichi NPPs is no problem. Whilst the use of materials per unit power generation is considerable for natural energy, only a little is consumed for nuclear power (Table 3.3) and the amount of disposal is small. Opinion leaders and experts from Finland think from their own experiences that this appropriate information would increase the number of supporters of nuclear power.

Figure 3.6: Fatalities in Energy Production



Source: Markandya, A. and P. Wilkinson (2007), *Our World in Data.* https://ourworldindata.org/grapher/death-rates-from-energy-production-per-twh (accessed 26 November 2019).

Table 3.3: Range of Materials Requirements (fuel excluded) for Various Electricity Generation Technologies

Materials (ton/TWh)	Generator only				Upstream energy collection plus generator			
	Coal	NGCC	Nuclear PWR	Biomass	Hydro	Wind	Solar PV (silicon)	Geothermal HT binary
Aluminum	3	1	0	6	0	35	680	100
Cement	0	0	0	0	0	0	3,700	750
Concrete	870	400	760	760	14,000	8,000	350	1,100
Copper	1	0	3	0	1	23	850	2
Glass	0	0	0	0	0	92	2,700	0
Iron	1	1	5	4	0	120	0	9
Lead	0	0	2	0	0	0	0	0
Plastic	0	0	0	0	0	190	210	0
Silicon	0	0	0	0	0	0	57	0
Steel	310	170	160	310	67	1,800	7,900	3,300

Key: **NGCC** = natural gas combined cycle; **PWR** = pressurized water reactor; **PV** = photovoltaic; **HT** = high temperature

Source: US Department of Energy (2015), *Quadrennial Technology Review 2015.* https://www.energy.gov/quadrennial-technology-review-2015 (accessed 26 November 2019).

The comments of opinion leaders and experts from Finland that were heard during the visit in advance and the outline of the explanation in the Tokyo workshop are as follows.

Chairperson of the Eurajoki Municipality Council:

- NPPs and the final disposal site are located in Olkiluoto. Nuclear power is in an important position for the local community. The population of Eurajoki municipality where Olkiluoto is located is about 10,000. On the contrary, 15,000 people visit the visitor centre annually.
- Nuclear power in Olkiluoto is supported thanks to the good operation and advanced safety culture at the plant, residents being used to and appreciating nuclear power, active and open communication with the operators, and trust for the operators with a policy of unconditional transparency.
- The Green Party and Greenpeace in Finland have an understanding of nuclear power.
- It is not bad that there are opposing opinions. They bring attention to points that people with the same opinions do not notice, and this sometimes leads to improvement.
- A small community is more suitable for summarising an opinion. Not all people have the same opinion, but as people with different opinions gather and discuss things, they deepen mutual understanding.

Member of the steering committee of Innovation for Cool Earth Forum:

- When I was studying in Austria in the 1970s, a national referendum was held concerning the commencement of NPP operation in Austria and it was rejected by a 50 to 47 vote. The opposition movement became active and the Chernobyl accident occurred in 1986, which naturally provoked people's opposing points of view. At that time, men supported nuclear power and women opposed it, and there was a gap between the elderly and young people. After that, I turned to support it, as I realised that the shutdown of nuclear power generation would have led to the increase of power generation through fossil fuels.
- One can hardly talk about nuclear power without discussing identity politics. In other words, if your thoughts do not follow your own ideas, you will lose your identity. However, this is wrong.
- Not using nuclear power might leave various issues for future generations.

- Wind and solar power are not dispatchable power sources and require a vast amount of backup. Not many people know that prices become high because of that. Even experts should review themselves if they know the correct information and publish sufficient information by trying to always learn correct information.
- Energy demand all over the world might increase, but it will never decrease. In addition, we need to reduce global warming gas emissions. In Germany, the amount of CO_2 emissions continues to increase, even though renewable energy is expanding. It is our obligation to own energy sources that can provide a stable supply of low carbon energy.
- Radioactive waste is the common issue to be solved in countries that have commenced nuclear power operation, even if they have stopped it. To solve this issue, it is necessary to develop technologies to reduce waste, and the importance should be acknowledged as common understanding.

3) Experiences and cases in the United Kingdom

A lecturer of the Nuclear Futures Institute of Bangor University in North Wales in the UK (where Trawsfynydd and Wylfa NPPs are located) and a regional development advisor with experience of involvement from the viewpoint of coexistence of the nuclear power industry and the community participated in the local discussion meeting and the Tokyo workshop as opinion leaders and experts.

