# Chapter 1

# Public View of Nuclear Energy Today

December 2019

**This chapter should be cited as**

ERIA (2019), 'Public View of Nuclear Energy Today', in Murakami, O. and V. Anbumozhi (eds.), *Public Acceptance of Nuclear Power Plants in Hosting Communities: A Multilevel System Analysis.* ERIA Research Project Report FY2018 no.18, Jakarta: ERIA, pp.1-27.

# Chapter 1
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Today it is getting harder to site or operate a nuclear facility without gaining 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. There are also cases where a power station was ordered to stop operations, based on a judicial decision, even though it passed examination by a regulatory authority, like Takahama Units 3 and 4 and Ikata Unit 3.

**Table 1.1. Current Status of Nuclear Power Plants in Japan**

| | Plant Name | Reactor Type | Output MWe | Commercial Operation | Age | Current Status | Review on Conformity to the New Regulatory Requirements | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Application by operator | Official approval by NRA | Restart of commercial operation |
| JAPC | TOKAI-2 | BWR | 1100 | 1978 | 40 | Outage (2011.03.11～) | 2014.05.20 | 2018.09.26 | |
| | TSURUGA-2 | PWR | 1160 | 1987 | 32 | Outage (2011.05.07～) | 2015.11.05 | | |
| Hokkaido EPC | TOMARI-1 | PWR | 579 | 1989 | 29 | Outage (2011.04.22～) | 2013.07.08 | | |
| | TOMARI-2 | PWR | 579 | 1991 | 28 | Outage (2011.08.26～) | 2013.07.08 | | |
| | TOMARI-3 | PWR | 912 | 2009 | 9 | Outage (2012.05.05～) | 2013.07.08 | | |
| Tohoku EPC | ONAGAWA-2 | BWR | 825 | 1995 | 23 | Outage (2010.11.06～) | 2013.12.27 | | |
| | ONAGAWA-3 | BWR | 825 | 2002 | 17 | Outage (2011.03.11～) | | | |
| | HIGASHIDORI-1 | BWR | 1100 | 2005 | 13 | Outage (2011.02.06～) | 2014.06.10 | | |
| TEPCO | FUKUSHIMA Daini-1 | BWR | 1100 | 1982 | 37 | Outage (2011.03.11～) | | | |
| | FUKUSHIMA Daini-2 | BWR | 1100 | 1984 | 35 | Outage (2011.03.11～) | | | |
| | FUKUSHIMA Daini-3 | BWR | 1100 | 1985 | 33 | Outage (2011.03.11～) | | | |
| | FUKUSHIMA Daini-4 | BWR | 1100 | 1987 | 31 | Outage (2011.03.11～) | | | |
| | KASHIWAZAKI KARIWA-1 | BWR | 1100 | 1985 | 33 | Outage (2011.08.06～) | | | |
| | KASHIWAZAKI KARIWA-2 | BWR | 1100 | 1990 | 28 | Outage (2007.07.05～) | | | |
| | KASHIWAZAKI KARIWA-3 | BWR | 1100 | 1993 | 25 | Outage (2007.07.16～) | | | |
| | KASHIWAZAKI KARIWA-4 | BWR | 1100 | 1994 | 24 | Outage (2007.07.16～) | | | |
| | KASHIWAZAKI KARIWA-5 | BWR | 1100 | 1990 | 29 | Outage (2012.01.25～) | | | |
| | KASHIWAZAKI KARIWA-6 | ABWR | 1356 | 1996 | 22 | Outage (2012.03.26～) | 2013.09.27 | 2017.12.27 | |
| | KASHIWAZAKI KARIWA-7 | ABWR | 1356 | 1997 | 21 | Outage (2011.08.23～) | 2013.09.27 | 2017.12.27 | |
| Chubu EPC | HAMAOKA-3 | BWR | 1100 | 1987 | 31 | Outage (2010.11.29～) | 2015.06.16 | | |
| | HAMAOKA-4 | BWR | 1137 | 1993 | 25 | Outage (2011.05.13～) | 2014.02.14 | | |
| | HAMAOKA-5 | ABWR | 1380 | 2005 | 14 | Outage (2011.05.14～) | | | |
| Hokuriku EPC | SHIKA-1 | BWR | 540 | 1993 | 25 | Outage (2011.03.01～) | | | |
| | SHIKA-2 | ABWR | 1358 | 2006 | 13 | Outage (2011.03.11～) | 2014.08.12 | | |
| Kansai EPC | MIHAMA-3 | PWR | 826 | 1976 | 42 | Outage (2011.05.14～) | 2015.03.17 | 2016.10.05 | |
| | TAKAHAMA-1 | PWR | 826 | 1974 | 44 | Outage (2011.01.10～) | 2015.03.17 | 2016.04.20 | |
| | TAKAHAMA-2 | PWR | 826 | 1975 | 43 | Outage (2011.11.25～) | 2015.03.17 | 2016.04.20 | |
| | TAKAHAMA-3 | PWR | 870 | 1985 | 34 | Operable | 2013.07.08 | 2015.02.12 | 2016.02.26 |
| | TAKAHAMA-4 | PWR | 870 | 1985 | 34 | Operable | 2013.07.08 | 2015.02.12 | 2017.06.16 |
| | OHI-3 | PWR | 1180 | 1991 | 27 | Operable | 2013.07.08 | 2017.05.24 | 2018.04.10 |
| | OHI-4 | PWR | 1180 | 1993 | 26 | Outage (2013.09.15～) | 2013.07.08 | 2017.05.24 | 2018.06.05 |
| Chugoku EPC | SHIMANE-2 | BWR | 820 | 1989 | 30 | Outage (2012.01.27～) | 2013.12.25 | | |
| Shikoku EPC | IKATA-3 | PWR | 890 | 1994 | 24 | Operable | 2013.07.08 | 2015.07.15 | 2016.09.07 |
| | GENKAI-3 | PWR | 1180 | 1994 | 25 | Outage (2010.12.11～) | 2013.07.12 | 2017.01.18 | 2018.05.16 |
| | GENKAI-4 | PWR | 1180 | 1997 | 21 | Outage (2011.12.25～) | 2013.07.12 | 2017.01.18 | 2018.07.19 |
| | SENDAI-1 | PWR | 890 | 1984 | 34 | Operable | 2013.07.08 | 2014.09.10 | 2015.09.10 |
| | SENDAI-2 | PWR | 890 | 1985 | 33 | Operable | 2013.07.08 | 2014.09.10 | 2015.11.17 |
| Total | 37 units | | 37,483 | | | | 25 units | 15 units | 9 units |

Source: JAIF (2019), Current status of Nuclear Power Plant in Japan, https://www.jaif.or.jp/cms_admin/wpcontent/uploads/2019/06/jp-npps-operation190606_en.pdf (accessed 6 June 2019).

In this study, each country's awareness of nuclear power, and experiences and measures for building a consensus will be researched to contribute to the improvement of 'social acceptance of nuclear power', and how society should accept nuclear power, and to propose a policy.

## 1. Opinion Research in Japan

Before the nuclear accident at the Fukushima Daiichi nuclear power plant in 2011 (hereafter referred to as the 'Fukushima accident'), 54 nuclear power plants were in operation in Japan, accounting for about 30% of power generation, but these nuclear power plants were suspended one after another according to the intention of the chairman of the Nuclear Regulation Authority set up in the wake of the Fukushima accident. Although plants ascertained to be safe by regulatory criteria newly laid down have been restarted since 2015, the number of plants operating as of the end of May 2019 is nine, with 16 plants still under review or preparing for a restart. Following the Fukushima accident, permanent shutdown was decided at 17 nuclear power plants (including Genkai 2 and 1F1-6) and was being considered at four plants (Fukushima Daini Units 1–4). Eight plants have not made clear their policies. Nuclear power plants generated 3% of power generated in 2017 but the Japanese government considers nuclear power as a base load power source and vows to raise this percentage to 20%–22% by fiscal 2030.

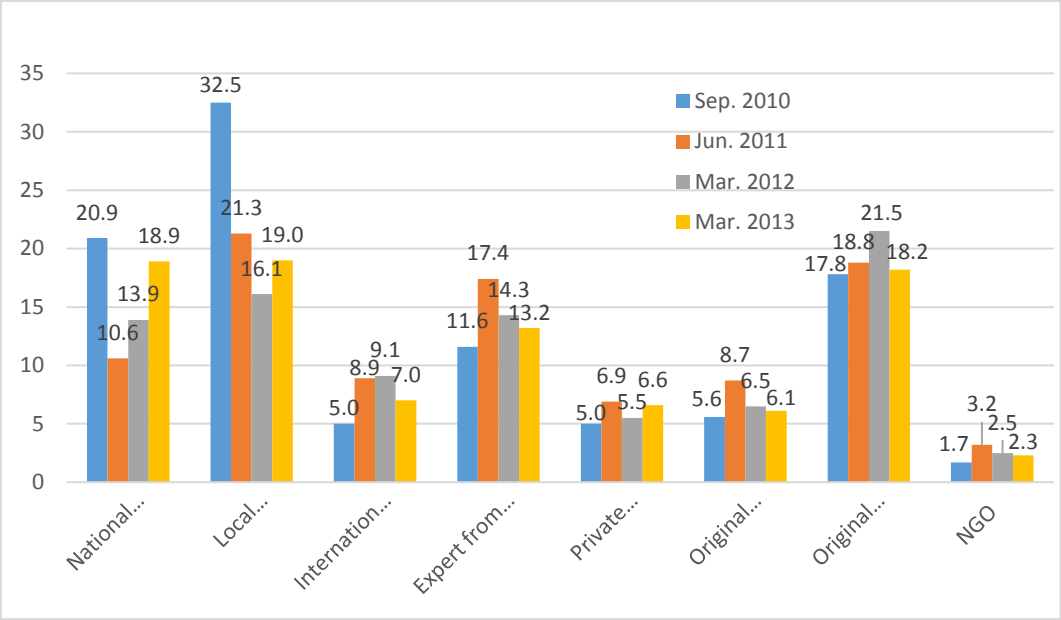
### Purpose and method of the opinion research

This report considers the results of the public opinion poll introduced by the Japan Atomic Energy Commission. The poll was conducted at 200 points selected from all over Japan with six people chosen from each of the 200 points. Then, interviews and questionnaires were conducted with a total of 1,200 respondents.

This poll has been conducted four times, from 2010 (before the Great East Japan Earthquake and the Fukushima accident) to 2013, to examine people's trust or distrust in disaster information including on nuclear power. The respondents were asked to choose from several options only one source of information on disasters they can trust the most and it was found that very few people have trusted the government even from before the Fukushima accident (Figure 1.1). The percentage of people who trust local governments, that is, prefectural, city, town, and village governments, declined to 21.3% three months after the Fukushima accident from 32.5% before the accident. This share dropped further to 16.1% a year later. Many respondents replied in a survey into fields other than nuclear power that they trust international organisations, but only 10% or less said that they believe international organisations in a survey into nuclear power. One year after the Fukushima accident, the percentage of respondents who said they trust the original broadcast of TV stations was the highest at 21.5%.

**Figure 1.1. Most Reliable Source about a Disaster**

(%)



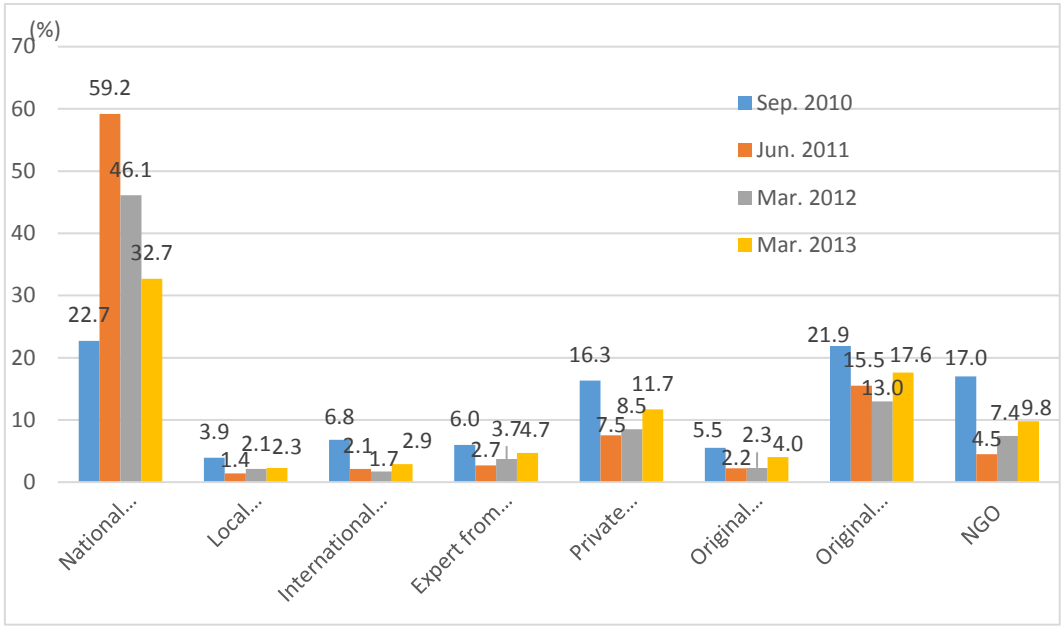

NGO = non-government organisation.

