

Comparative Analysis of Site-Selection Process for Power Plants in Korea: Cases of Thermal, Nuclear, and Renewable Energies

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1. Introduction

In 2014, the Ministry of Trade, Industry, and Energy announced the Energy Basic Plan 2nd [1] to propose policies that demand management, decentralized power generation, harmonization of environmental and safety, stable supply system, reinforcement of energy welfare and conflicts management based on analyses and forecasts of the domestic energy consumption circumstance with domestic and overseas conditions. Korea has been responding to electric power demand through national energy policy, but in 2011, it suffered a great outage across the country. Since then, the social interest in the energy security and supply stability has increased, and the need for additional power generation facilities has been emphasized.

However, although it is part of national energy strategies and public projects, construction of power generation facilities uses to cause social conflicts. Not only the construction of nuclear power plants, but there have also been cases in which the power plant projects of thermal or renewable energy (tidal power, wind power and solar power) were interrupted or canceled due to environmental problems or conflicts of stakeholders. In the latest date (March, 2017), various power generation facilities such as Samcheok thermal power plant, Busan offshore wind power plant, Garorim bay tidal power plant, Yeongdeok nuclear power plant, and Milyang transmission tower have been under discussion for future of the projects or already been canceled.

There are various conflicts related to power generation facilities; however, the conflicts that arise during the process of luring facilities or site selection, as in the previous cases, can eventually influence greatly the implementation of the national energy policy or strategy. In addition, the Boeun combined cycle power plants in Chungcheongbuk Province, which showed intense conflicts among the inhabitants during the process of establishing the Basic Plan for Power Supply and Demand 6th [2], dropped out of the Ministry of Knowledge Economy in January 2013. In the case of Shin-Hanul nuclear power plants unit 3 and 4 originally planned to commence in 2017, the plan for the 765kV transmission line from Shin-Uljin to Shin-Kyunggi was rejected by local inhabitants, so the parts of schedules for the Basic Plan for Supply and Demand of Power 7th [2] was also delayed.

This study focuses on overcoming or alleviating conflicts in power generation facilities with publicity and analyzing the policy decisions in the process of site selection by analyzing the cases. The subjects were the cases where conflicts occurred among power generation facilities by five energy sources: Shin-Kori nuclear power plant unit 5 [4,5], Garorim bay tidal power plant [6,7], Uiryeong county wind power plant [8,9], Haenam thermal power plant [10,11], and Gochang solar power plant Projects [12,13]. These projects with public conflicts are included in the Energy Basic Plan 1st [14] of 2008 or have been launched after the plan, and have been selected one by one for each energy source to understand context of policy characteristics with the energy sources, policy systems, external factors, etc.

These projects with public conflicts are included in the Energy Basic Plan 1st [14] of 2008 or have been launched after the plan, and have been selected one by one for each energy source to understand context of policy characteristics with the energy sources, policy systems, external factors, etc. The research method was the content analysis [15] based on the literature survey, and then created Causal Loop Diagram (CLD) [16] to analyze causal-effect structures. It is aimed to derive clear definition and implications of the phenomenon through the appropriate policy problem Structuring, is expected to contribute on further studies with Institutional Analysis and Development framework (IAD framework), Advocacy Coalition Framework (ACF) and game theory for prescriptive policy models.

2. Methods

This study was carried out by the content analyses of each case and causal-effects analysis as a qualitative research method. First, the case studies are to collectively grasp the phenomenon and context of each case Respectively by obtaining the data of selected cases, organizing the process of the project by period, indicating external factors such as policy changes, events, etc. Materials needed for case studies were obtained from public records such as government reports, municipal minutes, and official interviews, expert interviews, and related forums. Second, we conducted CLD analyses based on system thinking to structure the policy problem. It is a technique for identifying possible causes and consequences of problem situations with feedback processes in the dynamical analysis of events or behaviors, so this

method is adequate to find out causality of policy problem discussed in this study. The overall research process is shown in Fig. 1.