Wales has its own language and unique local characteristics different from other parts of the UK. Rural fields are spread all over North Wales and other than the energy industry, the country depends on forestry, agriculture, and tourism. The Trawsfynydd NPP commenced power generation in 1965. It stopped power generation in 1990 and is under a decommissioning process. Wylfa NPP started operation in 1971, stopped in 2015, and is under a decommissioning process. On the other hand, the construction of two new NPPs was proposed and was expected to start operation in the mid-2020s. However, the plan has temporarily ceased due to financial problems.

With financial support of the Welsh and British governments, Menai Science Park, an academic research institute, was established for the development of local science technology in the early

2000s. The Nuclear Futures Institute of Bangor University, the central structure of the park, was founded in 2017. It develops nuclear power skills in the NPP site area.

The comments of opinion leaders, experts, and their colleagues in the UK which were heard during the visit in advance and the outline of explanations at the Tokyo workshop are as follows.

Senior lecturer of the Nuclear Futures Institute at Bangor University:

- When the Trawsfynydd NPP was constructed, there was no prior consultation and people were mentally affected. On the contrary, it was a good example that the plant communicated with local residents when it commenced decommissioning. It was originally managed by the national government but later privatised, which reduced people's feeling of distrust.
- The Wylfa NPP had a few accidents and had suffered from exaggerated media reports. PA improved after a visitor centre was established but it closed after the September 11 attacks.
- It is important to share the advantages with the community, not to surprise people, to publish information in an understandable manner, and to ensure transparency by letting employees from the NPP talk.
- The Menai Science Park was created to promote regional development and human resources development as the outlook for the nuclear power industry in the UK worsened. The park carries out scientific and technological research in various fields and it is open to the community. Families with children often visit. The commercial and research facilities are 'part of the environment' and the park blends well with the natural surroundings. Many young people are learning science and technology after growing up in the area. In the long term, the park will contribute considerably to human resources development in the UK's science and technology fields.
- The views of society towards nuclear power facilities have significantly changed from a few decades ago. They started to change during the 1990s, and independent community groups started to do activities locally, which observe activities of operators, sometimes represent residents' opinions, and speak to operators and the regulation authority. Neutral people with knowledge and experience and legal experts participate in these groups. People trust

them as they see business activities from a viewpoint different from operators. Operators are not trusted whatever they say.

- The keyword to gain trust is independent. Because we act spontaneously and are not told what to do by anyone else, we could gain continued trust.
- Conditions for local success are consistent policies, being accepted by the community, leadership in the community, and active personnel from the private sector. The benefits of the general public include having access to a highly-reliable and low-cost power supply through nuclear power and employment. To the contrary, there are some risks. Employment expansion can be expected through the spinout of the nuclear power industry to other industries such as robotics and medicine. It is necessary to consider how information is transmitted with consideration of factors affecting public awareness.

Advisor to governments:

- Energy is a means, not a purpose. Examples of purposes to be realised are jobs, wealth, health, and the environment.
- For nuclear power and the regulation authority to be trusted, it is important that people recognise that they are created by people, not by the government.
- Using a third party like Brian Cox, a renowned English physicist and pop star, is necessary to deliver messages to people.
- Nuclear power requires policies beyond political difference and consistent policies even when the government changes.
- Education, research, and development are carried out at the science park built near the NPP in the UK. Cooperation with small and medium-sized enterprises and innovation have been in progress.
- The key to the future use of nuclear power is international. No country can solve nuclear power and energy issues alone. Nuclear power can be linked to international development of businesses other than the nuclear power industry by deepening cooperation with other countries in the field.

4) Experiences and cases in Japan

An expert from a community group independent from the government participated in the Tokyo workshop. The expert is one of the members that established a committee between those with supporting, neutral, and opposing opinions after the Fukushima accident based on experiences of being involved in PA activities of nuclear power, and has been engaged in activities in Kashiwazaki where nuclear power is located as well as the energy plan by the government. The following discussion is the introduction of this meeting by the expert.

Members of this committee include environmental groups and universities as well as members of peace and sports groups. It was held as a place for people with various positions and ideas including supporting and opposing opinions to discuss and have conversations without reaching a conclusion about future energy such as nuclear power and renewable energy. Meetings were held in Tokyo and in rural areas including those where NPPs are located and the surrounding areas and some meetings were held specifically for young people. The community expert's own organisation organised meetings specifically for young people and for women, inviting those related to the government as observers and explainers. Kashiwazaki City where NPPs are located became interested in holding such a meeting, and a symposium was held in Kashiwazaki with experts, public figures, and business persons who are interested in and taking measures against energy issues. These activities in Kashiwazaki later led to regional revitalisation.

