

Examining Prospects of Public Acceptance of Nuclear Power in the Republic of Korea

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1. Introduction

The Republic of Korea (ROK) has an aggressive plan for nuclear power development including a goal to become the world's third largest exporter of nuclear reactors by 2030. In contrast, the general public of the ROK shows different views toward nuclear energy. According to a recent survey, 63.8% of Koreans responded that nuclear power is important but unsafe. Along with this trend, there is a growing anti-nuclear movement in the ROK as a post-Fukushima development enlarging the gap between the government policy and social acceptance. In this research, we examined the prospects of public acceptance of nuclear power in the ROK. For this purpose, the history of nuclear power development and public acceptance changes in the ROK is reviewed and salient factors that affected the historical development are identified. Results are compared with what was observed among other major nuclear power countries such as the U.S., Sweden, Germany and Japan.

2. Examination of Public Acceptance Developments in Major Nuclear Power Countries

Introduction and development of large-scale advanced technology, such as nuclear power technology, has been carried out by government, dominated by technical experts. This type of development is often characterized by technological optimism and technological nationalism. When nuclear power was first introduced to the ROK, the general public was not familiar to nuclear risk debate. Decision-making by the experts and government bureaucracy demanded social acceptance of nuclear energy. At the time, the public was not given much choice but assumed trust in authorized and responsible parties. The purpose of this study is to apply the SCOT (social construction of technology) approach [1,2] to the history of public acceptance of nuclear power. The case of the ROK and other major nuclear power states (i.e., The United States, Sweden, Germany, and Japan) were examined. Salient factors affecting the developments were identified as part of the historical review.

2.1 The Republic Of Korea

Nuclear power was introduced in mid 1970s to the ROK based on foreign assistance. At that time, social political situation was dominated by an autocratic regime. As a war-torn country after World-War II, there

were no economical commercial foundations or infrastructure. Serious conflicts of ideology prevailed in the peninsula. Then, the Korean-war broke out devastating much of the peninsular resulting in divided two states. There were no major electricity generating infrastructure in South Korea. Military security was always on top of national agenda as the war was just in abeyance. ROK's first-president Syng-man Lee was interested in nuclear energy for both security and economic growth purpose. Government decision makers and scientists/technical experts dominated the process of developing such complex and advanced technology in isolation from the public. Such development history in the ROK resulted in low level of trust from the public especially when public trust in government was lacking. And after 1970, anti-nuclear movement had begun.

Throughout 1980s and 1990s, nuclear power provided much needed energy for rapid industrial development proving good business to the nuclear industries and government. The public remained uncertain about the technology through the experiences from the TMI accident in the U.S. and the Chernobyl accident in former Soviet Union. At that time, Korean government was not a good communicator with the citizen regarding potential risk of the technology. Decisions were made unilaterally. Policymakers and nuclear industry defined nuclear energy as national priority and promoted the advantages of nuclear power to the citizen through agencies such as KONEPA (Korea Nuclear Energy Promotion Agency). Site selection process began to be challenged by local residents following the NIMBY phenomena. And the anti-nuclear movement grew explosively.

In 2000s, government and nuclear industries agreed to a new approach to develop new sites for nuclear power plants, which contained local referendum law and financial inducements, close to 300 million dollars. Following these efforts, agreement was made for site selection process for radioactive waste disposal and the policy for expansion of power plant was adopted in 2000. Subsequently, Gyeong-ju was selected as the site of radioactive waste disposal with the support by the majority of local residents in 2005. Although some doubted the local referendum law, citizen's awareness of nuclear power and support grew strong and anti-movement of local resident was losing steams. People believed in nuclear power to further develop the nation as an economical and effective means of energy generation. Local residents also believed that nuclear power would be helpful to local economics and developments. The benefits of having nuclear power

plant in their community were felt by the families and neighbors. Thus, many local communities even competed as sites for new nuclear constructions, even in the regions that opposed the development in the past. Moreover, when Korea successfully completed an export deal of four nuclear power plants to U.A.E in 2009, nuclear energy became national pride and flagship national business project. It was Nuclear Renaissance. Nobody expected any major accident

In March 11, 2011 the Fukushima accident occurred. This accident shattered the existing paradigm of nuclear energy as national infrastructure energy source. After the Fukushima accidents, the world was reminded that nuclear power is hard to control by humans. Nuclear industries and researchers are focusing on development of new generation of technology investing heavily on nuclear safety. The government is also making effort to communicate with the public acknowledging the importance of social acceptance. Local residents remain ambivalent about nuclear power as they doubts the safety of nuclear power but feels powerless against ongoing national commitment to continued operation of nuclear power plants. Also they could not forget that they agreed to build nuclear power plant in their community recognizing financial benefits.

