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A Study on the Implementation of Renewable Portfolio Standard Policy in South Korea

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Table of Contents

Chapter 1. Introduction 1
1. Study Background 1
2. Study Scope 3

Chapter 2. Literature Review 5
1. An Overview of Renewable Energy Policy 5
1.1. Renewable Protfolio Standard (RPS) policy in the USA 5
1.2. Feed-In Tariff (FIT) policy in Germany 9
1.3. FIT policy in South Korea 12
1.4. RPS policy in South Korea 14
2. Literaure on FIT and RPS policy 18

Chapter 3. Research Design 21
1 Theoretical Framework of Study 21
1.1. Matland's Ambiguity-Conflict Matrix 21
1.2. Definition of Variables 22
2. Analytical Framework 25
3. Method of Study. 26

Chapter 4. Result of Analysis 27
1. Symbolic Implementation (2012) 27
1.1. High Level of Ambiguity 28
1.2. High Level of Conflict 30
1.3. Summary 33
2. Political Implementation (2013) 34
2.1. Low Level of Ambiguity 35
2.2. High Level of Conflict 38
2.3. Summary 40
3. Administrative Implementation (2014) 42

3.1. Low Level of Ambiguity **42**
3.2. Low Level of Conflict **45**
3.3. Summary **47**

Chapter 5. Conclusion **48**
5.1. Summary **48**
5.2. Political Implication **49**

Bibliography **51**

Abstract

A Study on the Implementation of Renewable Energy Portfolio Standard Policy in South Korea

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This study reviews the implementation of renewable portfolio standard (RPS) policy centering on five power generation subsidiaries of Korea Electric Power Corporation. The theoretical framework used is Matland's Ambiguity-Conflict model. This study tries to analyze characteristics of policy implementation according to the ambiguity of goals and level of conflict rather than evaluation of the RPS system.

This study finds that RPS policy implementation has undergone three different stages from symbolic to political to administration implementation over the first three years. This study confirms that policy ambiguity and policy conflict between policy stakeholders can be the cause of policy drift. Therefore, it is important for policy makers to specify reasons for setting policy goals, the necessity of implementation, the method of implementation, understanding policy subjects, and minimizing conflicts for successful implementation of policy. In addition, this study shows that the control tower on how to regulate the renewable energy industry is essential for smooth policy implementation.

Keywords : Renewable Energy, Renewable Portfolio Standard (RPS) Policy, Policy Goal Ambiguity, Ambiguity-Conflict Model, Policy Implementation

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Chapter 1. Introduction

1. Study Background

South Korea has pursued policies to foster new and renewable energy[1] (hereafter "renewable energy") production to strengthen energy security and foster related industries. South Korea's energy consumption is the eighth largest in the world. However, more than 95% of energy consumption is dependent on imports. This is because Korea has a natural environment with little energy resources except some coals. If we cannot use clean and safe energy as needed in the modern society, it will be a catastrophic disaster that makes it difficult to conduct everyday life. In addition, in May 2017, the South Korean government declared a temporary shut-down of coal-fired power plant in order to solve fine dust which is a serious threat to the environment and health. The government announced that it would cease construction of nuclear power plants in the future because the issue of radioactive leaks from nuclear power plants in the East Sea was highlighted by the Gyeong-ju and Po-hang earthquake. In addition, in the global renewable energy market such as solar panels, South Korean companies are competing with companies in other countries. In this way, there is a consensus that the development of renewable energy is indispensable for energy security, natural environment protection, and new growth engine of our economy.

From 2002 to 2011, South Korean government had compensated for differences between the cost of electricity generation from renewable energy resources and the cost from fossil fuel, in order to accelerate investment in renewable energy. This compensation is referred to as the Feed-In-Tariff (FIT) policy. Since 2012, the Korean government has phased out the FIT policy, and

[1]New energy: Energy that utilizes electricity or heat through conversion of existing fossil fuel or through chemical reaction such as hydrogen or oxygen, including energy generated by gasification of hydrogen energy, fuel cell, coal liquefied gasification, and heavy residues (Article 2 of the New and Renewable Energy Act)

Renewable energy: Energy that converts and uses renewable energy, including sunlight, water, geothermal, precipitation, bio-organisms, and so on. It includes solar energy, wind power, hydroelectric power, marine energy, geothermal energy, bio energy, and waste energy (Article 2 of the New and Renewable Energy Act)

started to apply Renewable Portfolio Standard (RPS) policy to major power generators. With this, the South Korean government announced a challenging target of increasing the rate of renewable energy resources to 20% by the year 2030. In 2012, the first year of introducing the RPS system, fulfillment performance was only 64.7%. However, the implementation rate was gradually increased to 90.2% in 2015. In other words, RPS policy implementation has been successful since 2015.

Although the RPS policy implementation amount has achieved its targets, there is still a question about whether South Korea's renewable energy competitiveness has been secured[2]. Is the government strengthening the competitiveness of renewable energy production by implementing RPS policy? Is renewable energy becoming a substitute for fossil fuels[3]? Is the renewable energy industry developing as a new growth engine for our economy?

This study starts from the consciousness that the competitiveness of renewable energy has not been intensified as intended of the policy goal, although the implementation of RPS, has been successfully achieved. This study argues that be obsessed with quantitative results, policy goal displacement could be appeared. For this purpose, this study attempts to analyze RPS policy implementation process during the first three years and suggests requirements for successful policy implementation.

The remainder of Chapter 1 briefly introduces information of RPS policy and the scope of this study. Chapter 2 reviews literature about RPS policy. Chapter 3 offers a theoretical framework by Matland's ambiguity-conflict model, including: symbolic, political, experimental, and administrative implementation. Chapter 4 analyzes the RPS policy in South Korea that has undergone three stages: symbolic, experimental, and administrative implementation. Finally, policy implications of this study with a summary of study results are presented in Chapter 5.

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[2] As the summer heatwave continued in August 2018, demand for electric power surpassed record highs every day. Questions were raised about the policy of the government's nuclear power plant.

[3] As of 2018, the cost of energy production is 62.05 won / kwh for nuclear power, 86.58 / kwh for coal, and 95.94 won / kwh for renewable energy, which is less economical than fossil fuel
(Retrieved December 10, 2018, from http://news20.busan.com/controller/newsController.jsp?newsId=20181004000268, Busan Ilbo, October 18, 2018).