Based on the experiences from these activities, the expert said that they had recognised the necessity of the acceptance of the public in social decision making, and since then, they have been trying to create shared opportunities by holding unofficial discussions based on the Chatham House Rule between the government and non-governmental organisations.

The outline of explanations given by the expert is as follows:

- Many of the participants in government meetings on the energy mix are over 60 years old, and less than 20% of them are women. For that reason, we held meetings for mainly young people and women only.
- Discussion is avoided in Japanese culture. Opinions are considered the speaker's personality and when an opinion is denied people feel that their personality is denied.
- Communication concerning nuclear power issues became difficult due to the strong

connection with the vested interests of operators, a rising sense of doubt towards policies without the presence of the general public, unclear seriousness of the government, and doubt about technical belief.

- Although we recommended the government assign a person in charge of communication, it was not accepted. Things never go smoothly when they try to communicate only in an emergency. It is important to have an ongoing relationship.

5) Discussion

Based on the meetings held in Kashiwazaki and Tsuruga, the following points were discussed in the Tokyo workshop:

- There was a question about how to transmit information on the risk of nuclear power. The 'fear' of risk affects people mentally, and technical methods of nuclear power alone have no effect on mental problems. Therefore, a method should be found to understand risk by comparison and consider its economic impact.
- There was a question about who should be involved in nuclear power discussions other than engineers. For example, appropriate groups could be people in the arts fields, visual artists, literary scholars, and pop stars who do not have biased views.
- Opinions of the public are significantly affected by third parties. Therefore, third parties should talk about what will be lost if nuclear power is not chosen. They need to use simple words to describe awareness of the problems with comparisons.
- Using unofficial opportunities including dinner and drinking parties, providing information that people want to know are methods to develop good communication with opponents and young people. Using social networking platforms for young people is important.
- The science park has been successful in inviting companies that are not related to nuclear power. This is because of its policy of business expansion in cooperation with research and development of the university. A specific activity example of the science park in Wales is to use the surrounding forest resources and combine woods with radiation exposure.

Participants from the ERIA countries pointed out that raising people's consciousness, improving the knowledge level of both the government and people including technical knowledge, and active building of relationships with local people are considered important.

d.Communication with media

A press conference was held after each workshop (Figure 3.7).

Figure 3.7: Press Conference after Kashiwazaki Workshop

Source: IEEJ.

For nuclear power PA, it is important that the media is proactively involved in order to transmit information to the people. In the press conferences, the following opinions were exchanged:

- There was a question about why the Eurajoki municipality in Finland accepted the construction of the final disposal site. They explained that the strong will of the municipality for acceptance, the location of the NPP, and economic reasons led to the acceptance, but it does not always mean there are many benefits.
- For the question about the efforts of operators in communicating with local residents, they explained that there was good communications between the municipality and operators in Eurajoki from the beginning. Information is disclosed in an abnormal situation and operators hold public hearings to communicate with local residents.

- To the question about the relationship between supporters and opponents in Western countries, the answer was that many of the opponents are not locally based and active discussions take place on social media.
- There was a question about the education of young people. They explained that education on how to understand information collected from social networking was provided, and they thought it was important to nurture people who can judge things properly.
- There was a question about the relationship between mothers' consciousness of protecting children and nuclear power. They explained that many mothers are beginning to understand the value of nuclear power by knowing the risk of not using nuclear power.
- The answer to the question about whether nuclear power should be promoted or withdrawn in the future was that it is important to keep a balanced energy mix based on the situation of each country.

e. Draft policy proposals

Draft policy proposals at the Tokyo workshop are introduced below; these draft policy proposals are the starting points to the policy proposals that IEEJ introduces in Chapter 4 of this report:

- Independent groups are crucial to get reliance from local residents. People do not believe what the operators say. The independent groups consist of various kinds of experts, such as academia, members of parliament, professors, and so on.
- The international nature of the nuclear industry is important. Partnerships and technologies in nuclear power can and do lead to business opportunities outside own country and indeed outside nuclear power for economic diversification. That is a factor often neglected in looking at the pluses and minuses of the nuclear industry.
- Sharing the common discussion base with various groups, such as political groups, social groups, environmental groups, academic groups, and so on, is important. It could build a diverse base of advocates to help deliver pro-nuclear messages, and could build public trust.
- Do not let political manoeuvres derail energy policy.