2.2 Overseas Experiences

This study also attempted to glean lessons from overseas countries where nuclear power was developed much earlier than ROK. Four states were included in the review; United States, Sweden, Germany, and Japan.

	Poll timescale (years)	Increase in support (%) over period of poll	Level of support (%) in most recent poll
Finland	21	21	45 (2003)
France	13	~0	47 (2007)
Hungary	14	7	75 (2005)
Japan	30	-15	40 (2008)
Sweden	19	38	50 (2005)
United Kingdom	6	16	36 (2007)
United States	9	20	62 (2007)

Table 1. Summary of time trends in support for nuclear energy [9]

2.2.1 United States

There has been considerable public and scientific debate about the use of nuclear power in the United States, mainly from the 1960s to the late 1980s, but also since about 2001 when talk of a nuclear renaissance began. There have been debates about issues such as nuclear accidents, radioactive waste disposal, nuclear proliferation, nuclear economics and nuclear terrorism [3]. Before 2000, three eras of social acceptance can be hypothesized to represent the history of social acceptance of nuclear power in the United States. The first era is the early period of optimism during the Eisenhower and Kennedy years before 1968 and the end of Vietnam War. After that comes the era of doubt, criticism and pessimism as an aftermath of Vietnam

War through the 1980s. And the last era since early 1990s is characterized by the slogan, 'Let the Good Times Roll' which means economic expansion with nuclear power [4]. A series of Gallup polls from 1994 to 2012 found support for nuclear energy in the United States varying from 46% to 59%, with opposition ranging from 33% to 48%. In nine out of the ten polls, both a plurality and a majority favored nuclear power; the exception was a 2001 poll in which 46% favored, and 48% opposed nuclear power. Polls which taken just before the Fukushima accident and a year after the accident found identical percentages of 57% favoring nuclear power [5].

Overall, do you strongly favor, somewhat favor, somewhat oppose, or strongly oppose the use of nuclear energy as one of the ways to provide electricity for the U.S.?

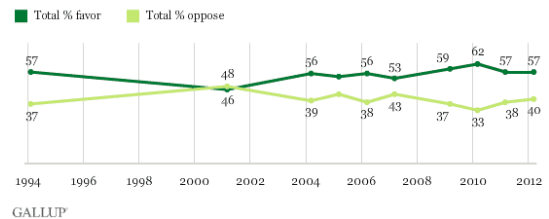


Figure 2. Gallup's annual Environment survey

After 2000, a number of newcomer states emerged in the use of nuclear technology and U.S has remained a global leader of nuclear power technology. The U.S. government is committed to support nuclear technology and its governance for nuclear safety and nonproliferation. The public opinion accepts the role of the U.S. as global leader.

2.2.2 Sweden

Before the Fukushima accident, public acceptance of nuclear power had been increasing. The latest Eurobarometer on Radioactive Waste published in July 2008, showed that there were almost as many citizens in favor of nuclear energy (44%) as against it (45%) in Europe. In Sweden, public's support for nuclear power rose to 62% [6].

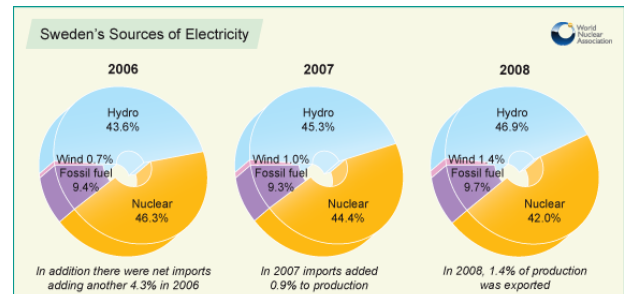


Figure 3. Sweden's Sources of Electricity

Sweden has 10 nuclear reactors that accounted for 43 % (65.8TWh) of total electricity production in 2013. The latest survey carried out in October 2013 by the

Analysis Group6 shows that 35 % of Swedes support the continued use of nuclear energy and the building of new reactors if needed and 33 % support the continued use of nuclear energy, but do not want any new reactors to be built. 22 % want nuclear power to be phased out. 47 % of the respondents back the idea of closing old reactors to replace them by new ones and 32 % are against it [6].