2. Scope of Study

This study analyzes the performance of RPS system for three years from 2012 to 2014. Specifically, the study was conducted on RPS performance of renewable energy generation except solar PV (hereafter "non-solar PV"), which was implemented by five power generation subsidiaries of Korea Electric Power Corporation[4] (hereafter "five power generation subsidiaries of KEPCO").

Reasons for selecting KEPCO's five power generation subsidiaries for analysis are as follows. The six power generation subsidiaries[5] of KEPCO are large-scale power generation companies. They accounted for 92% of the total supply of RPS in Korea in 2014 (table 1.1.). Thus, analyzing the implementation status of RPS by KEPCO subsidiaries has similar results as analyzing the RPS implementation of the entire power generation companies. Korea Nuclear & Hydro Power Co. (KHNP) is excluded from analysis of this study because KHNP operates 595MW hydropower facilities including 21 hydro-electric power plants. Thus, it has achieved 100% RPS performance since 2012. As such, KHNP can easily achieve the RPS requirement using existing hydroelectric power plants. Thus, there is no reason to analyze its implementation status.

Reasons for selecting non-solar PV implementation as the main analysis target in this study are as follows. It accounted for 81% of renewable energy generation except solar PV and 19% of solar-PV power in total RPS supply in 2014. The government sets up a separate amount of solar-PV power to protect and nurture the solar market which has relatively high power generation costs. Since solar-PV

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[4] Five subsidiaries of KEPCO include the following five companies.

1. Korean South East Power Co.(South East Power)
2. Korea Midland Power Co. (Midland Power)
3. Korea Southern Power Co. (Southern Power)
4. Korea Western Power Co. (Western Power)
5. Korea East-West Power Co. (East-West Power)

[5] KEPCO's power generation subsidiaries include the following six companies.

1. South East Power
2. Midland Power
3. Southern Power
4. Western Power
5. East-West Power
6. Korea Hydro & Nuclear Power Co.

power plants have been cultivated under the FIT system, it is easy to achieve solar energy requirement under the RPS. Thus, it was excluded from analysis in this study[6].

Therefore, five power generation subsidiaries of KEPCO have most of coal-fired plants. Thus, implementation of RPS by these five power generation companies is considered to be an essential factor for the success of RPS. This study looks at RPS implementation of these five power generation subsidiaries in non-solar PV.

Table 1.1. Obligatory supply under the RPS (2012~2014)

(unit : REC)

Total(solar PV)		2012	2013	2014
Group 1	Korea Nuclear & Hydro Power Co.	1,979,915 (44,160)	2,462,732 (114,234)	2,523,871 (211,254)
	Korean South East Power Co.	790,632 (42,780)	1,267,215 (110,619)	1,771,178 (205,749)
	Korea Midland Power Co.	695,094 (42,780)	1,055,343 (110,619)	1,367,294 (205,749)
	Korea Southern Power Co.	790,845 (42,780)	1,285,502 (110,619)	1,956,622 (205,749)
	Korea Western Power Co.	717,647 (42,780)	1,140,879 (110,619)	1,445,591 (205,749)
	Korea East-West Power Co.	691,227 (42,780)	1,156,955 (110,619)	1,387,192 (205,749)
Group 2	Korea Water Resources Corporation	- (2,484)	- (7,953)	- (14,883)
	Korea District Heating Corporation	103,698 (2,484)	164,355 (7,953)	204,952 (14,883)
	SK E&S	87,668 (2,484)	125,974 (7,953)	128,186 (14,883)
	GS EPS	78,294 (2,484)	131,999 (7,953)	180,595 (14,883)
	GS Power	50,116 (2,484)	91,364 (7,953)	96,426 (14,883)
	POSCO Energy	170,511 (3,036)	260,850 (7,953)	309,459 (16,773)
	CGN Meiya Power	36,994 (2,484)	59,273 (7,953)	77,653 (14,883)
TOTAL		6,144,279 (276,000)	9,210,394 (723,000)	10,224,565 (1,353,000)

Source: Reconstruction of data of Korea Energy Management Corporation

[6] Solar-PV has achieved 100% RPS performance since 2012.

Chapter 2. Literature Review

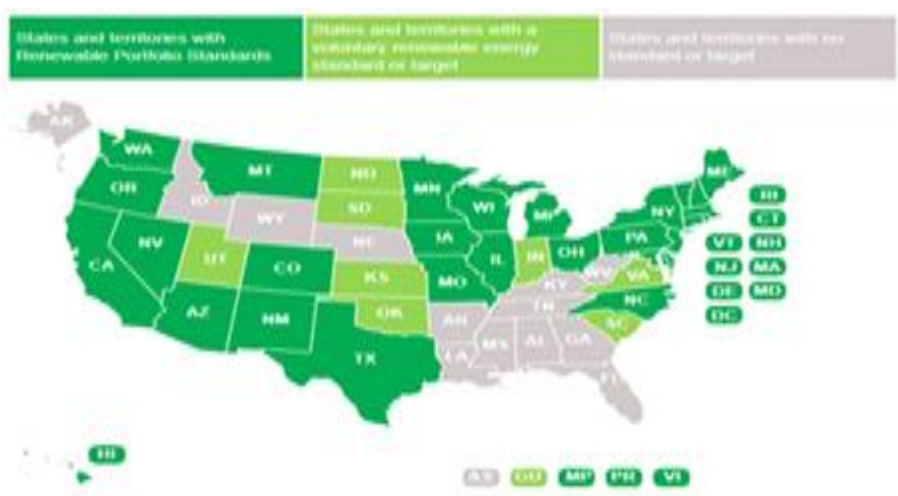
1. An Overview of Renewable Energy policy

Among renewable energy support policies, FIT and RPS are major representative policies. Many countries and state governments selectively implement one of these two polices. FIT has been implemented by 65 countries in 2012 and RPS is being implemented in 18 countries and many states in the United States (Kwon, 2015: 302). In Germany, FIT is the basis of renewable energy policy, and in the United States, RPS is the basis of renewable energy policy. Thus, the following section describes RPS in the US, FIT in Germany and FIT and RPS policies in South Korea.

1.1. RPS policy in USA

As of August 2017, 29 states including, California, Arizona, Washington D.C., and three U.S. territories required electric utilities to implement RPS system, while eight states, including Utah and Kansas, and Guam, recommended implementation of RPS system (Figure 2.1.).