- Continue to develop advanced technologies to solve the problem of waste and radioactivity, because the radioactive waste should be reduced even when phasing out nuclear power.
- Learning facts with actual data is the first thing to start discussions of energy use, growing energy demand, radioactivity levels, and so on.
- Having different opinions is acceptable if they can produce different views or solutions. It is easier to get acceptance from a small community because of smooth communication.
- It is recommended that the assignment of a person in charge of communication for an ongoing relationship.

Rather than using a lecture format, these workshops were structured so that people going through similar experiences or those who may require PA in the future could jointly deliberate policy proposals for nuclear PA.

Whilst local opinion leaders have spoken about their experiences on PA of nuclear power at many workshops and international symposiums, the workshops held in Japan were unique in that they involved researchers from Asian countries as well. By listening directly to discussions between opinion leaders in countries that have introduced nuclear power, such as Europe, the US, and Japan, policy researchers and advisers from the East Asia Summit countries were able to grasp the issues of nuclear power facilities.

Chapter 4

Policy Proposal

How can we improve stakeholder involvement on nuclear energy? This chapter makes several recommendations and defines stakeholders and coexistence and co-development with surrounding communities.

1. Analysis

Based on chapters 2 and 3, issues of PA, common and/or different points of recognition between the explainer and the recipient have been specified, and some common conditions for a successful PA undertaking are analysed below.

1) Issues of PA

The US pointed out *anxiety* as an issue for PA. In that background, it is thought to be a temporary decline in public support for nuclear power following the accident at the NPP, which has occurred in a public opinion survey.

Finland pointed out the *misunderstanding* that renewable energy can solve everything. The background is thought to have suspended construction plans of NPPs due to the past accident at the NPP, even though it could be a means to comply with the greenhouse gas emissions reduction target.

The UK pointed out *overreaction* to accidents and to risks. The background is thought to be the fact that it has been difficult to cope with the overreaction of the media when several accidents occurred in the history, which has accumulated since the early days of nuclear power generation.

Japan pointed out that *difficulty in communicating* is an issue. The background is thought to be the difficulty in restoring trust after the accident at the NPP due to the lack of discussion and identity politics.

The definition of PA is ‘a certain concrete measure is clearly or tacitly supported by members of the public who may be affected, positively or negatively, by its implementation’ as mentioned in Chapter 2. Considering this definition together with the issues pointed out by each country, there could be some findings. Misunderstanding hinders the correct communication of positive effects and anxiety hinders that of negative effects. An overreaction could be the cause of losing clear or tacit support. The difficulty in communicating suggests that once they lose the support, identity politics would occur from misunderstanding and anxiety. The identity politics would seriously divide the society and prevent discussions, which leads to a total loss of penetration of PA.

2) Common and/or different points of recognition between explainer and recipient

To overcome the above issues, it is important to consider how to make a positive effect on public awareness through communication.

The US suggested some common recognition that both the explainer and the recipient tend to have, which are common values that people would naturally desire such as availability, low carbon, and high reliability. The background is thought to be the fact that after the electricity crisis occurred in some US states in the past, many people recognised the need for a stable supply of electricity. On the other hand, the US also suggested that activities conducted solely by business operators hindered the sharing of common values, and that exclusively technical communication made people feel concerned, based on their own experiences.

Finland mentioned *values for the region cultivated through long history*. The background is thought to be the accumulation of good relations between the region and nuclear power, from the initial introduction of nuclear power to the present, including the acceptance of the world's first final disposal facility.

The UK suggested the *stance of the government and businesses* as seen as a positive feeling amongst people with prior consultation, and negative feelings without that. They also suggested that differences in recognition are unlikely to arise when they involve a trusted third party into their dialogue. The background is thought to be the hard experience of overcoming the antagonism of people that was caused when they had introduced NPPs without preliminary consultation.

On the other hand, as for differences in recognition that tend to arise between the explainer and the recipient, the US suggested the *degree of fear that people perceive*. This might be the same factor as anxiety that was mentioned above as an PA issue.

From Finland and Japan, it is pointed out that differences in recognition arise depending on the attributes of the recipients such as gender, age, and whether they attach importance to the life of future generations. It is also pointed out that the more identity politics they have, the more they cannot bridge the gap of recognition. These are also attributable to the PA issues of anxiety and misunderstanding that depend on the attributes of a recipient, and these are also factors that cause the difficulty in communicating effectively.