Source: Japan Atomic Energy Commission Conference, *Changes in Public Opinion Relating to Nuclear Power Generation, Hirotada Hirose* (17 July 2013), http://www.aec.go.jp/jicst/NC/iinkai/teirei/siryo2013/siryo27/siryo2.pdf (accessed 28 February 2019) (in Japanese).

In a survey where respondents were asked to choose only one source of information they can trust the least (Figure 1.2), the percentage of those who said that they trust information from the government the least jumped to 59.2% from 22.7% recorded before the Fukushima accident. Although this number is on the decline, the level of trust in the government before the accident has not yet been restored. In the meantime, the original broadcast of TV stations, which most people chose as the most trustful source of information, was selected by many people as the information that they can trust the least. The percentage of people who do not trust their prefecture, city, town, or village fell from 3.9% before the accident. It can therefore be said that distrust in municipalities is relatively low.

**Figure 1.2. Least Reliable Source about a Disaster**

(%)



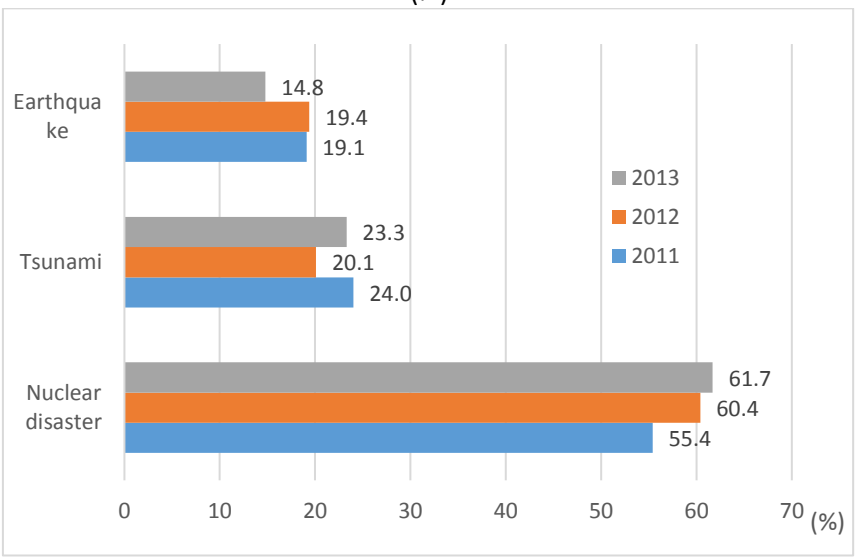

NGO = non-government organisation.

Source: Japan Atomic Energy Commission Conference, *Changes in Public Opinion Relating to Nuclear Power Generation, Hirotada Hirose* (17 July 2013), http://www.aec.go.jp/jicst/NC/iinkai/teirei/siryo2013/siryo27/siryo2.pdf (accessed 28 February 2019) (in Japanese).

Asked a question about the Great East Japan Earthquake, more than half the respondents said, 'the disaster that did the most serious damage was the nuclear power plants accident', despite the fact that most people were killed by the earthquake and tsunami (Figure 1.3). The number of these respondents is gradually rising every year because many people have died or taken their own lives after evacuation. This survey result indicates that many Japanese cite the Fukushima accident as an answer to a question about what caused the most damage in the Great East Japan Earthquake. Many surveys conducted after the Fukushima accident demonstrated that radiation did not have a serious impact on health. As time passes after the accident, however, it can be considered that evacuation and living in an unfamiliar environment have gradually affected the psychology of people.

**Figure 1.3. Which Disaster is Cited as Causing the Most Damage in the Great East Japan Earthquake?**

(%)

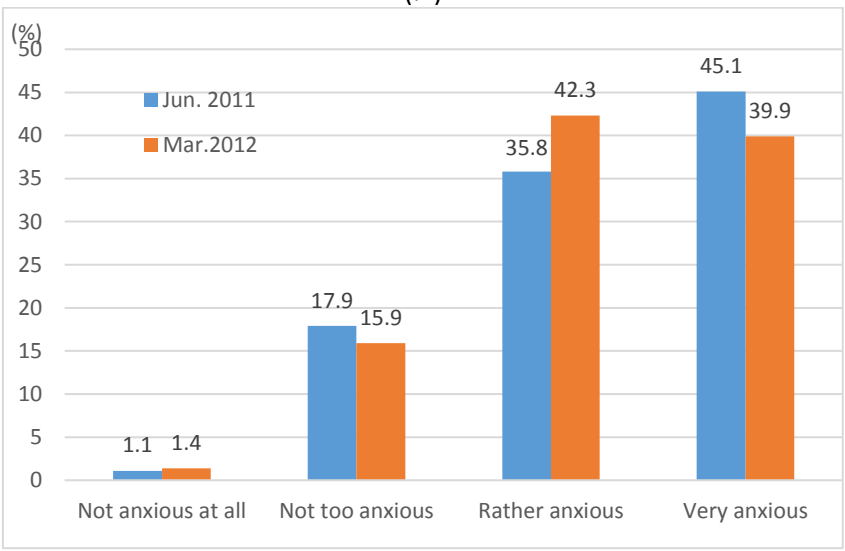



Source: Japan Atomic Energy Commission Conference, *Changes in Public Opinion Relating to Nuclear Power Generation, Hirotada Hirose* (17 July 2013), http://www.aec.go.jp/jicst/NC/iinkai/teirei/siryo2013/siryo27/siryo2.pdf (accessed 28 February 2019) (in Japanese).

Surveys into people's anxiety about exposure to radiation in the wake of the Fukushima accident were conducted 3 months and 1 year after the accident (Figure 1.4). Those who said they were very anxious or they were rather anxious exceed 80% of the total, indicating that 80% of all Japanese, not only the residents in the neighbourhood of Fukushima, are concerned about exposure to radiation.

**Figure 1.4. Anxiousness Regarding Radioactive Exposure due to Fukushima Disaster**

(%)

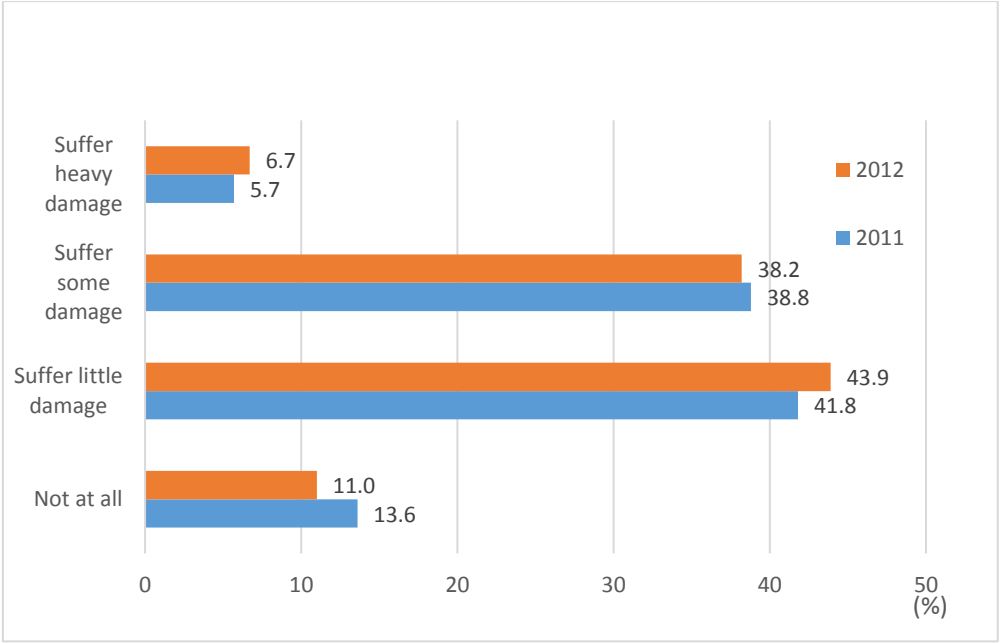



Source: Japan Atomic Energy Commission Conference, *Changes in Public Opinion Relating to Nuclear Power Generation, Hirotada Hirose* (17 July 2013), http://www.aec.go.jp/jicst/NC/iinkai/teirei/siryo2013/siryo27/siryo2.pdf (accessed 28 February 2019) (in Japanese).

In response to a question if the respondent's health has been affected as a result of the Fukushima accident, more than 40% replied they suffered little, but nearly 40% of the respondents thought they had suffered (Figure 1.5) as a result of the Fukushima accident.

**Figure 1.5. Do You Think Your Health was Affected by the Fukushima Accident?**

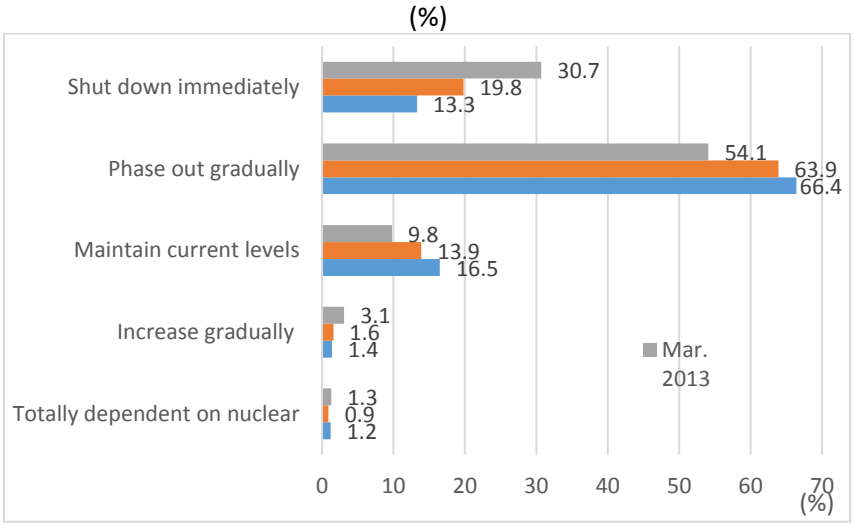
(%)




Source: Japan Atomic Energy Commission Conference, *Changes in Public Opinion Relating to Nuclear Power Generation, Hirotada Hirose* (17 July 2013), http://www.aec.go.jp/jicst/NC/iinkai/teirei/siryo2013/siryo27/siryo2.pdf (accessed 28 February 2019) (in Japanese).

The total of those who said that the nuclear power plants in Japan must be 'shut down immediately' or 'phased out gradually' in response to a question whether nuclear power generation should be discontinued or continued in Japan, the percentage of those who support decommissioning of nuclear power plants was 79.7% in a survey conducted immediately after the Fukushima accident in March 2011. This percentage increased to 84.8% two years later in March 2013 (Figure 1.6). Especially, those who replied that nuclear power plants should be immediately shut down more than doubled to 30.7% from 13.3%. This is probably because recognition has spread that electricity can be supplied even without nuclear power generation because electricity has been supplied without power outages after all the nuclear power plants were stopped in May 2012, even though there was at first a concern immediately after the Fukushima accident, that electricity could not be supplied if all nuclear power plants were shut down.