Figure 2.1. State in which RPS system is in operation

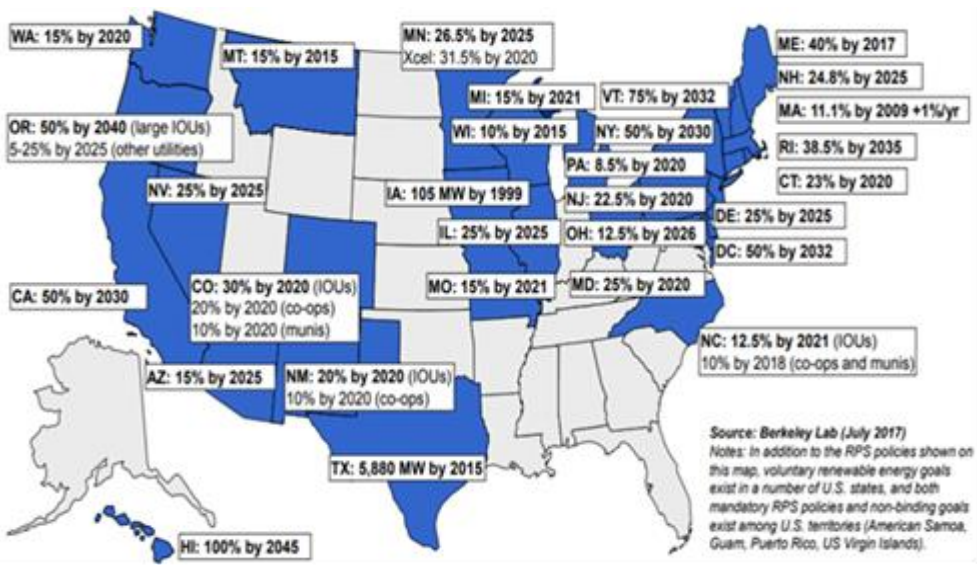


Source: http://eta-publications.lbl.gov/sites/default/files/2017-annual-rps-summary-report.pdf

The US RPS system also requires that a certain percentage or amount of power sold by utility companies should be supplied by renewable energy sources, as is the case of South Korea's RPS system. This regulation applies mainly to investor-owned utilities. It may also apply to utilities or power cooperatives operated by the state. State governments provide tax credits to support utilities compliance.

As shown in Figure 2.2., Hawaii is planning to provide 100% of its electricity with renewable energy by 2045, which sets the most aggressive target as of 2017. In most states, the amount of renewable energy is defined as the percentage of renewable energy sources in total energy source. But Iowa and Texas require that a certain amount of renewable energy should be produced[7] . Kansas has regulated the production of renewable energy at a certain percentage of the electricity generation time that it produces the most [8][9].

Figure 2.2. Duty to supply renewable energy for each state



Source: http://eta-publications.lbl.gov/sites/default/files/2017-annual-rps-summary-report.pdf

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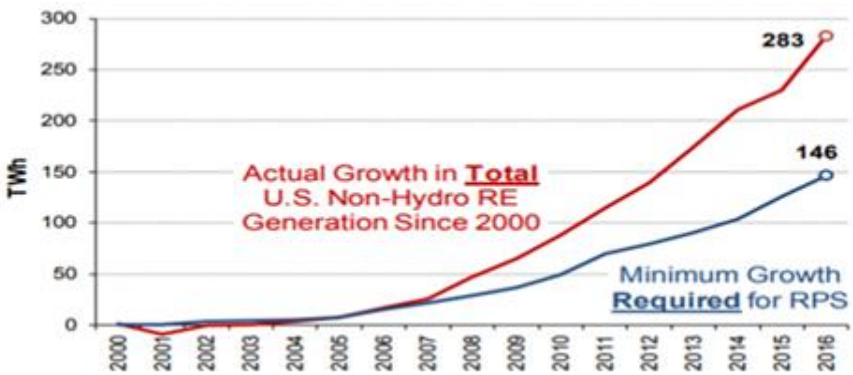
[7] Iowa requires that investor-owned power companies produce 105 MW of renewable energy, and Texas states that utility companies must produce 5,880 MW by 2015 and 10,000 MW by 2025 as renewable energy.

[8] Electricity companies should supply 15% by 2019 and 20% by 2020 as renewable energy in peak-time.

[9] http://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx

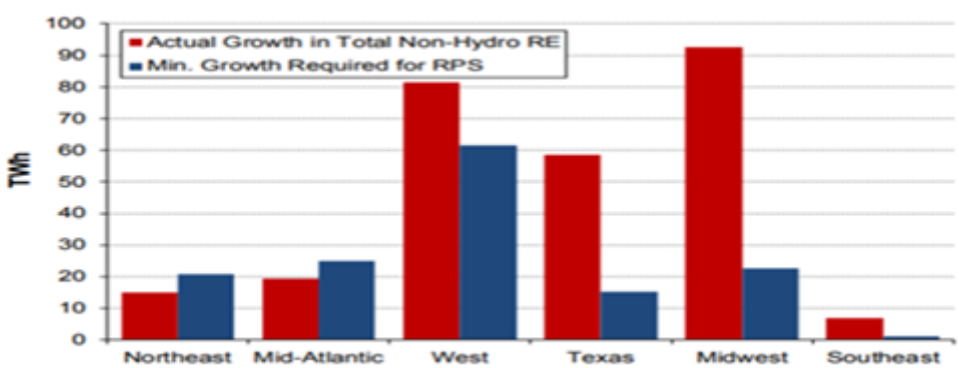
RPS system has provided a stable supply of renewable energy demand. As shown in Figure 2.3., about half of renewable energy production excluding hydroelectric power in 2016 was due to RPS system. In particular, the RPS system plays a pivotal role in the West, Northeast, and Mid-Alantic regions, covering 70% to 90% of renewable energy demand (Figure 2.4.).