The UK pointed out that society's view on nuclear power can be improved by *accumulation of experiences through long history*. This is related to Finland's suggestion *values for the region cultivated through long history* as the positive aspect. In other words, if they do not have a long history, or if it is a long series of bad cases, the recognition of its value would be changed seriously.

The following is a summary of the discussion above. In order to improve PA, common values that people would desire such as availability, low carbon, and high reliability should be nurtured. This is considered a positive aspect amongst common points of recognition that are likely to occur from the good stance of the government and the operators and interaction with a third party with no misunderstanding. In addition, it is desirable to conduct appropriate communication considering various elements such as gender difference and age difference in relation to anxiety, namely a feeling of fear where differences in recognition tend to occur.

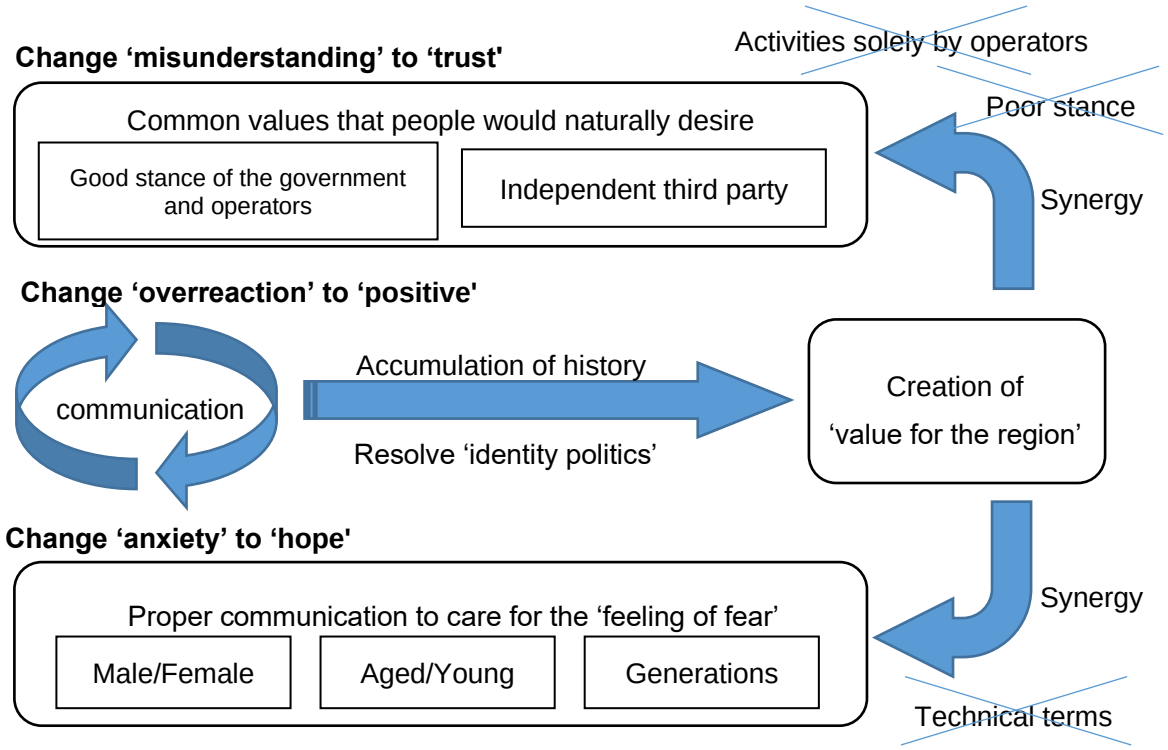
The accumulation of such experiences would lead to the resolution of the identity politics caused by anxiety and misunderstanding that bring about the difficulty in communicating, would reduce cases where support is lost due to overreaction, and eventually will create values for the region cultivated through long history. If the differences on the negative aspects are resolved and a common recognition on the positive aspects is constructed, the synergistic effect of PA improvement is expected.

On the other hand, the poor stance of the government and the operators, activities conducted solely by business operators, and technical communication can create a common recognition of

the negative aspects. It is desirable to learn from these failures in the past of knowledge transfer to grow the positive aspects paradoxically.

Such findings can be illustrated as follows (Figure 4.1).

Figure4.1: Process for Improvement of Nuclear Public Acceptance



Source: IEEJ.

By continuing such interaction as illustrated in Figure 4.1, it can be expected to realise the situation in which PA is obtained – in other words, in which the number of those who support nuclear power exceed those who do not.