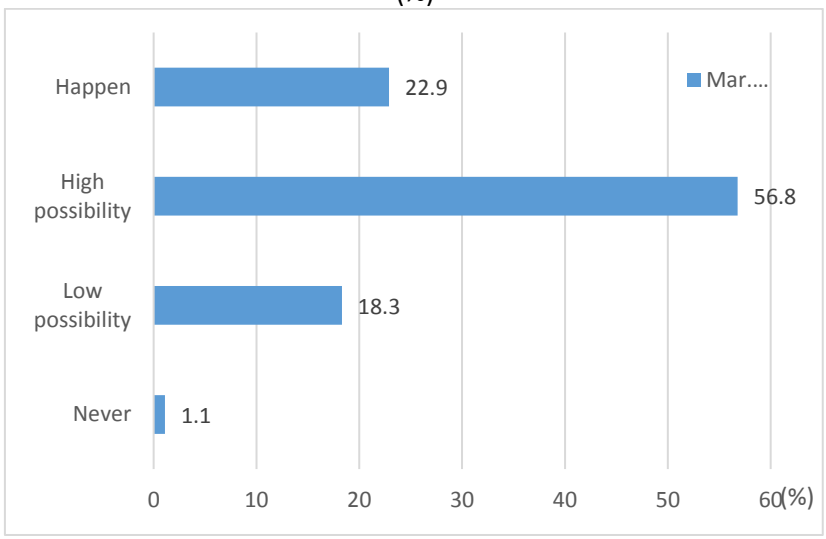
**Figure 1.6. Should Nuclear Power Plants be Shut Down in Japan?**




Source: Japan Atomic Energy Commission Conference, *Changes in Public Opinion Relating to Nuclear Power Generation, Hirotada Hirose* (17 July 2013), http://www.aec.go.jp/jicst/NC/iinkai/teirei/siryo2013/siryo27/siryo2.pdf (accessed 28 February 2019) (in Japanese).

In response to a March 2013 question 'Do you think it is possible that an accident similar in scale to the Fukushima accident could occur if nuclear power plants in respective regions are restarted?', nearly 80% replied they thought such an accident could 'happen' or such a 'possibility is high' (Figure 1.7). This is probably one of the causes that led to the answer that nuclear power plants should be 'shut down immediately' or 'phased out gradually' in response to the question in Figure 1.6.

**Figure 1.7. Possibility of an Accident Similar to Fukushima if Nuclear Power Plants Restarted**




Source: Japan Atomic Energy Commission Conference, *Changes in Public Opinion Relating to Nuclear Power Generation, Hirotada Hirose* (17 July 2013), http://www.aec.go.jp/jicst/NC/iinkai/teirei/siryo2013/siryo27/siryo2.pdf (accessed 28 February 2019) (in Japanese).

## 2. Status in Finland

In Finland, the Loviisa nuclear power plant began operations in 1977. Four power plants are operating and Olkiluoto Unit 3 was under construction as of the end of 2018. Nuclear power generation accounted for about 30% of total power generation in 2017.

The number of people who opposed the commercial use of nuclear power increased following the accident at Chernobyl Unit 4 in the Soviet Union in 1986, but the percentage of nuclear power generation supporters exceeded that of opponents in the second half of the 1990s and, as of 2016, most people support nuclear power generation. The energy resources of Finland include hydroelectric power, peat, and wood biomass but the country is not as rich in hydroelectric power as other Nordic countries and its fossil fuel resources are also scarce. In addition, per capita energy consumption in Finland is high, partly because industries consuming a lot of energy such as paper and iron and steel are flourishing and partly because its cold climate is pushing up demand for energy for heating. However, the self-sufficiency ratio in the primary energy supply in Finland is relatively low at 50% and the country relies on Russia for most of its electricity and fossil fuel. Elimination of the excessive reliance on Russia is considered a challenge. The Finnish government, therefore, is focusing on the promotion of nuclear energy, as well as enhancing efficiency in the use of energy and the expansion of renewable energy sources to address climate change impacts by 2020 as advocated by the European Commission. One of the reasons that the Finnish people support nuclear power generation is probably because the government and parties concerned have positively disclosed the above information on the energy situation.

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 permission 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.

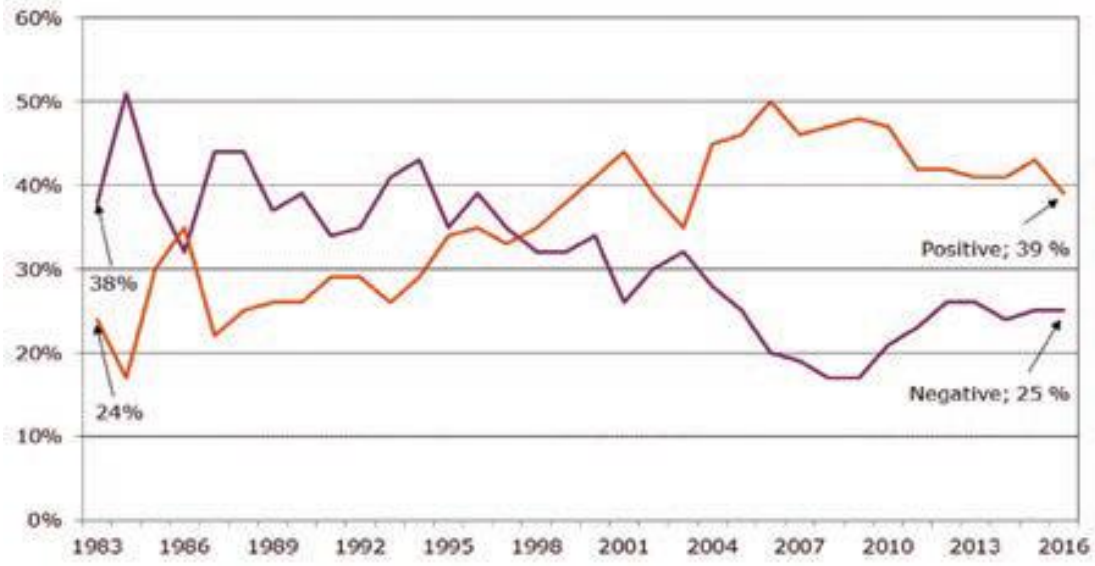
Under the atomic energy act, the Finnish government introduced a step for the government to decide whether a project for introducing nuclear facilities is appropriate or not, and made a decision in principle (DIP), a policy decision means peculiar to Finland. This step is known as the 'DIP procedure'. The atomic energy act clearly states what the government should decide on this DIP procedure and prescribes a procedure format. In this procedure, a nuclear power operator requests the government to make a decision on whether a business plan presented by the operator will be beneficial to the whole of Finnish society. Before making the decision, the government must confirm that the municipality of the planned construction site of the nuclear facility is willing to accept the facility. It is also necessary to confirm that the Radiation and Nuclear Safety Authority of Finland (STUK), a regulatory body, has the opinion that the plan would have no problem in terms of safety. In selecting energy, the

Finnish government concluded that nuclear power is the best option to cope with climate change, ensure energy safety, and reduce reliance on Russia, and has not changed this conclusion to this day.

Figure 1.8 is a revised version of a public opinion poll in Finland that the fiscal year 2017 version of this research quoted. Results of another poll shown in Figure 1.9 also indicate that the majority of the Finnish support nuclear power generation.

**Figure 1.8. Evolution of Public Acceptance of Nuclear Power in Finland**

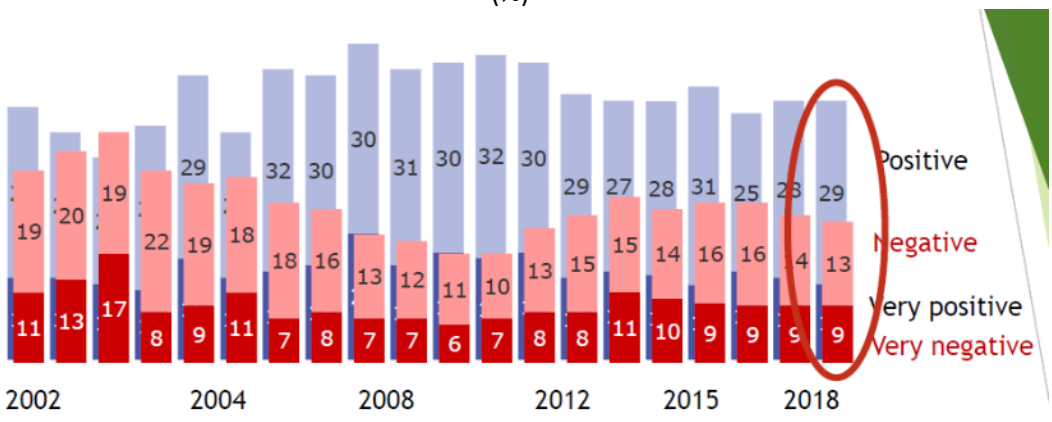
(%)




Source*: ATW–International Journal for Nuclear Power*, (2017), 'What People Really Think About Nuclear Energy*',* 62(3), pp.157–63. https://www.kernenergie.de/kernenergie-wAssets/docs/fachzeitschrift-atw/2017/atw2017_03_157_What_People_Really_Think.pdf (accessed 21 Feb 2019).

**Figure 1.9. Nuclear Public Acceptance in Finland**

(%)




Source: Partanen, R (2018), Public Acceptance in Finland, July 2018, http://nuclearsafety.gc.ca/eng/pdfs/third-party/Rauli-Partanen-Presentation-Public-Acceptance-Finland-eng.pdf (accessed 6 March 2019).

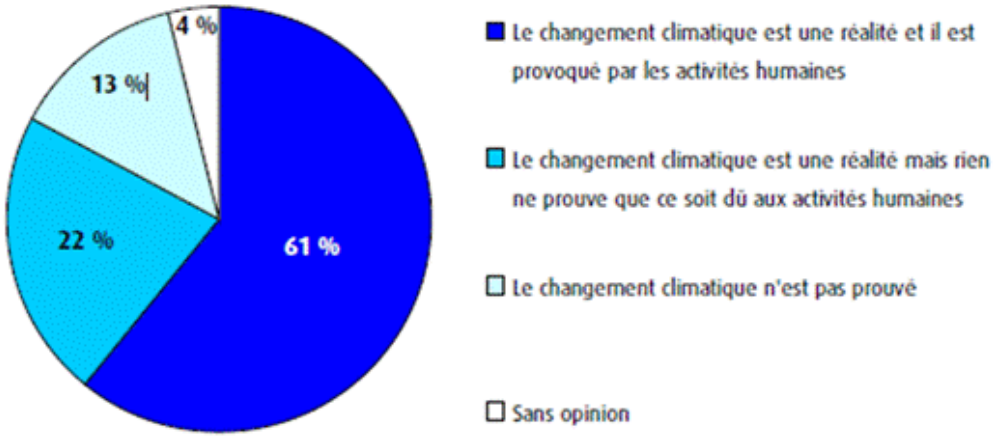
## 3. Status in France

France, which is not rich in energy resources, has pushed forwards with nuclear energy development to reduce its dependence on energy of other nations since the first oil crisis in 1973. As of the end of 2018, 58 nuclear power plants were operating in the country, producing about 75% of the electric power generated. In 2015, France enacted an energy conversion act that brings the percentage of nuclear power generation down from 75% to 50% by 2025. Later, however, it was found that achieving this goal by 2025 was practically impossible and the government announced in 2018 it would delay achieving the goal until 2035 whilst maintaining the upper limit of 50%.

Figure 1.10 shows the results of a survey conducted by France's Service de l'Observation et des Statistiques (SOeS) (Observation and Statistics Service Committee) in 2013. The committee employed the quarter method so that a reduced drawing of the gender, age, and occupation of all of France would be created, and conducted a survey questioning 1,910 people 15 years or older.

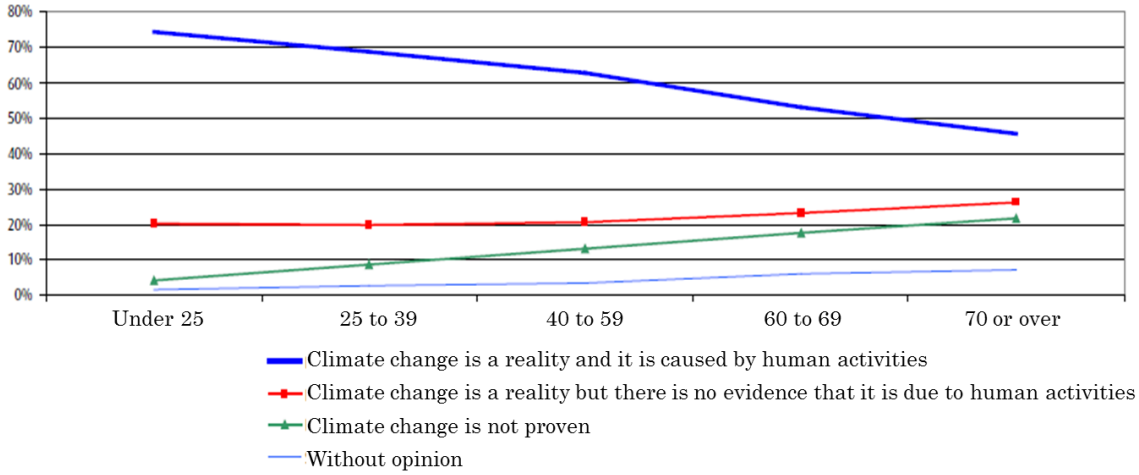
Eighty-three percent of French people regard climate change as a reality and 61% believe that this change is due to human activities (Figure 1.10). Figure 1.11 shows a decrease in this percentage as the age of the respondents increase. More than 70% of respondents less than 25 years old think that human activities have caused climate change while less than 50% of those who are 70 years or older think so.