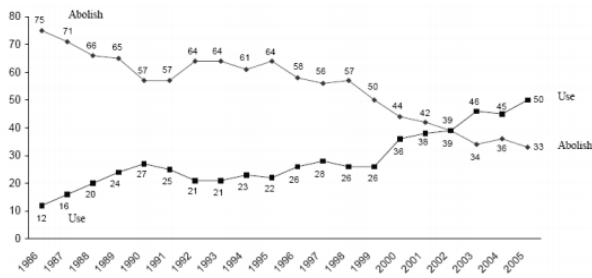


Figure 4. Swedes on the use of nuclear power as an energy source [9]

2.2.3 Germany

Germany had been one of the largest users of nuclear energy in Europe before the Chernobyl accident. After the Chernobyl accident, Germany adopted the policy of nuclear phase-out. This policy became controversial when the performance of nuclear power continued to improve. The country currently operates 9 nuclear reactors that accounted for 15% of its total electricity production in 2013. After the Fukushima accident, German Chancellor, Angela Merkel, announced in March 2011 immediate closure until June 2011 of seven nuclear reactors that has been operating from 1980. In August 2011, eight reactors were declared permanently shut down. The government adopted the decision to phase out nuclear by 2022. An opinion poll commissioned by the German Atomic Forum (DATF) and carried out by Forsa in April 2014 shows that 72 % of the Germans support a unified European energy policy. However 56 % oppose the idea that Germany should review its energy policy goals, such as the nuclear phase-out, the limitation of lignite mining and the ban of shale gas extraction in the light of energy security of supply concerns raised by the Ukrainian political crisis [7].

2.2.4 Japan

Japan has been one of the world’s most committed promoters of civilian nuclear power. Japan’s nuclear industry was not hit as hard by the effects of the 1979 Three Mile Island accident (USA) or the 1986 Chernobyl disaster (USSR) as some other countries. Construction of new plants continued to be strong through the 1980s and into the 1990s. However, starting

in the mid-1990s there were several nuclear related accidents and cover-ups in Japan that eroded public confidence in the industry, resulting in protests and resistance to new plants [8]. In case of Japan, the government has strong centralized controlling power over people, so public acceptance has depended on the government’s policy. But the 2011 Fukushima nuclear disaster has changed the attitudes of the public in Japan.

2.3 Salient factors of each state

Based on the reviews of nuclear power development history in the ROK, the U.S., Sweden, Germany, and Japan, some salient factors that might have affected the history may emerge. In addition, there may be not only direct factors but indirect ones related to social systemic issues. Some of them are driven by the concerns related to perceived lack of transparency.

Table 1. Factors that might increase public support for nuclear power

Factor		
Direct	Necessity	Dependence on nuclear power
	Economy	Economic benefits
	Safety	Risk management ability, risk acceptance
	Sustainability	Long-term government policy for energy sustainability and spent fuel management
Indirect	Knowledge	Education, information sharing
	Trust	Communication, participatory decision making
	Relationship	National culture

In general, the common factors that have affected nuclear power development are related to necessity, economic benefits, social culture, and trust in government.

In the case of the United States, safety records of nuclear power, economic benefits, and information sharing played a large role. In August 2001, the U.S. declared National Energy Policy Development (NEPD) which included diversity in energy source mix, enlargement of nuclear power plant, and enhancing national energy infrastructure. Nuclear energy policy of the U.S also affected other countries’ development of nuclear power.

In the case of Sweden, the country currently has positive public opinion toward nuclear power. This country has focused national effort on information sharing as the key to increasing public acceptance. The level of information sharing can be identified by Eurobarometer survey report. On average EU citizens do not feel well-informed (74%, Eurobarometer on Nuclear Safety) about nuclear issues and radioactive waste in particular. However in Sweden, the level of knowledge sharing as perception is high (Knowledge (K): 47%, Acceptance (A): 62%). The public opinion is also more favorable to nuclear power (Eurobarometer on Radioactive Waste) [7].

In Germany opposition to nuclear has risen sharply in recent years. , while new build plans are underway, in countries like the United Kingdom or France. After the Fukushima accident Germany decided not to build new nuclear reactors and/or to phase out nuclear [7]. Because of German public's fear about nuclear power, the support level is only at 7%. German government acted immediately after the Fukushima accident shutting down the eight oldest operating reactors and imposing severe financial costs on local power consumers through moving to a renewables-heavy energy strategy [11]. In terms of efforts for public assistance and communication, Germany is a role model in comparison to the ROK political situation.

Lastly, Japan is in a similar situation with the ROK. There are no domestic energy resources, with the dependence on foreign energy import at 83.6% while maintaining very large commercial nuclear power program. Because of geographical location, the country is isolated from other states in terms of energy supply. Japan has the capability to reprocess spent nuclear fuel providing sustainable fuel cycle management scheme. Political system in Japan is powerful and centralized, while social culture remains conservative.

3. Conclusions

Some lessons can be learned from other states' experiences to help ROK develop positive nuclear public acceptance. Improving nuclear safety and solving nuclear waste management problem along with enhancing information sharing with the public were found important. Building the culture of trust between government and the public was also very important.

As a future work, this study will attempt to perform quantitative analysis of the historical data to identify major factors that might significantly affect public acceptance trend.

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