3) Common conditions for a successful PA undertaking

This section summarises the common conditions for successful PA acquisition through the interaction illustrated in the previous section. The conditions focused here are the ones

mentioned in the workshop. This section summarises the conditions in accordance with some categories: trust, transparency, transmission of appropriate knowledge, and the economy of the host area. These are key topics which were discussed in the workshops in Kashiwazaki and Tsuruga. Since the transmission of appropriate knowledge is realised by mutual communication and transparency is a key factor to make communication effective, these two are grouped together. There are three categories: trust, communication and transparency, and economic efficiency.

Trust

In the first place, a relationship of trust between stakeholders will significantly affect the difficulty of obtaining PA. To make the situation where trust has been obtained from the beginning, a government's policy decisions are considered to be the most important factor. If the government changes its decisions too frequently, it will not be able to build a relationship of trust. The first step in improving PA will be *to announce consistent policies* and to clearly explain their commitment to achieving them.

In addition, it is important to make sure that the operators who will carry out the projects in accordance with the government's policy gain the confidence, not distrust, of the stakeholders. The operators are required to not only provide information that is convenient for them, but also *to be honest with people about disclosing the information they are looking for*, even if it is inconvenient. For example, when nuclear power is introduced, radioactive waste is always accumulated, and how to deal with it becomes an unavoidable issue. It is necessary to inform this fact well in advance. Such attitudes are necessary not only for operators but also for the government that implements its policy and that should show its seriousness.

These are the conditions for the good attitude of the government and operators, and it leads to *being trusted by people*.

Even if the government and operators, who are responsible for the policy and its implementation, engage in activities to improve PA with the proper attitude described above, they may not be able to obtain PA and could lose their credibility if they communicate inappropriately. The following are conditions to avoid this and to obtain more trust.

Communication and transparency

As mentioned in section 2, *an independent third party* should be involved in the communication, and the third party should consist of people from various backgrounds. The discussion in the workshop mentioned some examples: artists, writers, and pop stars. It is desirable not to make closed discussions amongst limited experts only, but to involve such people and derive their contribution.

It has also been discussed in section 2 that it is important not to trigger misunderstanding and cause anxiety. To this end, it is crucial to share and confirm undeniable facts about topics in which everyone is interested. *Sharing undeniable facts about climate change, energy security, economic issues that are related to the benefit of the community, and so on*, they could eventually reach common values with many people in their conclusion even if there should be some conflicts in the process of communication.

Undeniable facts are often proved by technical logic in which safety and risks are evaluated quantitatively or qualitatively. However, discussions about safety and risks are likely to make people anxious that such risks would happen to them. This is a mental issue, and the workshop mentioned that technical explanations would not solve mental issues. Therefore, *it is not desirable to use technical terms when safety and risks are explained*. Instead, they are required to make some efforts in communication such as citing the relationship between a risk in everyday life and economic efficiency that has already been understood and accepted by everyone and encouraging people to make a comparison with nuclear risks. The workshop noted that they need to relativise the risks, consider the economic aspects, and explain the comparison using simple words.

Certainly, such efforts are a consideration for the mental issues, but someone might suspect that the speaker is trying to avoid a concrete and technical explanation. Therefore, the credibility of the speaker is a key element that influences successful communication. Long and continuous engagement is important to form credibility, and so *the government or operators*, those who want to promote discussions with the people, *are required to appoint communication experts. The experts should stay in the same position for a long term*.

Even in discussions based on the undeniable facts, they may not be able to reach an agreement due to misunderstanding, anxiety, or identity politics. Such disagreement tends to be regarded

as an obstacle to forming a common opinion, but it brings attention to the point that people with the same opinion do not notice. Such opportunities lead to a clarification of the misunderstanding and anxiety and the consideration of how to deal with them. Therefore, communications should encourage different opinions and *respect various opinions from different people*. In the workshop, one of the foreign opinion leaders said that there were no casualties from radiation following the Fukushima accident. Local opinion leaders responded that saying 'no casualties, it is good' should be avoided, because people are unable to return to their communities. Certainly, judging from the quantified risk from the viewpoint of radiology, it is unlikely that the Fukushima accident brought definitive effects on human health. But it is also true that fears of radiation have resulted in negative consequences in people's lives and activities. Unless anxiety is wiped away, a negative effect that outweighs the radiological risk will arise when an accident happens. What was pointed out in the workshop indicates that it is needed to wipe away the anxiety through PA activities to avoid such serious effects.