**Figure 1.10. Opinion on Climate Change in France**




Source: Service de l'Observation et des Statistiques (2013), *Baromètre d'Opinion sur l'Énergie et le Climat en 2013*, https://www.connaissancedesenergies.org/sites/default/files/pdf-pt-vue/barometre_dopinion_energie_et_climat.pdf (accessed 6 March 2019) (in French).

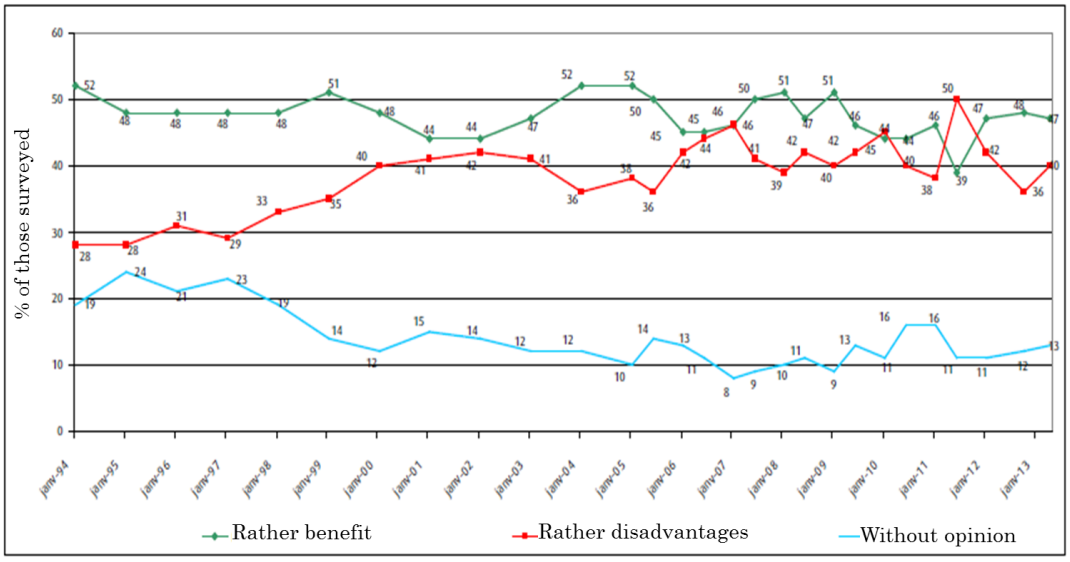
**Figure 1.11. Opinion on Climate Change by Age in France**




Source: Service de l'Observation et des Statistiques, *Baromètre d'Opinion sur l'Énergie et le Climat en 2013*, https://www.connaissancedesenergies.org/sites/default/files/pdf-pt-vue/barometre_dopinion_energie_et_climat.pdf (accessed 6 March 2019) (in French).

The percentage of those who think nuclear power is advantageous is 47%, surpassing 40% of the people who think it is disadvantageous. Those who thought it was disadvantageous rose to 50% three months after the Fukushima accident, exceeding by as much as 11% the 39% of those who thought nuclear power to be advantageous. Subsequent surveys show those who think nuclear power is advantageous exceeds the number of people who think it is disadvantageous (Figure 1.12).

**Figure 1.12. Evolution of French Opinion on Nuclear Energy**

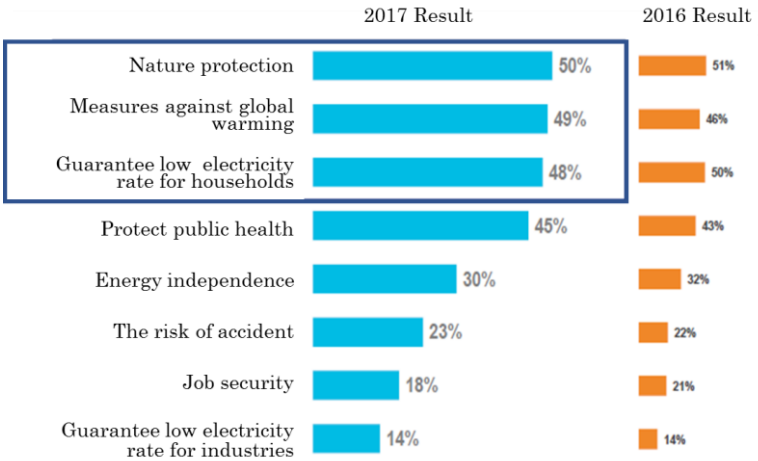



Source: Service de l'Observation et des Statistiques, *Baromètre d'Opinion sur l'Énergie et le Climat en 2013*, https://www.connaissancedesenergies.org/sites/default/files/pdf-pt-vue/barometre_dopinion_energie_et_climat.pdf (accessed 6 March 2019) (in French).

The results of a survey conducted by research company Consumer Science and Analytics (CSA), which was presented in January 2018 at a public debate over the energy programme of the Commission Nationale du Débat Public (CNDP) (National Commission of Public Debate), is outlined in Figure 1-13. This survey was conducted by CSA in December 2017 by interviewing 2,020 people 18 years or older.

As a basis to choose energy, about half of the respondents cited environmental protection, global warming prevention measures, and low electricity rate for households (Figure 1.13).

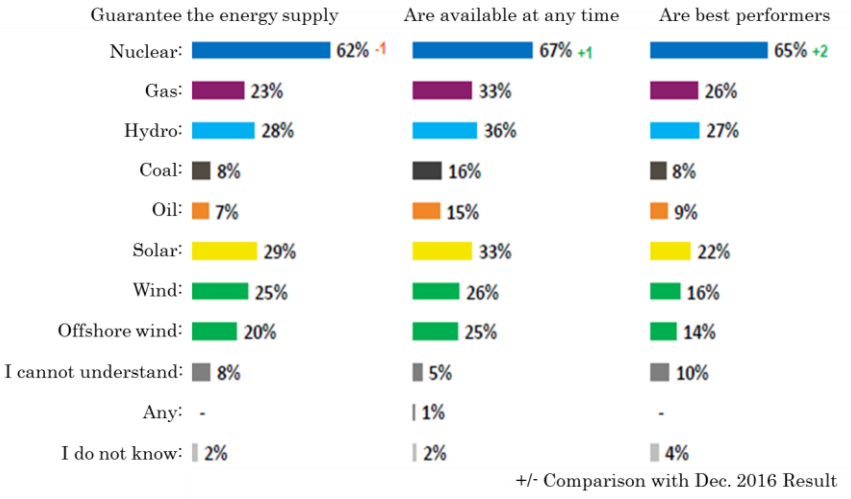
**Figure 1.13. What are the Criteria to Choose Energies to Use**




Source: Baromètre des Énergies (2018), – *vague 6, Etude de l'Institut CSA pour EDF,* Jan 2018, https://ppe.debatpublic.fr/sites/debat.ppe/files/barometre_des_energies_-_janvier_2018_-_ppe.pdf (accessed 6 March 2019) (in French).

In a survey into the image of each power source, more than 60% of the respondents chose nuclear power because it can be trusted, it contributes to stable supply, and has a high operating rate (Figure 1.14).

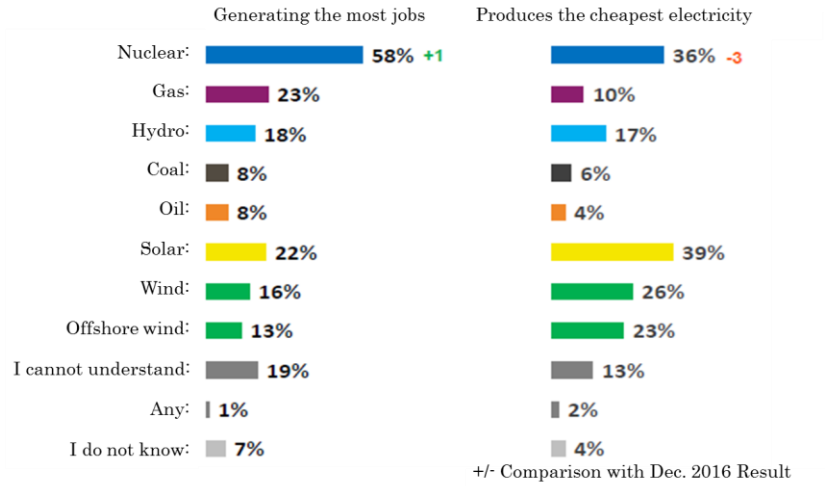
**Figure 1.14. Your Image of the Following Power Generation Sources (1/4)**




Source: Baromètre des Énergies – *vague 6, Etude de l'Institut CSA pour EDF,* Jan 2018, https://ppe.debatpublic.fr/sites/debat.ppe/files/barometre_des_energies_-_janvier_2018_-_ppe.pdf (accessed 6 March 2019) (in French).

The percentage of people who chose nuclear power as a means for securing employment was the highest, and nuclear power came second, following solar power generation, as a low-priced power source. This is the result of how people view each power source, and is different from the actual electricity price (Figure 1.15). OECD's Nuclear Energy Agency shows the actual electricity price in 'The full costs of electricity provision', in which it shows that nuclear power is the cheapest in France.

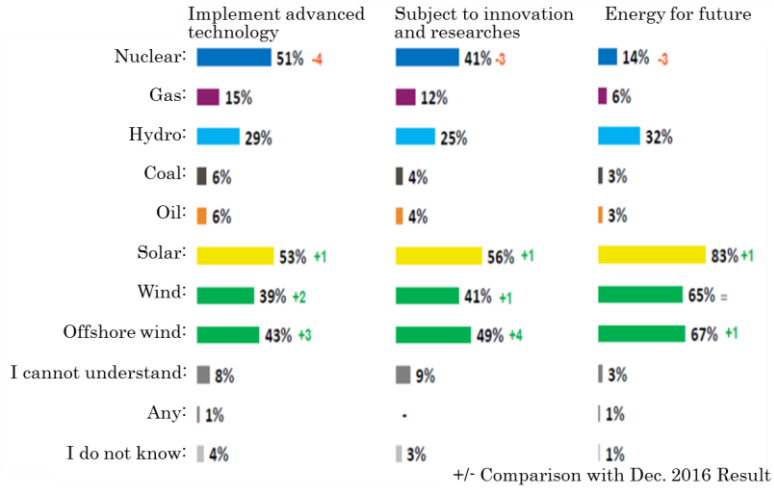
**Figure 1.15. Your Image of the Following Power Generation Sources (2/4)**




Source: Baromètre des Énergies – *vague 6, Etude de l'Institut CSA pour EDF,* Jan 2018, https://ppe.debatpublic.fr/sites/debat.ppe/files/barometre_des_energies_–_janvier_2018_–_ppe.pdf (accessed 6 March 2019) (in French).

More than half the respondents chose nuclear power as a power source of advanced technology, but a great number of people also chose solar power, wind power, or offshore wind power. As a future energy, more respondents chose nuclear power than those who chose fossil fuel, while the majority of the respondents chose renewable energy (Figure 1.16) as desirable future energy sources.