Figure 2.3. Renewable energy generation by year (excluding hydropower)



Source: http://eta-publications.lbl.gov/sites/default/files/2017-annual-rps-summary-report.pdf

Figure 2.4. Renewable energy generation by region (excluding hydropower)



Source: http://eta-publications.lbl.gov/sites/default/files/2017-annual-rps-summary-report.pdf

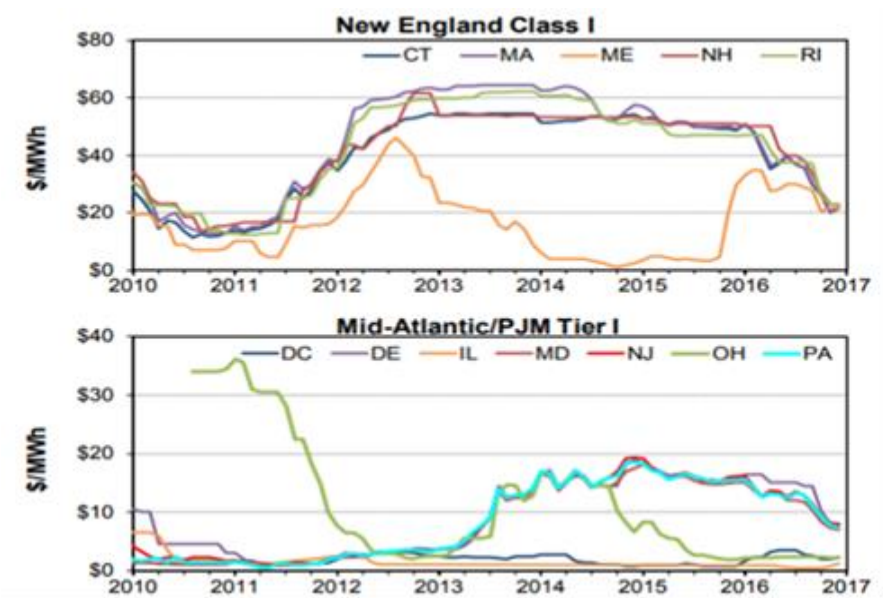
As shown in Figure 2.5., RPS targets for 2017 were mostly achieved except

for some states such as New York and Illinois. As many renewable energy sources are available in many states, the price of renewable energy certificates (REC) has been declining since 2016 (Figure 2.6.).

Figure 2.5. RPS Obligations per State (2017)

Source: http://eta-publications.lbl.gov/sites/default/files/2017-annual-rps-summary-report.pdf

Figure 2.6. Renewable energy supply certificate price trend by region

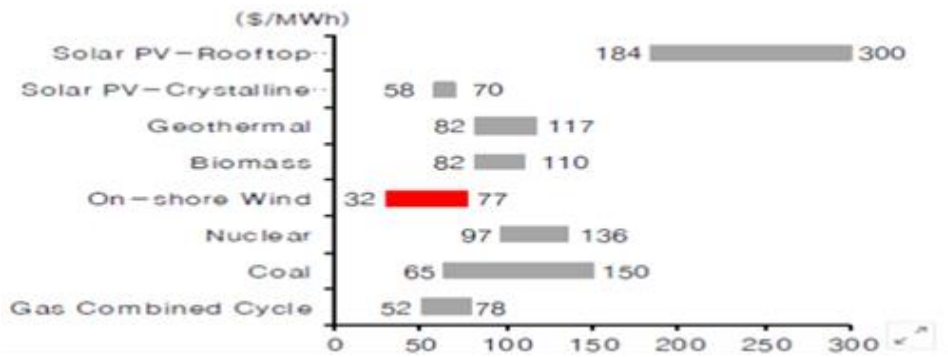


Source: http://eta-publications.lbl.gov/sites/default/files/2017-annual-rps-summary-report.pdf

The US RPS system has triggered a trickle-down effect on the renewable

energy sector. This, has led to large-scale private sector investment. As a result, it has secured the competitiveness of renewable energy. At present, the unit price of some renewable energy such as wind power and solar power in the United States has achieved grid parity (renewable power generation unit cost is similar to that of existing energy sources such as coal and thermal power). In particular, as shown in Figure 2.7., the unit cost of 1 MWh for offshore wind is 32 to 77 dollars, lower than the cost of coal (65 to 150 dollars), nuclear power (97 to 136 dollars), and natural gas (52 to 78 dollars). If technological development of renewable energy sources continues, the price of power generation will continue to decline. This will secure price competitiveness against fossil fuel energy sources[10] .

Figure 2.7. Comparing the cost of power generation by energy source



Source: The U.S. Energy Information Administration, 2017

2.2. FIT policy in Germany

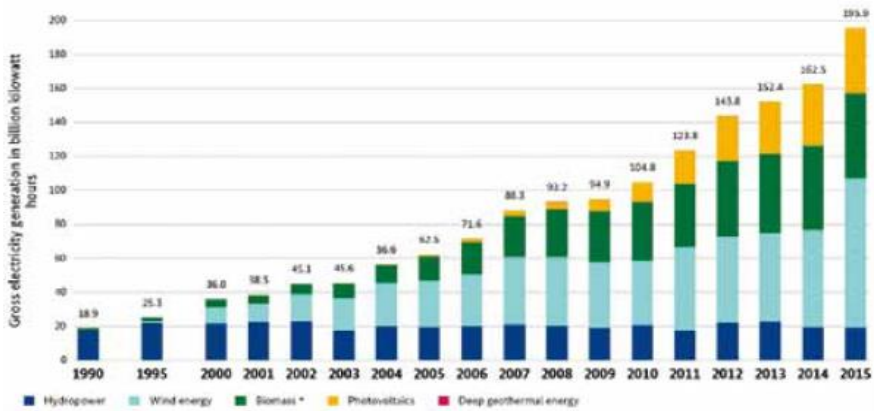
According to the German Ministry of Economy and Energy, the share of renewable energy in total power consumption in Germany reached 32.6% in 2015. Renewable energy generation amounted to 195.9 TWh, but the share of wind power was 44.9% followed by biomass power generation, solar power generation,

[10] Danny Kennedy, a solar energy company in California, says his company is already making more profit than existing fossil-fuel power plants. He explains that the solar energy industry is already a stage where profits can be made (Scaling-up at unit level or Scaling-up at the industry scale) beyond the initial inefficient technology stage (Extended period of experimentation) (https://tedxsydney.com/contributor/danny-kennedy/).

and hydro power generation.