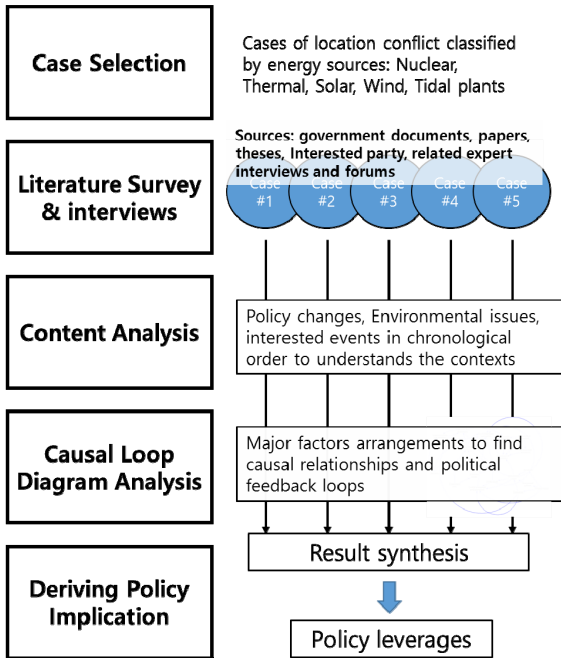


Fig. 1 The overall research process

3. Results and Discussion

In this study, we listed the major issues of each case on a time scale basis, and drew out and verified the causes and consequences of the phenomena revealed in the case through interviews and consultations. The following table is the case of construction process for the Shin-Kori unit 5 to describe the phenomena revealed in each process with following external factors: 1) a policy decision stage, 2) East Japan great earthquake, 3) EPZ change, 4) Gyeongju Earthquake, and 5) current states. In addition, Fig. 2. shows the changes in stakeholder who played a leading role in the decision-making process through the process, and then, CLD analysis was conducted to identify the cause-effect of this specific case as shown in Fig 3.

Table. 1. The case of construction process for the Shin-Kori unit 5 to describe the phenomena revealed

Time	Events	External factor
Jan.'09. ~Nov.'10.	Preliminary preparation work such as preliminary geological survey, cold sea water impact assessment, basic site layout and initial construction plan	
Feb.'09.	Establishment of basic plan for construction	Policy decision stage
Oct.'10.	KNHP began detailed site investigation to prepare preliminary safety analysis report	

Sep.'11.	Draft Environmental Impact Assessment Report for inhabitants and inhabitants briefing session	After East Japan great earthquake
Jun.'12.	Public hearing (local area)	
Jul.'12.	Application for approval of implementation plan of power development project	
Jul.'12.	Public hearings (KHNP)	
Aug.'12.	Basic agreement for migration of all of Silla Village	
Sep.'12.	Application for construction permit	
Nov.'12.	Establishment of organization for consultation of regional requirements (Chairperson: Vice Governor of Ulju county, 17 members)	
May.'13.	Commencement of examination of construction permit for Shin-Kori 5,6 units	
Jul.'13.	Submission of proposal for self-promotion from Seosaeng myeon inhabitants' Council to Governor of Ulju county	
Jul.'13.	Submission of the request for the construction of Shin-Kori 5,6 units in Ulju county from Governor of Ulju county to the National Assembly	
Jul.'13.	Ulju County Council agreed to request the construction of Shin-Kori 5,6 units	
Sep.'13.	Completion of environmental impact assessment consultation	
Nov.'13.	Completion of feedback from local governments and consultation with related central administrative agencies	
Jan.'14.	Seosaeng myeon inhabitants and KHNP Agreed regional support project	
Jan.'14.	Ulju county requested construction of Shin-Kori 5 and 6 plants to Ministry of Trade, Industry and Energy	
Jan.'14.	Approval of implementation plan of Power Development Project	
Jun.'16.	Approval of construction permit	After EPZ expansion
Sep.'16.	Greenpeace filed a lawsuit to revoke the construction permit for Shin-Kori 5 and 6 units	Yang-san earthquake
Oct.'16.	Earthquake issues pointed out in Ulju county plenary session	
Feb.'17.	Resolution to ban the legislation of the abortion construction of Shin-Kori 5 and 6 units (Ulju county plenary session)	

Overcoming or mitigating conflicts among stakeholder in the process of site selection has become an important issue as much as it was reflected in the Energy Basic Plan 2nd, which is Korea's top energy policy in the form of "Preemptive Management of Energy Conflicts". The plan established the principles of conflict management, minimized conflicts with

information of potential conflict factors, and tried to rearrange the policy direction from resolving post conflict settlement and adjustment with compensation and support policy to prevent proactive conflicts. This can be relevant to the tendency to spread awareness about ecological environment values and community reflection throughout society. The environmental damage caused by various facilities will be become a discussion point with the cleanliness of the area and the right to live, and will be managed in a rational way through the publicizing process of opinion setting through discussion processes including public hearings, informal gatherings for discussion, and debates.