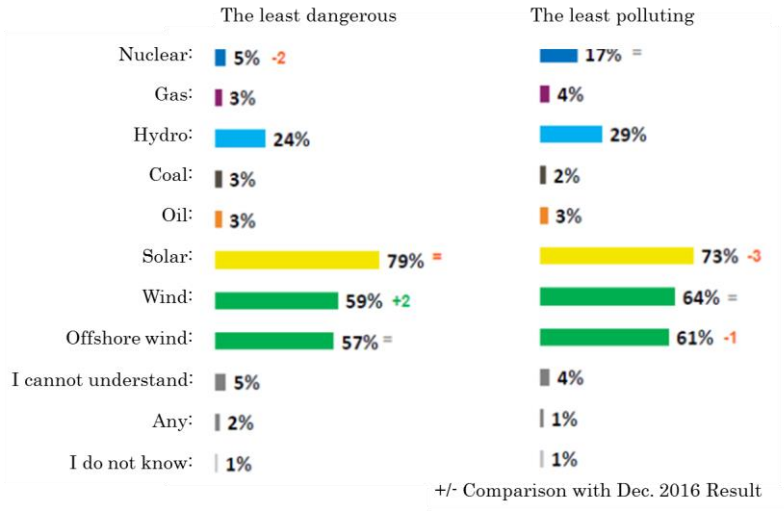
**Figure 1.16. Your Image of the Following Power Generation Sources (3/4)**




Source: Baromètre des Énergies – *vague 6, Etude de l'Institut CSA pour EDF,* Jan 2018, https://ppe.debatpublic.fr/sites/debat.ppe/files/barometre_des_energies_–_janvier_2018_–_ppe.pdf (accessed 6 March 2019) (in French).

When it comes to a safe and least polluting energy, a great number of respondents chose renewable energy, but more people chose nuclear power than those who chose fossil fuel (Figure 1.17).

**Figure 1.17. Your Image of the Following Power Generation Sources (4/4)**

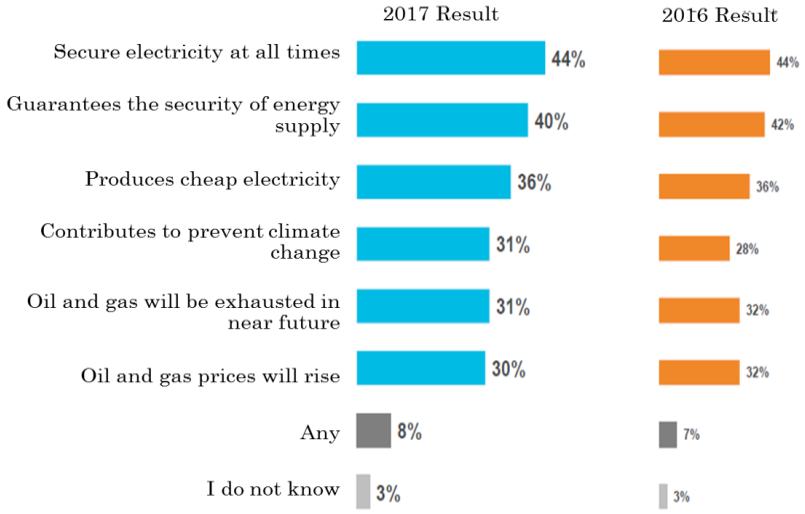



Source: Baromètre des Énergies – *vague 6, Etude de l'Institut CSA pour EDF,* Jan 2018, https://ppe.debatpublic.fr/sites/debat.ppe/files/barometre_des_energies_–_janvier_2018_–_ppe.pdf (accessed 6 March 2019) (in French).

It can be said from the above that nuclear power is positively accepted in France as compared with other power sources.

Moreover, as shown in Figure 1.18, it is understood as a benefit, that nuclear power contributes to the stable supply of electricity and ensures energy security. It is also understood that nuclear power generation supplies energy at low cost.

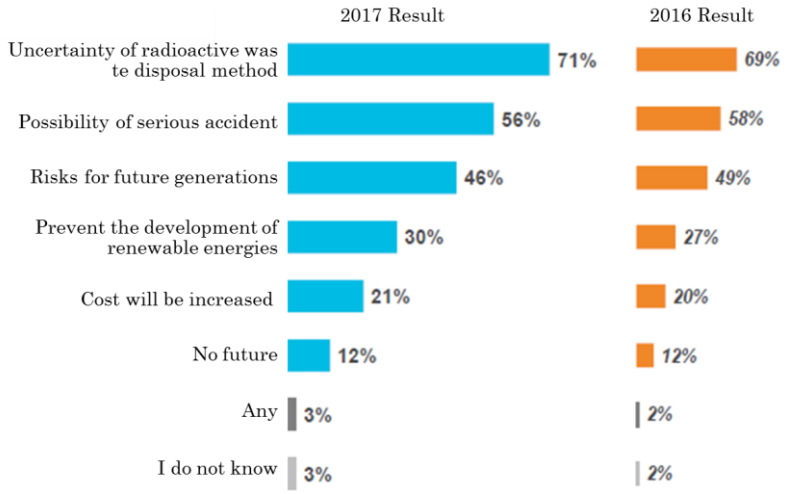
**Figure 1.18. Which is the Most Convincing in Favour of Nuclear Energy?**




Source: Baromètre des Énergies – *vague 6, Etude de l'Institut CSA pour EDF,* Jan 2018, https://ppe.debatpublic.fr/sites/debat.ppe/files/barometre_des_energies_-_janvier_2018_-_ppe.pdf (accessed 6 March 2019) (in French).

The main reasons for opposing nuclear power are that a method of disposing of radioactive waste has not been established, that an accident can happen, and that risks for the next generation are too large (Figure 1.19).

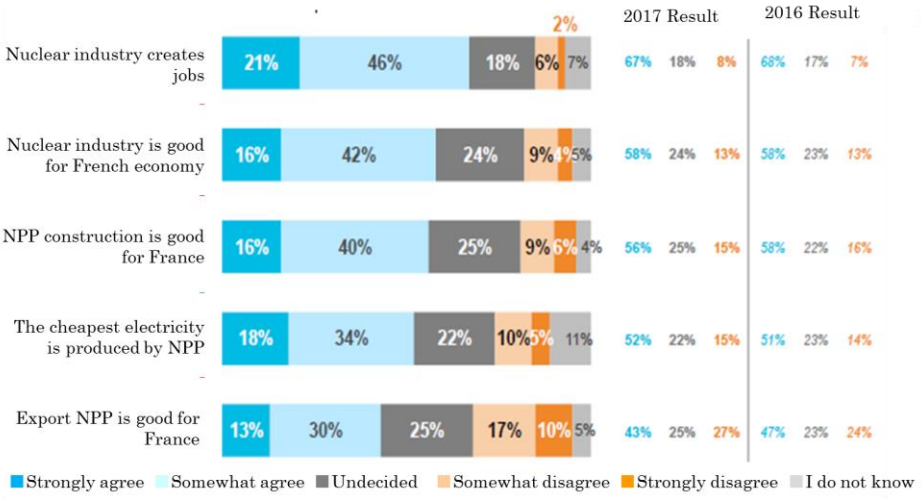
**Figure 1.19. Which is the Most Convincing Reason Against Nuclear Energy?**




Source: Baromètre des Énergies – *vague 6, Etude de l'Institut CSA pour EDF,* Jan 2018, https://ppe.debatpublic.fr/sites/debat.ppe/files/barometre_des_energies_–_janvier_2018_–_ppe.pdf (accessed 6 March 2019) (in French).

CSA also gathered opinions on the contribution of nuclear power to the French economy. In Figure 1.20, the blue (strongly agree) and light blue (somewhat agree) portions represent responses that nuclear energy contributes to the French economy. More than 50% of the respondents thought that nuclear power contributes to the expansion of employment, has an economic effect both during and after construction of a plant, and contributes to the supply of low-price electricity, positively responding to four of five questions. This indicates that the French understand well the contribution of nuclear power to the economy.

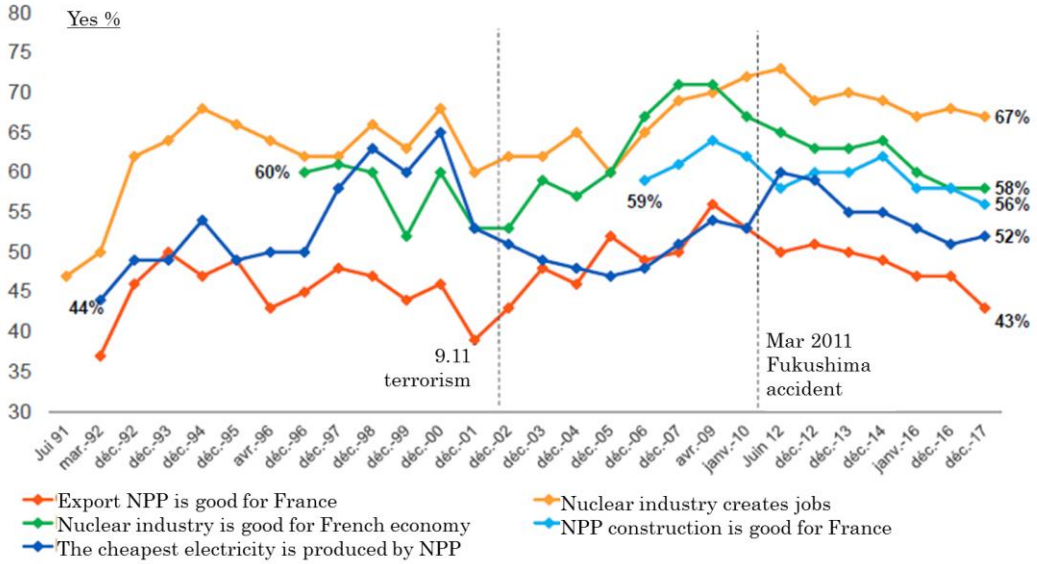
**Figure 1.20. Economic Contribution of Nuclear Energy**




NPP = nuclear power plant.
Source: Baromètre des Énergies – *vague 6, Etude de l'Institut CSA pour EDF,* Jan 2018, https://ppe.debatpublic.fr/sites/debat.ppe/files/barometre_des_energies_–_janvier_2018_–_ppe.pdf (accessed 6 March 2019) (in French).

Figure 1.21 shows changes with time in the survey results. Since 2011, the number of people that believe nuclear power is contributing to the French economy and constructing a nuclear power plant improves the economy has decreased, but, as compared with the 1990s, those who think that nuclear power generation has a favourable effect on the French economy is on the rise.

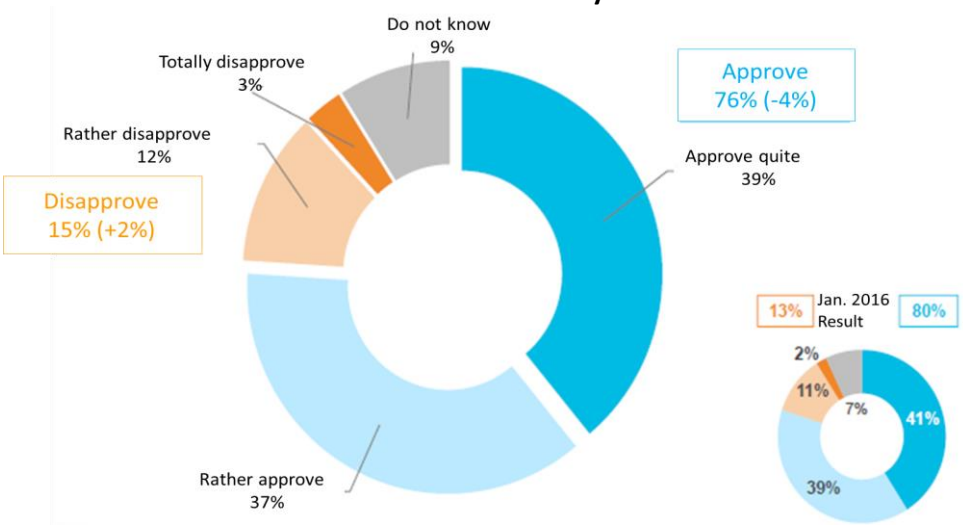
**Figure 1.21. Evolution of Public Opinion regarding Economic Contribution of Nuclear Energy**




NPP = nuclear power plant.
Source: Baromètre des Énergies – *vague 6, Etude de l'Institut CSA pour EDF,* Jan 2018, https://ppe.debatpublic.fr/sites/debat.ppe/files/barometre_des_energies_–_janvier_2018_–_ppe.pdf (accessed 6 March 2019) (in French).

To the question 'What do you think of the government decision in 2015 to lower the power generation ratio of nuclear power from 75% to 50% by 2025?', 76% of the respondents replied they would 'approve' or 'approve somewhat' the decision (Figure 1.22).