Figure 2.8. Renewable energy-based electricity production in Germany

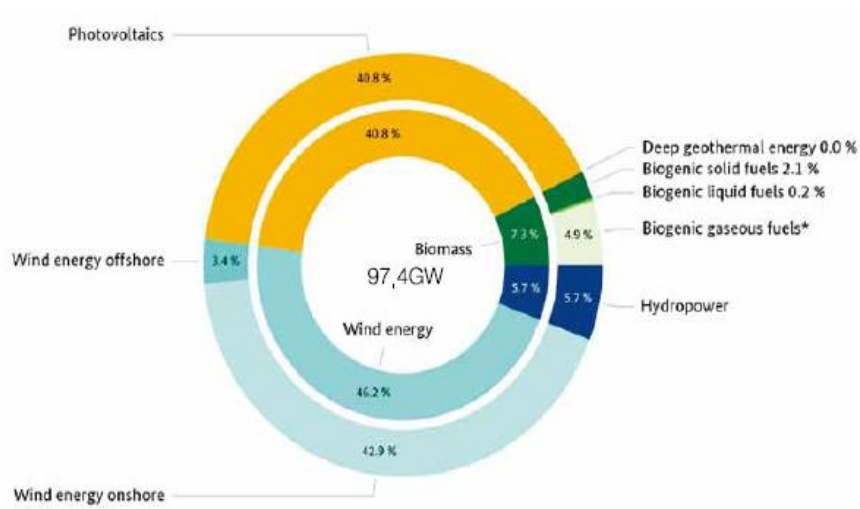
(unit: TWh)



Source: German Ministry of Economy and Energy, 2016

The capacity of renewable energy generation facilities reached 97.4GW, with wind power capacity of 45GW (46.2%), followed by 40.8% (39.7GW) of photovoltaic power generation, 7.3% (7.1GW) of biomass power generation, and hydropower 5.7% (5.5GW).

Figure 2.9.Germany’s renewable energy technology capacity by 2015



Source: German Ministry of Economy and Energy, 2016

Germany has begun to pay attention to renewable energy as an alternative to oil and nuclear power, undergoing oil and Chernobyl accidents. The core goal of Energiewende in Germany is to expand renewable energy, including the complete abandonment of nuclear power by the end of 2022. The target of the proportion of renewable energy in electricity consumption is to reach 50% in 2030, 60% in 2040 and 80% in 2050. Since April 2000, Renewable Energy Sources Act, EEG)

Since April 2000, Germany has implemented the Renewable Energy Source Law(EEG), which is the core of FIT. The expansion of German renewable energy is based on the renewable energy law (EEG), which is the application of the FIT for renewable energy power and the guarantee of the power grid connection of renewable energy. The renewable energy law has been successfully implemented for 14 years, which has affected not only German policy but also renewable energy policy in other countries and also contributed to the growth of the renewable energy industry. As a result, wind and solar costs have declined due to economies of scale, global competition, and pressure to lower base prices.

Germany has significantly revised the EEG in 2014. The main goal of the revision in 2014 is to expand renewable energy based on the market while mitigating cost increases and increasing control over renewable energy. To break down cost barriers, the government tries to focus more strongly on economic technology. At the same time, in order to improve the price efficiency, Germany are in the process of removing excess support, abolishing the bonus, and reducing the ambitious price.

Prices for renewable energy have fallen sharply. In addition, if new facilities for renewable energy production increase more than planned, a system is being implemented in which the support ratio for additional power plants is automatically reduced. Specific annual supply is about 2.5GW of solar power, 2.5GW of onshore wind power, and 100MW of biomass. Offshore wind power is expected to be 6.5 GW by 2020 and 15 GW by 2030.

One of the changes in German renewable energy policy is the introduction of competitive bidding. The introduction of competitive bidding has changed the way the government decides the price of renewable energy through competition in the

way that the government determines the purchase price. Germany is now in the early stages of introducing renewable energy competitive bidding between 2015-2017. Three times a year, nine bidding till 2017 will determine the purchase price for 1,200 MW of capacity. Auction prices are likely to better reflect actual costs.

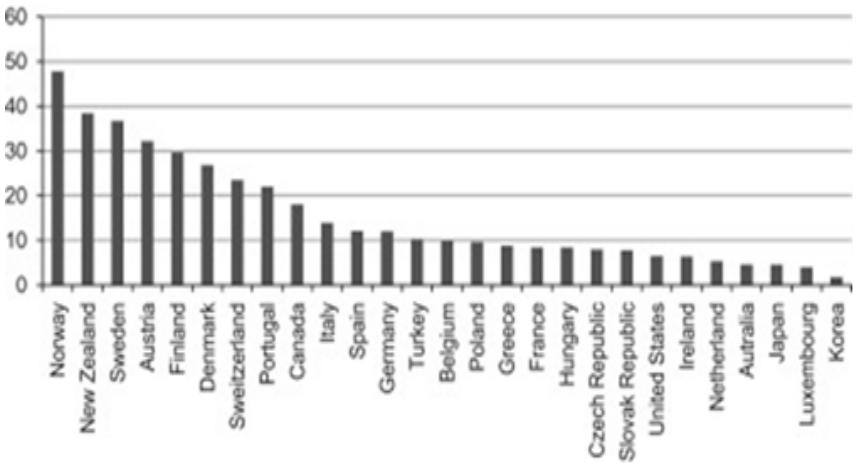
2.3. FIT policy in South Korea

In FIT system, a company that supplies electricity as a renewable energy source has contract with the government at a special price for a certain period. If the market price falls below the contract price, the government pays the difference between market price and contract price to the company. Generally, the contract period is 15 years.

Korea introduced FIT policy in 2002. After about a decade of experience with FIT policy, the government decided to stop it for the following reasons.

First, Korea's renewable energy contributed 1.9% to total primary energy supply (Korea Energy Management Corporation, 2016: 32), while the International Energy Agency (IEA) average is 9% in 2012 (Figure 2.10.).

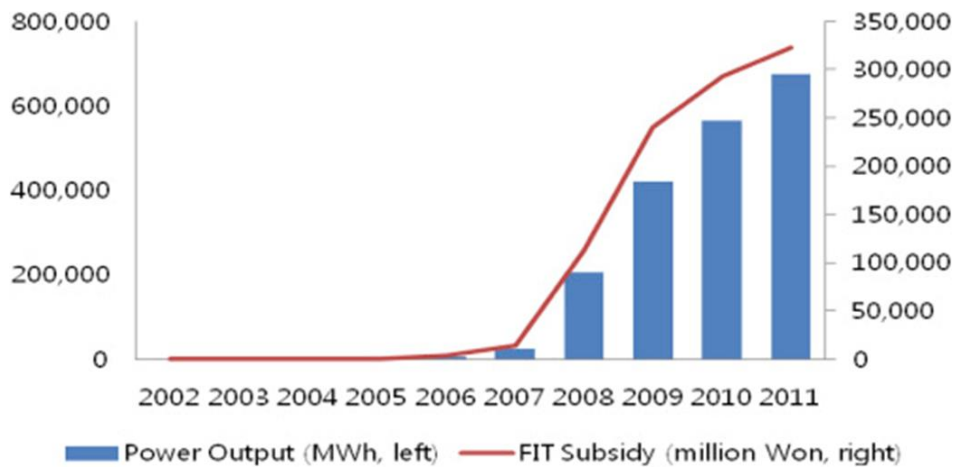
Figure 2.10. Ratio of renewable energy among energy supply of major countries



Source: International Energy Agency, 2012 World Energy Outlook.