It is up to the recipients to determine whether PA has been obtained for the relevant policy as a result of the communication process. Policies are proposed for the people, but their intentions would not be transmitted if they are submitted without any prior discussion. Even if there is a suggested policy, it is desirable that the value of the policy is shared and the policy is perceived as being created by the people. If so, in the actual implementation of the policy, the willingness of local people involved in the policy should be considered. *It is desirable that residents can participate in decision making and have the right to refuse the policy implementation if necessary*. Leadership in the local communities is highly anticipated when concluding opinions. In the workshop, there was a case study that a small community is suitable as a unit to summarise opinions, which can be one of the conditions. Using various communication channels, including visitor centres and camps to increase knowledge, it is necessary to provide sufficient information to not only the current generation but also to future generations, and to actively and openly communicate with each community. Direct participation and explanations from the employees of the operators could be one effective way of ensuring transparency in the communication channels.

These are some conditions for overcoming the difficulty of communication. There are also some conditions to further improve the acquired PA through past experiences.

Even if a policy is successfully implemented by acquiring PA, if the subsequent response is not appropriate, the relationship of trust with the region where the policy is implemented will be damaged, and one day local PA could be lost. If PA is lost, it would be difficult to continue with the policy implementation. The following are the conditions for avoiding that, but rather for gaining more trust.

Economic development

Implementing a policy with PA will realise its value for the people, especially for the people in the region where they are implemented. For the region, starting from that value, it is desirable to develop the region further, grow human resources, and bring up and expand various values in a sustainable way by mobilising the dynamic private sector and without depending merely on one value. In the workshop discussion, business expansion linked to university research and development was cited as an example. It is expected that *there will be links to other areas of business that can expand in the region, without depending only on those projects implemented by the policy*. In addition, if the implemented policies can solve national and international issues, it is achievable to increase regional sustainability by deepening cooperation with the nation, the world and the regions where the policies are implemented.

These are the conditions for enriching the value for the region, which will lead to the continuation of policy implementation.

By continuing the communications summarised in section 2 following the conditions described above, local residents will become accustomed to the implemented policy, and the facilities installed, along with the implementation of the policy will become ordinal, therefore it penetrates the region. In the process, good operation of the facilities and a high level of safety culture are essential. If it is lost and an accident occurs, it will frighten people, trigger misunderstanding and anxiety that have been wiped out until then, and the credibility that has been gained will be damaged. If the anxiety is not well dissolved by PA activities, the impact will be even greater. This is the method of communication for PA acquisition based on the lessons learned from past cases of PA activities including failed ones, and it is considered that this method would be one condition for maintaining the good status.

Policy proposals

Based on the workshops and analysis, the following policy proposals were compiled. These proposals are the common conditions for successfully gaining PA mentioned and italicised in the previous section.

1) Matters on trust

- The government should announce a consistent national energy policy.
- The government and the operators should disclose information required by people in an honest manner.
- Information shall be sent by trusted bodies.

2) Matters on communication and transparency

- Independent third parties should be involved in the communication.
- It is important to share facts about climate change, energy security, and related economic issues for the benefit of the community.
- Technical terms should not be used in the explanation of safety and risks.
- The government and the operators should appoint communication experts who stay in the same position for the long term.
- The government and the operators should respect various opinions from different people.
- Residents should be involved in decision making and have the right to refuse the policy implementation if necessary.

3) Matters on economic development

- There should be links between business opportunities of nuclear power and other sectors so that various kinds of business can expand in the region.

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Appendix

Itinerary for the Public Acceptance Week for Nuclear Energy FY 2019

Workshop on 'Living in the hosting municipality of nuclear facilities – with opinion leaders from foreign countries and Japan'

Date: 11 November 2019

Venue: Kashiwazaki City Hall for Industry and Culture, Kashiwazaki City, Niigata Prefecture, Japan

Language: Japanese/English (with simultaneous interpretation)

Timetable

12:30	Doors open and Registration
13:00-13:10	Opening Remarks: Dr Anbumozhi Venkatachalam, Senior Energy Economist, Energy Unit, Research Department, ERIA
13:10-13:20	Opening Address: Kashiwazaki City and Kariwa Village
Session 1: Relationship with nuclear power plants in Kashiwazaki City and Kariwa Village: 50 years of history (Moderator: Ms. Tomoko Murakami, IEEJ)	
13:20-14:40	Mr Yasuyoshi Kuwabara (Committee for Securing Transparency of Kashiwazaki–Kariwa Nuclear Power Station)
	Mr Yasuo Ishizaka (Committee for Securing Transparency of Kashiwazaki–Kariwa Nuclear Power Station)
	Ms Chie Takakuwa (Committee for Securing Transparency of Kashiwazaki–Kariwa Nuclear Power Station)
	Discussion
14:40-14:50	Break
Session 2: Efforts of respective countries in the hosting municipality of nuclear facilities: life, employment, industry, and residents' thoughts (Moderator: Ms. Tomoko Murakami, IEEJ)	