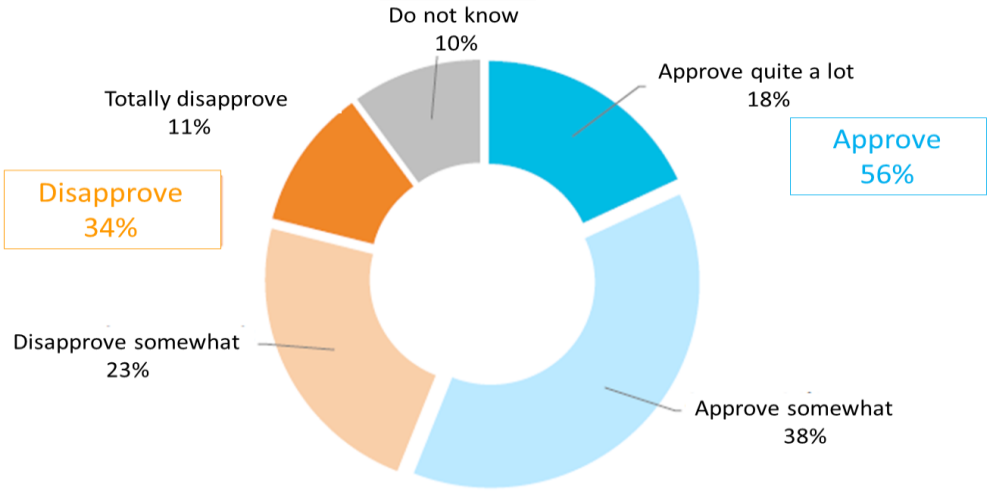
**Figure 1.22. Do You Agree with Government Policy to Reduce Nuclear Power Generation Ratio from 75% to 50% by 2025?**




Source: Baromètre des Énergies – *vague 6, Etude de l'Institut CSA pour EDF,* Jan 2018, https://ppe.debatpublic.fr/sites/debat.ppe/files/barometre_des_energies_–_janvier_2018_–_ppe.pdf (accessed 6 March 2019) (in French).

In 2018, the energy minister thought it impossible to push down the ratio of nuclear power generation to 50% by 2025 and decided to put it off to 2035. While 56% of people approved the decision, 34% opposed the postponement (Figure 1.23).

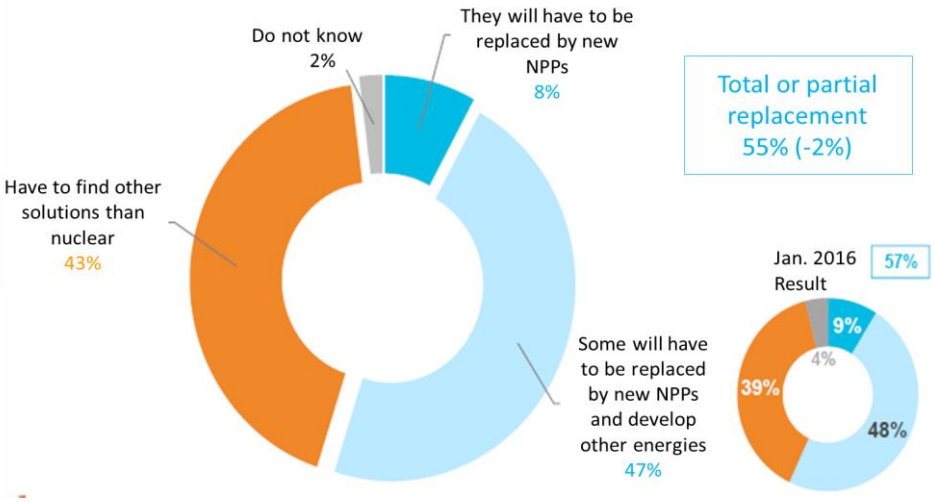
**Figure 1.23. Do You Agree with the Government to Postpone the Target to Reduce Nuclear Power?**




Source: Baromètre des Énergies – *vague 6, Etude de l'Institut CSA pour EDF,* Jan 2018, https://ppe.debatpublic.fr/sites/debat.ppe/files/barometre_des_energies_–_janvier_2018_–_ppe.pdf (accessed 6 March 2019) (in French).

To the question about what measures should be taken when a nuclear power plant has ended its service life, 55% of the people said, 'the plant should be replaced in part or entirety' while 43% replied that solutions other than nuclear power should be found (Figure 1.24).

**Figure 1.24. Which is Your Preference Future, After the End of the NPP Life?**




NPP = nuclear power plant.
Source: Baromètre des Énergies – *vague 6, Etude de l'Institut CSA pour EDF,* Jan 2018, https://ppe.debatpublic.fr/sites/debat.ppe/files/barometre_des_energies_–_janvier_2018_–_ppe.pdf (accessed 6 March 2019) (in French).

The survey results generally can be said to reflect French people's deep understanding of nuclear power.

## 4. Status in Sweden

Sweden's first nuclear power plant was AGESTA, an experimental reactor, that started operations in 1964. In Sweden, which does not have any energy resources other than hydroelectric power, hydroelectric power and nuclear power are important base load power sources and nuclear power accounts for about 40% of electric power generated.

On the back of the nuclear accident that took place at Three Mile Island Unit 2 in the United States in 1979, a national referendum was held in Sweden in 1980 and the Swedish congress decided to prohibit construction of new nuclear power plants and conditionally decommission 12 nuclear power plants by 2010. The accident that occurred at Chernobyl Unit 4 in the Soviet Union in 1986 mounted pressure on the Swedish government to give up nuclear power generation and, as a result, the government decided in 1988 to phase out nuclear power generation from 1995. In 1999, Barsebäck Unit 1 was shut down, followed by Unit 2 in 2005. However, development of alternative power sources did not progress, energy security was unstable because demand was satisfied by electric power imported through international cooperation amongst four Nordic nations, and the policy of abandoning nuclear power generation affected the Swedish economy and employment. For these reasons, the nuclear phase-out policy has practically stalled. In 2006, the Social Democratic Labour Party, which was advocating the nuclear phase-out policy, gave way to a coalition government. The

new government agreed to scrap the nuclear phase-out policy and announced in 2009 a new energy policy based on countermeasures against global warming and the energy policy of the European Union. The government set forth environmental sustainability, reinforcement of competition in domestic industries, and energy security as three pillars, permitting replacement of aged nuclear power plants with new ones. It acknowledged the importance of nuclear power generation to cope with global warming 'for the time being' and vowed to take the following four measures:

(1) Properly handle future applications for enhancing output
(2) Approve replacement in one site as long as the number of units at a nuclear power plant is kept to within the present 10
(3) Abandon 'nuclear phase-out act' and prepare a new legal system aimed at construction of new nuclear reactors
(4) Provide no financial assistance to construct new nuclear power plants

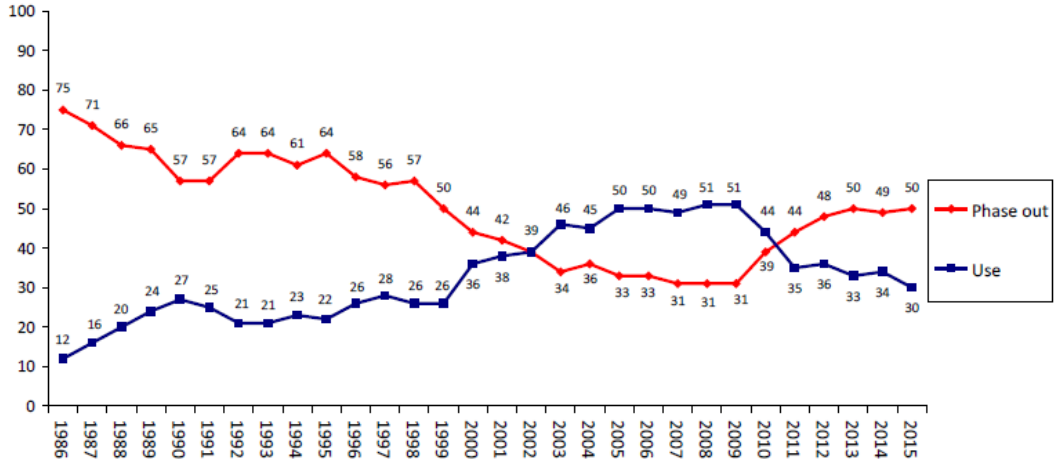
Oskarshamn Units 1 and 2 were closed in 2016 and 2017, respectively, but the reasons for the closure were not the nuclear phase-out policy, but economic factors such as the small output of these units, stagnant price of electricity, and a hike in nuclear power generation tax.

The results of a public opinion survey in Sweden are shown in Figure 1.25. The annual surveys are conducted by the SOM Institute with an investment from the Swedish energy agency. Questionnaires are sent by mail to 3,000 randomly selected people 16 to 85 years old. The response ratio is about 60% every year.

When the survey was started in 1986, 75% of the respondents were in favour of a phase out of nuclear power generation while 12% supported continued use. This ratio was reversed in 2003 and more people endorsed nuclear power generation than those who favoured the phase out. Since the Fukushima accident, however, the percentage of people choosing the phase out has been increasing (Figure 1.25).

**Figure 1.25. Sweden on the Use of Nuclear Power as an Energy Source**

(%)

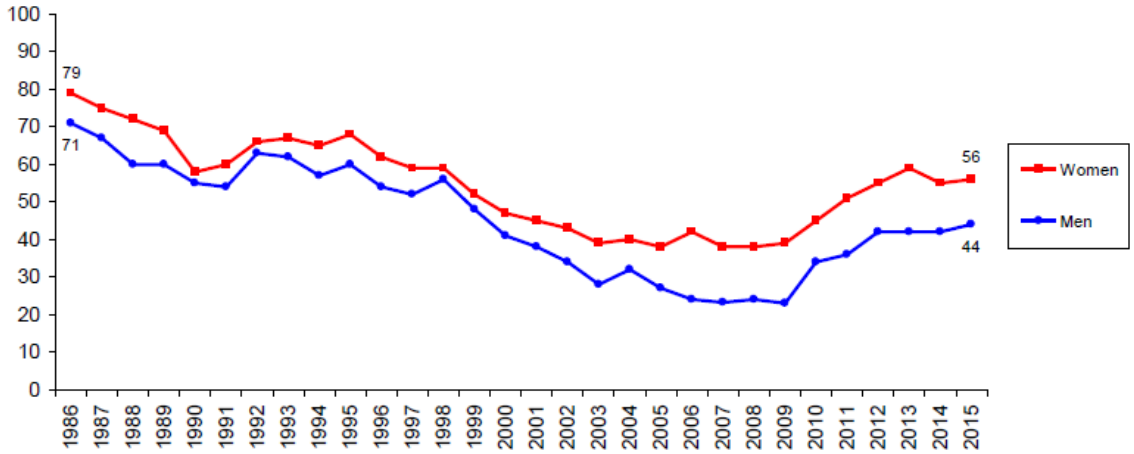



Source: Holmberg, S (2016), *Swedish Opinion on Nuclear Power 1986–2015,* June 2016, https://som.gu.se/digitalAssets/1579/1579277_swedish-opinion-on-nuclear-power-1986-2015.pdf (accessed 11 March 2019).

The ratio of men to women in favour of the phase out is shown in Figure 1.26. More female respondents are in favour of the phase out than male respondents every year.

**Figure 1.26. Percent in Favour of Phasing Out Nuclear Power amongst Swedish Women and Men**

(%)

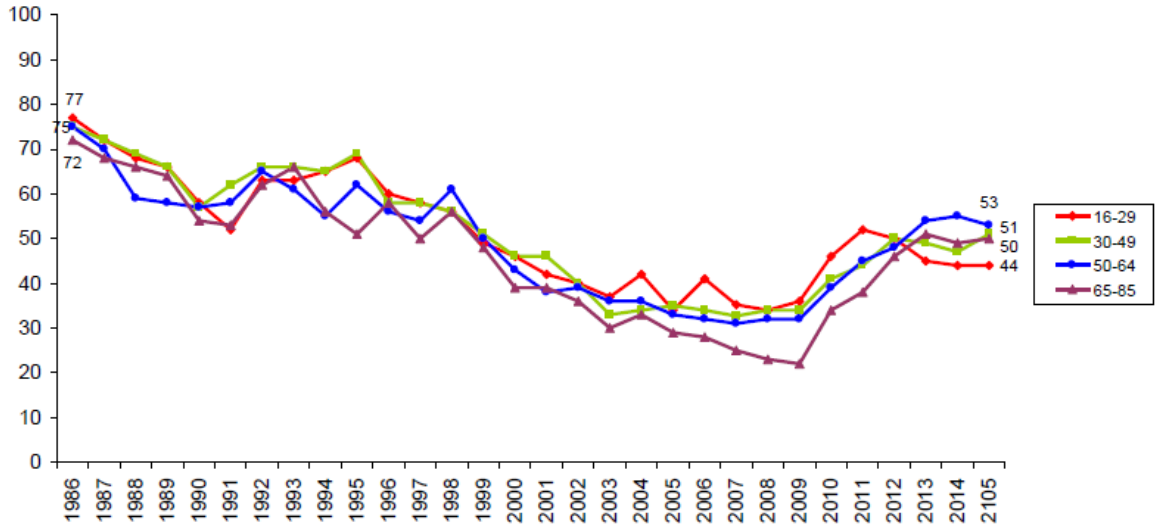



Source: Holmberg, S (2016), *Swedish Opinion on Nuclear Power 1986–2015,* June 2016, https://som.gu.se/digitalAssets/1579/1579277_swedish-opinion-on-nuclear-power-1986-2015.pdf (accessed 11 March 2019).