Second, the policy costs had risen rapidly. In particular, the rapid increase of FIT subsidies for solar photovoltaic (PV) was a key reason for its being replaced by the RPS in 2012. In 2011, the government paid 250 million dollars to solar PV generations (Korea Energy Management Corporation, 2016: 55). Figure 2.11. shows FIT subsidies and power outputs for solar PV between 2002 and 2011.

Figure 2.11. Total FIT subsidies and power outputs for solar PV



Source: Korea Energy Management Corporation, 2016 New and Renewable Energy White Paper.

The government had reduced the contract price four times while operating the FIT policy for ten years (See Table 2.1.). Both renewable energy companies and environmental groups have strong opposrion on this.

In 2008, the contract price of solar PV was reduced by 30% from October. Solar PV power generation companies had tried to finish power plant construction so that they could have contract with the government before October. Accordingly, module prices as, core components of solar PV power generator in 2008, skyrocketed by 200%. In 2009, the government announced that it would limit the amount of solar PV power generation support to 50MW per year. In a week after the announcement, the contract for solar PV companies' surged, exceeding the annual limit of 50MW. Citizen groups strongly criticized this situation. The government held talks with representatives of solar PV companies to withdraw the annual limit and cut the contract price by 14%. In 2010, the government proposed

18% cut in solar PV contract price and the renewable energy industry strongly rebounded. It was confirmed that the contract price was reduced by 13% through meeting with the government and companies (Kwon, 2015: 303-305).

Table 2.1. FIT subsidy price adjustment

Year	Contract Price Adjustment
2006	The contract price of all renewable energy companies cuts 5%
2008	Solar PV contract price cuts 30%
2009	Set the ceiling for solar PV to 50MW per year Withdraw ceiling of solar PV and cut contract price by 14%
2010	Solar PV contract price cuts 18% Modified to reduce the price by 13%

Source: Ministry of Trade, Industry and Energy in Korea

Third, various renewable energy sources could not be fostered and concentrated in solar PV. They were concentrated on 373 solar PV power plants, 60 hydroelectric power plants, 18 wind power plants, 18 fuel cell power plants, 15 landfill gas power plants, 3 bio power plants, and 1 waste power plant in 2011 (Korea Energy Management Corporation, 2016: 32).

2.4. RPS policy in South Korea

In 2008, the government submitted a bill to the National Assembly for revision of the Law for introduction of RPS. It was passed the National Assembly in March 2010. Thus, the government introduced the RPS policy in 2012.

Under the RPS, power suppliers providing more than 500 MW must generate a certain amount of power electricity from Renewable Energy Sources (RES-E). The obligatory supply rate of RES-E is scheduled to rise from 2% in 2012 to 6% in 2020, as shown in Table 2.2.

Table 2.2. RES-E targets under the RPS

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020
Target(%)	2.0	2.5	3.0	3.0	3.5	4.0	4.5	5.0	6.0

Source: Annex 3 of the Enforcement Decree of the New and Renewable Energy Act

According to the New and Renewable Energy Act, energy suppliers are obliged to obtain Renewable Energy Certificate (REC) to prove that they have produced electricity using renewable energy facilities, or purchased REC from the renewable energy generation companies. If energy suppliers fail to fulfill their obligations, a fine will be imposed within 150% of the market price of defaulted REC.

Table 2.3. RPS Performance Result by Year

year	Obligation Supply	Performance	Postponement	Non-performance
2012	6,420,279	4,164,227 **(64.7%)**	1,686,163 **(26.3%)**	579,889 **(9.0%)**
2013	10,896,557	7,324,861 **(67.2%)**	2,678,408 **(24.6%)**	893,288 **(8.2%)**
2014	12,905,431	10,078,351 **(78.1%)**	2,822,402 **(21.9%)**	4,678 **(0.04%)**
2015	13,838,637	12,486,461 **(90.2%)**	1,352,176 **(9.8%)**	-

Source: The Board of Audit and Inspection (2016), “Promotion Status of New Growth Power Energy Business”paper.

REC is calculated by multiplying the amount of renewable energy production and multipliers(REC = MWh×multipliers). These multipliers by energy source are shown in Table 2.4.

Table 2.4. REC multipliers

REC multipliers	Energy group
0.7~1.5	Solar PV (4 multipliers based on the locations)
0.25	Integrated gasification combined cycle
0.5	Waste
1.0	Hydro, Biogas, On-shore wind
1.5	Biomass, Off-shore wind (0-5km)

2.0	FuelCell, Off-shore wind (more than 5km)

Source: Ministry of Trade, Industry and Energy.

The REC calculation method looks a little complicated. However, it is simpler to present it in numbers. For example, an energy company producing 10,000 MW per year would need to produce 600 MW of renewable energy (6% of production) in 2020. If the company produces 600MW of hydro as 1 REC multiplier, it will be recognized as 600MW of renewable energy production. If the company uses waste as 0.5 REC multipliers, it should produce 1200MW. The company can directly produce renewable energy or purchase REC from other companies.

The higher the energy generation price, the higher the REC multipliers are set. This is not a simple energy generation unit price. But it is determined in proportion to difference between the generation unit price and electricity's market price. The higher the REC multiplier, the more profitable the renewable energy company will have. Thus, renewable energy companies are very sensitive to REC multipliers because their profits are determined by REC multipliers.

Another issue raised in relation to RPS is the size of renewable energy production. For general power companies, they want to reduce the quota. Renewable energy companies want to increase the quota. Environmental groups also want to increase the quota (Kwon, 2015: 310).