14:50-15:20	Dr Eija-Riitta Korhola, Mr Vesa Jalonen (Finland) Ms Kristin Zaitz (US) Dr Michael Rushton, Prof. John Fyfe (UK) Discussion
Session 3: Policy Proposals (Moderator: Ms. Tomoko Murakami, IEEJ)	
15:20-15:30	Wrap-up of proposals
15:30-15:40	Closing Address: Prof. Masakazu Toyoda, President and CEO, IEEJ

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

Workshop on 'Living in the hosting municipality of nuclear facilities – with opinion leaders from foreign countries and Japan'

Date: 14 November 2019

Venue: New Sunpia Tsuruga, Tsuruga City, Fukui Prefecture, Japan

Language: Japanese/English (with simultaneous interpretation)

Timetable

12:30	Doors open and Registration
13:00-13:10	Opening Remarks: Dr Anbumozhi Venkatachalam, Senior Energy Economist, Energy Unit, Research Department, ERIA
13:10-13:20	Opening Address: Tsuruga City
Session 1: Relationship with nuclear power plants in Tsuruga City: 60 years of history (Moderator: Ms Tomoko Murakami, IEEJ)	
13:20-14:20	Mr Takatoshi Takeuchi (Fukui Council for Nuclear Peaceful Use)
	Ms Mitsuko Hirayama ((Fukui Council for Nuclear Peaceful Use)
	Discussion
14:20-14:30	Break
Session 2: Efforts of respective countries in the hosting municipality of nuclear facilities: life, employment, industry, and residents' thoughts	

(Moderator: Ms Tomoko Murakami, IEEJ)	
14:30-15:10	Dr Eija-Riitta Korhola, Mr Vesa Jalonen (Finland) Ms Kristin Zaitz (US) Dr Michael Rushton, Prof. John Fyfe (UK) Discussion
Session 3: Policy Proposals (Moderator: Ms Tomoko Murakami, IEEJ)	
15:10-15:20	Wrap-up of proposals
15:20-15:30	Closing Address: Prof. Masakazu Toyoda, President and CEO, IEEJ

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Workshop and wrap-up meeting on 'How to improve PA for nuclear energy in referring to the experience in the respective countries'

Date: 15 November 2019

Venue: Hotel Grand Nikko Tokyo Daiba, Tokyo, Japan

Language:Japanese/English (with simultaneous interpretation)

Timetable

08:30	Doors open and Registration
09:00-09:10	Opening Address: Dr Anbumozhi Venkatachalam, Senior Energy Economist, Energy Unit, Research Department, ERIA
09:10-09:20	Welcome Address: Ministry of Economy, Trade and Industry in Japan
Session 1: Why nuclear power is important, significance and acceptance of nuclear power, and residents' thoughts (Moderator: Ms Tomoko Murakami, IEEJ)	
09:20-09:30	Introduction: Introduce speakers by moderator
09:30-10:00	Ms Kristin Zaitz (US)
10:00-10:30	Dr Michael Rushton (UK)
10:30-10:50	Coffee Break

10:50-11:00	Introduction: Introduce speakers by moderator
11:00-11:30	Mr Vesa Jalonen (Finland)
11:30-12:00	Report result of workshops at Kashiwazaki and Tsuruga
12:00-13:20	Lunch Break
Session 2: How do we gain trust?; stakeholder involvement, dialogue with stakeholder (Moderator: Ms Tomoko Murakami, IEEJ)	
13:20-13:30	Introduction: Introduce speakers by moderator
13:30-14:00	Dr Eija-Riitta Korhola (Finland)
14:00-14:30	Prof. John Fyfe (UK)
14:30-14:50	Coffee Break
Session 3: Communication about nuclear power (Moderator: Ms Tomoko Murakami, IEEJ)	
14:50-15:00	Introduction: Introduce speakers by moderator
15:00-15:20	Ms Junko Edahiro (Japan)
Session 4: Policy Proposals (Moderator: Ms Tomoko Murakami, IEEJ)	
15:20-15:30	Report proposals of workshops 2017 and 2018
15:30-16:30	Free discussion, wrap-up of proposals
16:30-16:40	Closing Address: Prof. Masakazu Toyoda, President and CEO, IEEJ

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