The age groups of those who favour the phaseout are shown in Figure 1.27. Before the Fukushima accident, younger people tended to support the phase out. After the Fukushima accident, older people favour the phase out whilst fewer young people choose the phase out. No statistically significant difference is observed anyway.

**Figure 1.27. Percent in Favour of Phasing Out Nuclear Power in Different Age Groups**

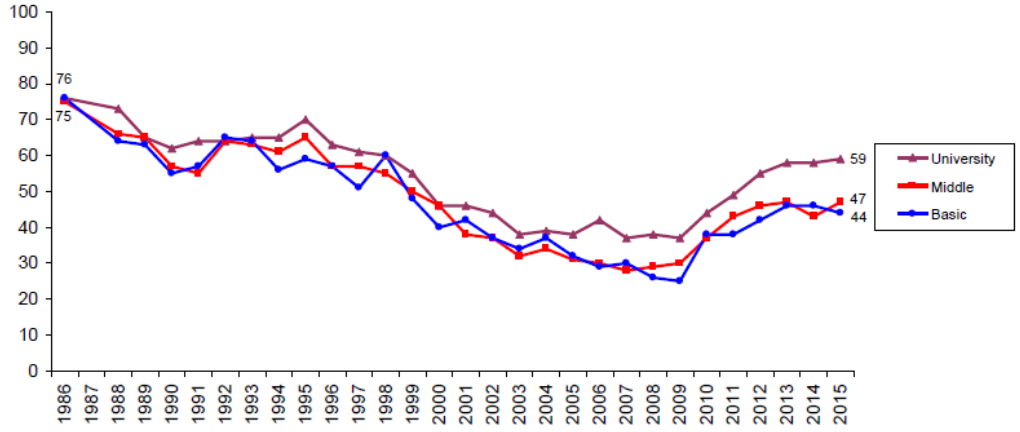
(%)




Source: Holmberg, S (2016), *Swedish Opinion on Nuclear Power 1986–2015, June 2016,* https://som.gu.se/digitalAssets/1579/1579277_swedish-opinion-on-nuclear-power-1986-2015.pdf (accessed 11 March 2019).

The educational backgrounds of those who endorse the phase out are shown in Figure 1.28. Those with a higher education (university graduates) tend to choose the phase out slightly more than those with other academic backgrounds, however, there is no statistically significant difference, either.

**Figure 1.28. Percent in Favour of Phasing Out Nuclear Power in Different Educational Groups** (%)

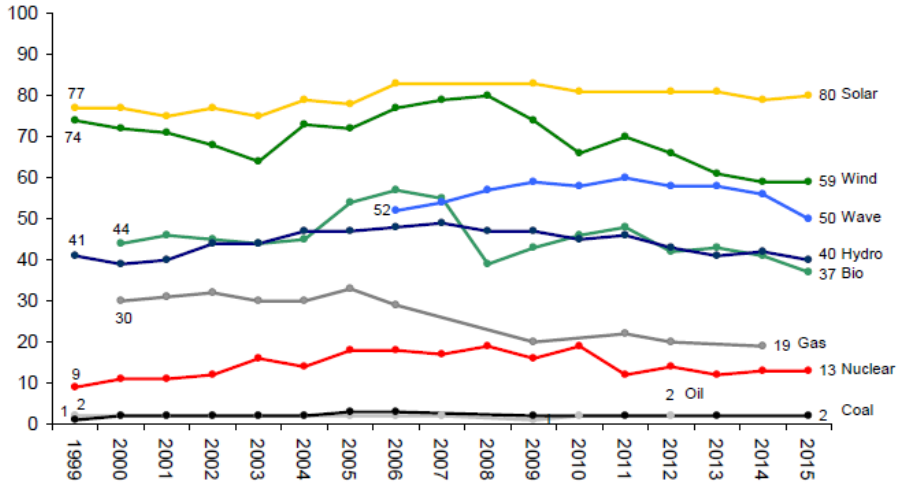



Source: Holmberg, S (2016), *Swedish Opinion on Nuclear Power 1986–2015,* June 2016, https://som.gu.se/digitalAssets/1579/1579277_swedish-opinion-on-nuclear-power-1986-2015.pdf (accessed 11 March 2019).

The percentage of people who favour renewable energy as an energy source that Sweden should use is high. In comparison with fossil fuel, those who choose gas are on the decline, but more people choose gas than nuclear power. The percentage of those who chose petroleum and coal remains unchanged from about 1.2% (Figure 1.29).

When it comes to renewable energy, it is interesting that more people favour solar power, which supplies less than 1% of electric power, than wind power, which supplies 11%.

**Figure 1.29. Which Energy Sources do You Think Sweden Should Choose?** (%)

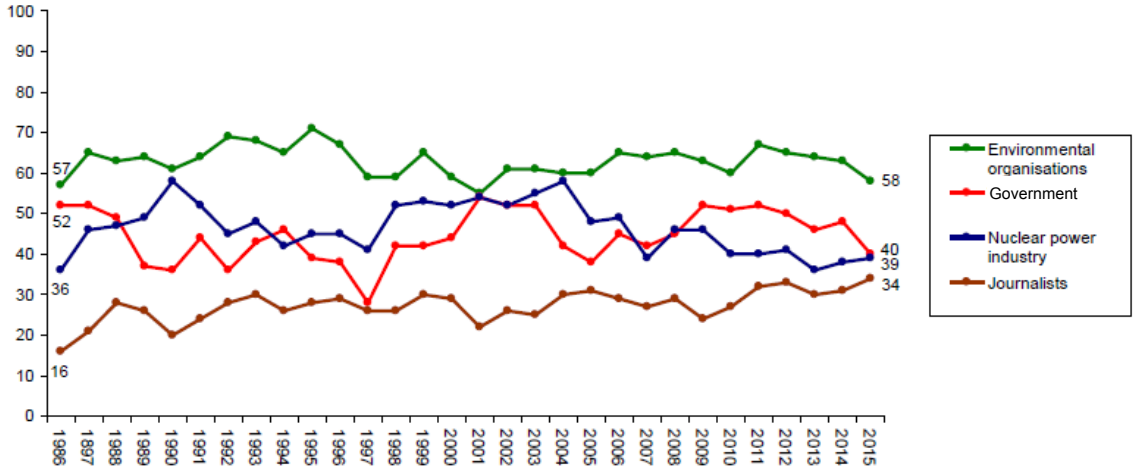



Source: Holmberg, S (2016), *Swedish Opinion on Nuclear Power 1986–2015,* June 2016, https://som.gu.se/digitalAssets/1579/1579277_swedish-opinion-on-nuclear-power-1986-2015.pdf (accessed 11 March 2019).

In this survey, a question 'What information source do you trust' was also asked and the results indicated that fewer people trusted the media and that more people trusted environmental organisations. The trust in nuclear power operators varies from year to year but has stood at about 40% in recent years, indicating no sign of an adverse influence from the Fukushima accident (Figure 1.30).

**Figure 1.30. Do You Trust Information about Energy and Nuclear Power Provided by Different Groups?**

(%)




Source: Holmberg, S (2016), *Swedish Opinion on Nuclear Power 1986–2015,* June 2016, https://som.gu.se/digitalAssets/1579/1579277_swedish-opinion-on-nuclear-power-1986-2015.pdf (accessed 11 March 2019).

It is difficult to generalise from the results of the above survey alone, but the results suggest that Swedish people do not think the use of nuclear power is favourable because a high percentage of people hope for the phase out of nuclear power generation, solar power comes first place as the desirable energy source, and trust in environmental organisations is consistently high. The gap from the reality that nuclear power generation supplies about 40% of electricity is interesting.

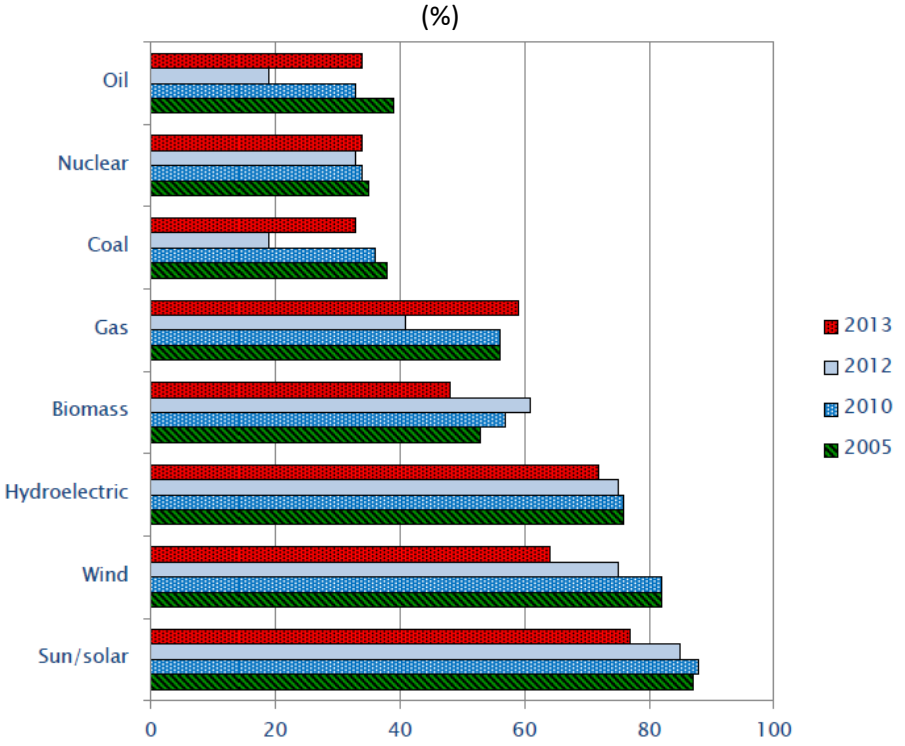
## 5. Status in the United Kingdom

In the UK, development of nuclear power has been promoted since 1956 when Calder Hall Unit 1 started operations, but no new power plants have been constructed since 1995, when Sizewell B opened, due to the liberalisation of electricity and fall in gas prices. After 2000, however, the advantages of nuclear power generation were recognised again as gas fields in the North Sea dried up and the need for a stable energy supply and reduction of greenhouse gas emissions were increasingly felt. In 2007, a policy for promoting the construction of new power plants was made clear in the nuclear white paper of that year. Nuclear power generation accounted for 21% of electric power generated in 2017 and, as of the end of February 2019, 15 nuclear power plants are in operation and a new station, Hinkley Point C, is under construction.

The results of surveys by the UK Energy Research Centre (UKERC) are shown in Figure 1-31. The surveys were conducted in 2005, 2010, 2011, and 2012. Until 2010, people 15 years or older were directly interviewed; however, online surveys have been conducted since 2011. In 2005, 1,491 people were directly interviewed and 1,822 in 2010. Online surveys were conducted with 2,050 respondents in 2011 and 2,441 in 2012.

Figure 1.31 shows that, while renewables remained the most favoured form of electricity production, support for them has dropped substantially over the years. Favourability ratings for wind power in particular have shown a sharp decline, from 82% in 2005 to 64% in 2013. Favourability ratings of solar power have dropped from 87% in 2005 to 77% in 2013. Favourability ratings of nuclear power are not high but do not show much difference before and after the Fukushima accident.