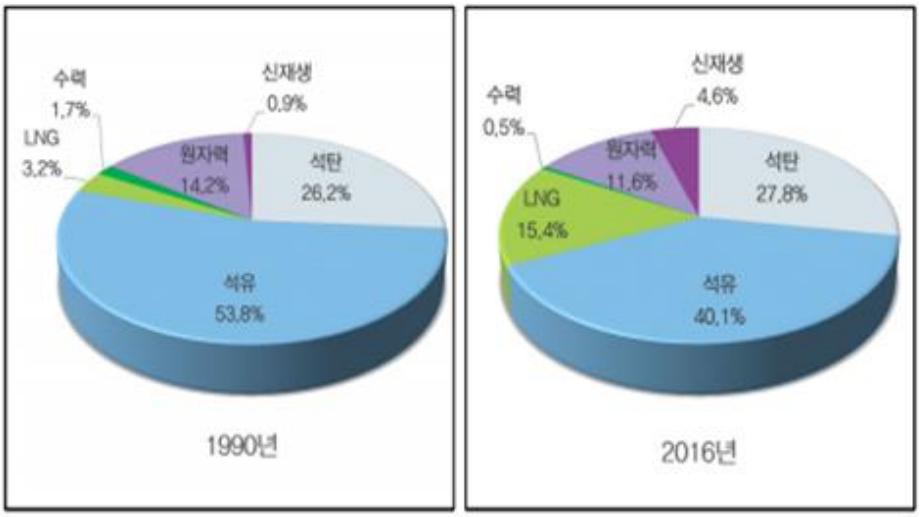
In the policy making process of the government, both renewable energy companies and general power companies have tried to raise REC multipliers. Representatives of offshore wind, biomass, and solar PV power generators all claim that they will raise their REC multiplier. General power companies also agree. In addition, general power companies are strongly urged to reduce their mandatory quota after paying a lot of fine due to RPS default[11].

Due to these mandates, the production of renewable energy has increased. As shown in Figure 2.12., Korea's supply ratio of renewable energy was 4.6% of total

[11] Retrieved November 10, 2018 from http://news1.kr/articles/?1588332 (News 1, March 7, 2014)

energy supply as of 2016.

Figure 2.12. Total FIT subsidies and power outputs for solar PV



Source: Korea Energy Corporation, 2018 Energy Statistics Handbook

2. Literture on FIT and RPS policy

Existing literature on RPS policy is largely grouped into three categories: conditions for success of the policy, analysis of policy effects, and comparison with FIT policy.

First, there are several studies on success condition of RPS policy. Park & So (2012) have stated that successful implementation of RPS depends on several factors such as size and composition of specific renewable energy resources of the country, proper design of contents, and consistency of the system. They argue that detailed contents of the system such as mandatory quota standard and, differential handling problem of specific REC price are needed.

Kim & Cho (2010) have argued that if the government wants to use renewable energy as a new growth engine to expand the supply of renewable energy from a long-term perspective, it is necessary to introduce RPS. On the other hand, if the government wants to increase the supply of renewable energy in the short term, a subsidy system is desirable.

Yun (2011) argues that the RPS policy is a somewhat burdensome policy for electric power generation companies. It should consider costs and benefits of mandatory implementation and non-performance from the perspective of power generators who are given mandatory quotas. RPS is the policy that the government sets the amount of power generation or power generation facilities. The price is set by the market. However, if the price of the certificate is too low due to wrong policy operation, fostering of renewable energy industry could return to failure. Although RPS policies that encourage domestic renewable energy industry development, promotion, and competition by market principles are positive, wrong policy design and unreasonable promotion may cause side effects. He suggests it will be necessary to design and operate flexible system considering domestic situation.

Second, some studies have predicted the effect of RPS policy. In the case of RPS policy in South Korea, since it has only been implemented a few years, objective research on long-term effects require a little more time because more data

and experience are needed. Most studies on RPS policy were conducted before implementation of the system which was estimated by theoretical analysis.

One study has predicted that electricity rate will rise 2.4 times in 2020 due to expansion of facilities for the production of renewable energy (Hong & Han & Kim, 2009). RPS has the advantage of being able to achieve the target amount because it can regulate the quantity, and technology diffusion effect can be expected when renewable energy target is achieved. However, GDP decline is expected in the short term due to rising investment in new and renewable energy facilities (Kim, 2010). One study has suggested the introduction of FIT for small-scale photovoltaic companies because it is difficult to expect supply expansion through RPS due to high cost of power generation (Lee & Yun, 2011).

Spme studies argue that the renewable energy industry has high risks so the government should reduce such risks through policies. For example, the government can implement a policy of increasing subsidies for solar and wind power to support small and medium enterprises of renewable energy (Lee & Heo, 2013). In terms of REC price, one study has shown that REC is formed at an excessively higher price than the cost which is a factor of rising electricity rates (Shim, 2015).

Third, there are studies comparing the effectiveness of the RPS system and the FIT system. The policy superiority between RPS and FIT has yet to reach a definite conclusion. There are many differences in the efficiency and effectiveness of these two systems in the existing literature.

FIT has been found to be more effective in expanding the renewable energy market by reducing market risks and ensuring the profitability of renewable energy companies in some studies (Battle et al. 2012, Bergek & Jacobsson 2010, Woodman & Mitchell 2011). However, RPS system is more effective because the FIT system does not incentivize cost reduction from the producer side because of its stable difference support (Söderholm & Klaassen, 2007).

There have been many discussions about merits and demerits of these two systems in Korea. In 2006, the Ministry of Commerce and Industry's report, "Improving the system for FIT and linking with the RPS system" pointed out FIT

performance and problems by 2005 and suggested the introduction of RPS. From the same viewpoint, one study has defined Korea's FIT as a failed policy and analyzed its causes in a new industrial policy theory (Koo, 2013). However, another study has analyzed effects of RPS and FIT as growth factors of renewable energy market and concluded that there is no difference in these effect of the two policies (Kim, 2011). Another study has negatively predicted the effect of RPS conversion policy in Korea based on Japan’s RPS case (Lee & Park, 2008).

Most studies of RPS were those that anticipated the effects of RPS implementation and concerned about how to design policies. Few studies have evaluated actual effects after introduction of RPS. Thus, this study analyzes the implementation of RPS not done in previous studies. Matland’s policy implementation theory is an analytical framework for this study. This study applies Matland's policy ambiguity and conflict as independent variables to determine the policy implementation stage.

Chapter 3. Research Design

1. Theoretical Framework of Study

1.1. Matland's Ambiguity-Conflict Matrix

Matland has proposed the model that typifies various policy implementation behaviors according to 'ambiguity-conflict matrix' (Table 3.1.).

Table 3.1. Matland's Ambiguity-Conflict Matrix

		The Level of Conflict	
		Low	High
The Level of Ambiguity	Low	Administrative Implementation	Political Implementation
	High	Experimental Implementation	Symbolic Implementation

Source: Matland (1995: 160).