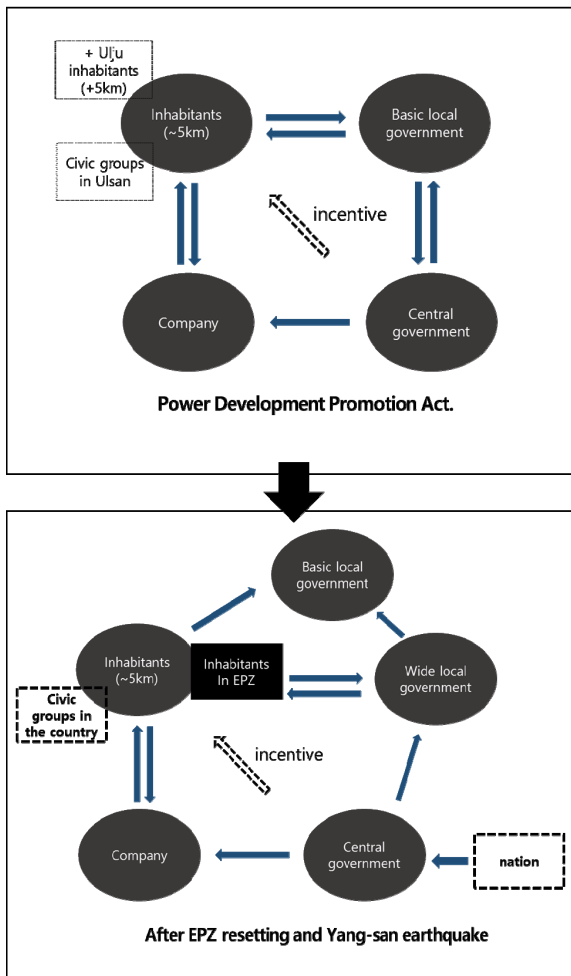


Fig. 2 The changes in stakeholder who played a leading role in the decision-making process through the processes in the case of Shin-Kori unit 5

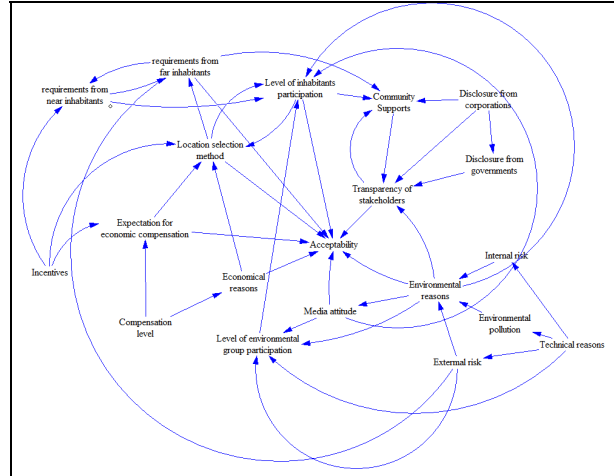


Fig. 3 Causal Loop Diagram for the case of Shin-Kori unit 5

The energy-related mode of governing has evolved into a voluntary and deliberative approach from the past Decide-Announce-Defend approach with the bureaucratic and technological elitist policy-making process, but has still been controversial. In spite of the fact that many procedural devices could reflect the opinions of inhabitants and experts in Ulsu county's voluntary acceptance model luring Shin-Kori nuclear power plant unit 5 and 6, it has been difficult to resolve, disagreements with local communities, complaints about policies, and the distrust of the company, policy makers and practitioners. Haenam Thermal Power Plant lured by the local government and part of inhabitants was eventually abandoned to construct by the company. Garorim bay tidal power generation has been consulted for various types of conflict resolution, but it is still in conflict. The planned energy policies have been failed to realize accurately with those cases.

On the other hand, the agreement between the resident representatives and the business operators led to commercial operation in the case of Uiryeong county wind power plant. These differences identified in the CLD results were the form of consensus that could enhance the credibility of company. The corporation actively responded to the demands of the inhabitants in order to restart the business. In addition, the arbitration from the experts that both sides could admit was effective. This shew that negotiations could be made to meet the conditions of both parties when inhabitants trusted the experts and corporation with high understanding of the project.

In the end, the cause of the conflict has been that although the change of the stakeholder due to the environmental change is obvious, the existing site selection policy is not able to handle the variable circumstances from the initial decision. Although current policy decision making has already evolved through many adjustments, it cannot adequately respond to environmental and stakeholder changes during power station construction that requires many periods.

4. Conclusion

This study analyzed the conflict phenomenon that occurred in the site selection policy of the power generation facilities through the case studies. We selected the most recent conflict cases by each energy source, identified the qualitative context characteristics of the cases and tried to suggest the policy leverages. In this study, it is concluded that the cause of conflicts in decision making system for site selection of power plants is insufficient yet due to the variable circumstances such as environmental events, stakeholder range, etc. However, the conclusions obtained from the case study are difficult generalization without specific prescription books, so further studies for those areas are required.

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