**Figure 1.31. Percentage of Respondents having Mainly or Very Favourable Opinions or Impression of Different Energy Sources for Producing Electricity**




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 12 March 2019).

The purpose of the surveys is to assess what the general public thinks about nuclear power. Overall support for nuclear power has increased by about six percentage points since 2005, while opposition has decreased by about eight percentage points since 2005 (Table 1.2). 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.

**Table 1.2. Overall Support For and Opposition To Nuclear Power** (%)

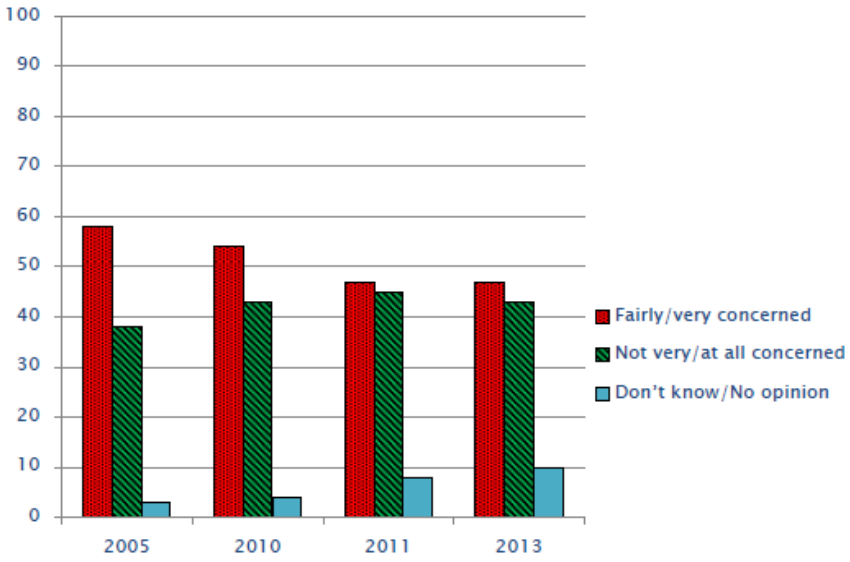
| | 2005 | 2013 |
|---|---|---|
| Overall, I support nuclear power | 26 | 32 |
| Overall, I oppose nuclear power | 37 | 29 |
| I am not sure whether I support or oppose nuclear power | 32 | 27 |
| I don't care what happens with nuclear power | 3 | 3 |
| Other/None of these/ Don't know | 1 | 9 |

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 12 March 2019).

Figure 1.32 shows the proportion of people reporting being fairly or very concerned about nuclear power dropped from 2005 to 2013. The proportion of respondents being 'not very' or 'not at all' concerned about nuclear power remained stable over the same time period. The data shows the increased acceptability of nuclear power over the 2005–2013 period.

**Figure 1.32. Concern about Nuclear Power**

(%)

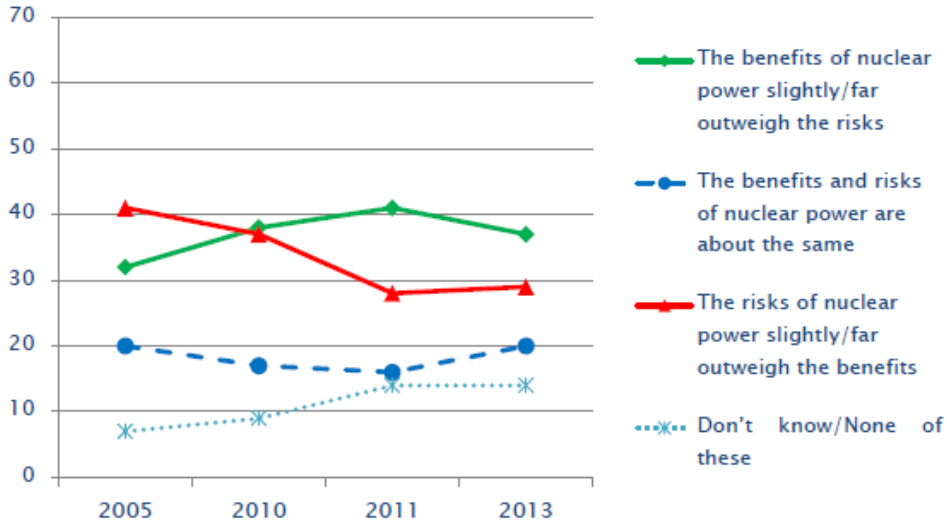



Source: UKERC (2013), Public Attitudes to Nuclear Power and Climate Change in Britain Two Years after the Fukushima Accident, 19 Sep, http://www.ukerc.ac.uk/publications/public-attitudes-to-nuclear-power-and-climate-change-in-britain-two-years-after-the-fukushima-accident-summary-findings-of-a-survey-conducted-in-march-2013-working-paper.html (accessed 12 March 2019).

Figure 1.33 shows the proportion of respondents who believe that the risks of nuclear power either lightly or far outweigh the benefits has likewise fallen. The proportion of people who believe that the benefits of nuclear power slightly or far outweigh the risk of nuclear power increased slightly, whilst the proportion being of the opinion that the risks and benefits of nuclear power are about the same remained stable.

**Figure 1.33. Perceived Risks and Benefits of Nuclear Power**

(%)



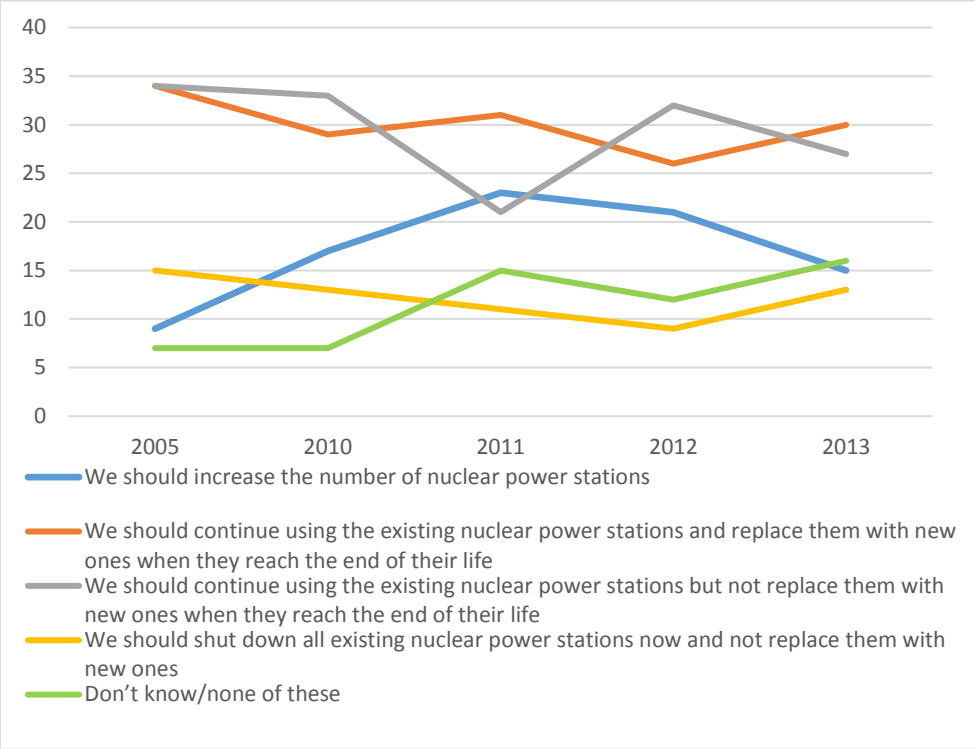

Source: UKERC (2013), Public Attitudes to Nuclear Power and Climate Change in Britain Two Years after the Fukushima Accident, 19 Sep, http://www.ukerc.ac.uk/publications/public-attitudes-to-nuclear-power-and-climate-change-in-britain-two-years-after-the-fukushima-accident-summary-findings-of-a-survey-conducted-in-march-2013-working-paper.html (accessed 12 March 2019).

Figure 1.34 regarding the future of nuclear power in the UK shows that public views were evenly balanced. While 15% maintained that the number of nuclear power stations should be increased, 13% were of the opinion that all existing nuclear power stations should be shut down immediately. A total of 30% of the sample were of the opinion that 'We should continue using the existing nuclear power stations and replace them with new ones when they reach the end of their life'; whereas 27% agreed that 'We should continue using the existing nuclear power stations but not replace them with new ones when they reach the end of their life'.

People who choose 'We should continue using the existing nuclear power stations but not replace them with new ones when they reach the end of their life' or 'We should shut down all existing nuclear power stations now and not replace them with new ones', want to phase out nuclear power immediately or gradually, has decreased from 50% in 2005 to 40% in 2013. People who choose 'We should increase the number of nuclear power stations' or 'We should continue using the existing nuclear power stations and replace them with new ones when they reach the end of their life', want to replace nuclear power plant has changed little from 43% in 2005 to 44% in 2013.

**Figure 1.34. Views on the Future of Nuclear Power in the United Kingdom**

(%)




Source: UKERC (2013), Made by IEEJ based on 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 12 March 2019).

## 6. Summary of the public images on nuclear power

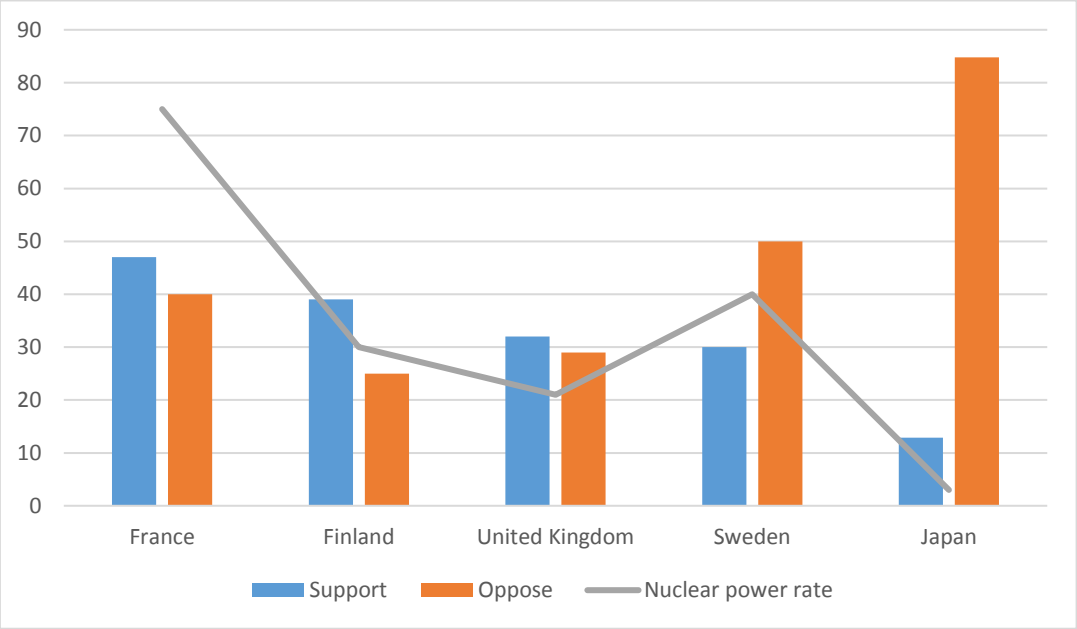
In general, nuclear power has been accepted in France, Finland and the UK, although its level differs from country to country depending on domestic affairs and how and by whom surveys are conducted.

Figure 1.35 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. 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 public acceptance of nuclear power and its share in the nation's electricity supply.

As mentioned in sub-chapter 4, nuclear power accounts for about 40% of Sweden's electricity supply, though the public in general does not support this power source. The greater the acceptance of nuclear power, however, the higher its share in the nation's electricity supply, which applies to France, Finland, the UK, and Japan.

The survey techniques and questionnaires, meanwhile, should be standardised to see if these trends apply to the 31 countries generating nuclear power. In particular, there are variations in energy policies, decision-making mechanisms and electrical institutions in Asia, which consists of countries with different cultures and histories. Thus, the results of surveys to be conducted in the Republic of Korea, China, India, Taiwan, and Pakistan based on standardised targets, techniques, and questionnaires remain to be seen, given that Japan's policymaking mechanisms are different from theirs.

**Figure 1.35. Is there Correlation between Public Opinion and Nuclear Use?** (%)




Source: Prepared by IEEJ based on the results of surveys shown in Chapter 1.