According to Matland, if the ambiguity of the policy goal and the level of the conflict between stakeholders are low, administrative implementation will appear. If the ambiguity of the policy goal is high while the level of conflict is low, political implementation will be conducted. If the ambiguity of the policy goal and the level of conflict between parties are both high, symbolic implementation should be done. If the level of ambiguity is high while the level of conflict is low, experimental implementation will appear (Matland, 1995: 160-170).

First, the stage of administrative implementation occurs when goals are clearly defined and technical means for problem solving are well known. Policy outcomes are determined by the availability of resources that meet these goals and means. In this case, the policy process shows hierarchical characteristics in which

the rational decision is transmitted from the top to the bottom. When the level of conflict is low, compliance in the implementation process can be sufficiently secured by means such as standard operating procedures.

Second, the stage of experimental implementation can be carried out when participants' preferences for policy goals are ambiguous and policy measures are uncertain. Since conflicts of interests around policies are not sharp, situational conditions are important, such as who is actually active at the implementation site or the state of available resources. Therefore, policy processes and policy outcomes are difficult to predict. Sometimes they are very different.

Third, the stage of symbolic implementation takes place when policy goals are unclear and conflict level is high. There are various interpretations of policy instruments because there is a high ambiguity about policy objectives. Therefore, the role of expert group interpreting policy instruments is important. In addition, since the content of policy is not yet sufficiently polished, policy results are determined by coalition strength between actors in the policy field, rather than authority of the government.

Fourth, the stage of political implementation occurs when actors have clear policy goals. However, these goals conflict with each other. In addition, they have different policy instruments. In such case, the possibility of coercive or remunerative measures will increase because it is very difficult to draw compliance with policy target group and related actors.

1.2. Definition of variables

According to Matland's model, the type of policy implementation can be systematically grouped according to the ambiguity of policy goals and the degree of conflict among stakeholders. However, in order to use the above model as an analysis framework for this study, the concept of goal ambiguity and conflict level should be concretely constructed.

1. 2. 1. Policy Goal Ambiguity

Policy goal is a desirable future state to achieve through policy. The policy goal is the reason for the policy. Achievement of the goal is possible only through realization of policy means. The ambiguity of policy goals can lead to misunderstandings in policy implementation, ultimately resulting in policy failures. The ambiguity of policy objectives is an abstract value that can be interpreted in a multitude of ways, or a situation in which two or more of these values must be pursued at the same time in spite of their contradictory or conflicting relations.

Chun has classified the ambiguity of policy goals into four categories: 1) mission comprehension ambiguity, 2) directive ambiguity, 3) evaluative ambiguity, and 4) priority ambiguity (Chun, 2004 : 53-57).

Ambiguity is defined as “the degree to which competitive interpretation is possible.”

Mission comprehension ambiguity is the degree of competitive interpretation that occurs in relation to understanding the reason for the existence of the organization. The ambiguity of policy goals is more ambiguous as more competitive interpretations can appear.

Directive ambiguity implies a competitive interpretation that occurs in converting abstract policy goals into specific action guidelines. For example, because of unclear terms in the law, bureaucrats have difficulty understanding clear action guidelines needed for the policy implementation process (Lerner and Wanat, 1983).

Evaluative ambiguity refers to a competitive interpretation that occurs when assessing how much the policy goal has been achieved. If indicators for evaluating the achievement of goals are not objective or measurable, evaluative ambiguity increases. When objective performance indicators cannot be established, the organization tries to assess organizational performance by relying on work-load-oriented indicators rather than on outcomes (Merton, 1957).

Priority ambiguity refers to ambiguity arising from simultaneous pursuit of multiple targets that conflict with each other. In this case, even if each goal is clear,

confusion can arise if priority is not set between goals.

If the policy goal is ambiguous or the technology for realizing the policy is uncertain, the implementation process can be specified according to who is participating in the execution site or what resources are utilized in the enforcement process.

Korea's renewable energy policy started from the beginning with very ambiguous goals. Korea has been forced to pursue renewable energy policies due to reputation and peer pressure caused by the efforts of various countries for environment protection such as UN Climate Convention. Since then, Korea has been able to switch to RPS because its ten-year performance of the FIT policy is not great. However, in the first year of Korean RPS policy, high level ambiguity appeared. In particular, mission comprehension ambiguity and directive ambiguity emerged during policy implementation. In other words, reasons for implementing the RPS policy and what means are appropriate for achieving goals have not been specifically decided.

Thus, confusion had arisen in the policy implementation process. Since imposition of penalties for non-compliance with RPS, the mission to achieve the goal has been established. Thus, the ambiguity level of the policy goal has been lowered by seeking appropriate policy measures. As a result, five power generation subsidiaries were more committed to attaining quantitative efficiency to show them to the outside rather than trying to achieve meaningful outcomes that the RPS policy goals intended.

1.2. Policy Conflict

Policy conflict means a situation where various values or interests conflict with each other in the course of implementing the policy. This includes cases in which opposition between actors is not only manifested, but also invisible. Especially, when the goal of the policy is ambiguous and the moral hazard of the agent is present sych as a‘Principal-Agent problem’, policy conflict appears.

In the case of RPS policy, all agreed on the importance of renewable energy. However, various levels of conflicts arose among stakeholders. First, there were conflicts between the Ministry of Commerce, Industry and Energy that, made RPS policy, and five subsidiaries of KEPCO that implemented the policy. The Ministry of Commerce, Industry and Energy is the central government body that oversees the planning process for setting RPS goals, the implementation process, the evaluation process, and the feedback process for evaluating policy implementation results. On the other hand, five power generation subsidiaries of KEPCO are agencies that actually implement RPS targets set by the Ministry of Commerce, Industry and Energy. Initially, KEPCO's five power generation subsidiaries showed weaker efforts to achieve the target, because their mission and urgency in achieving RPS targets were weaker than those of the Ministry of Commerce, Industry and Energy.

Among government ministries, the Ministry of Commerce, Industry and Energy and the Ministry of Environment had a conflict on the construction of renewable energy power plants. During this period, the Ministry of Strategy and Finance had a negative stance on large investment in renewable energy of public corporation. There were social conflicts among the central government, local governments, environmental organizations, and local residents. Therefore, this study will examine conflicts between government and agents, within government, and finally between government and society in three stages and determine how each conflict with policy goals and means has affected the policy implementation process.

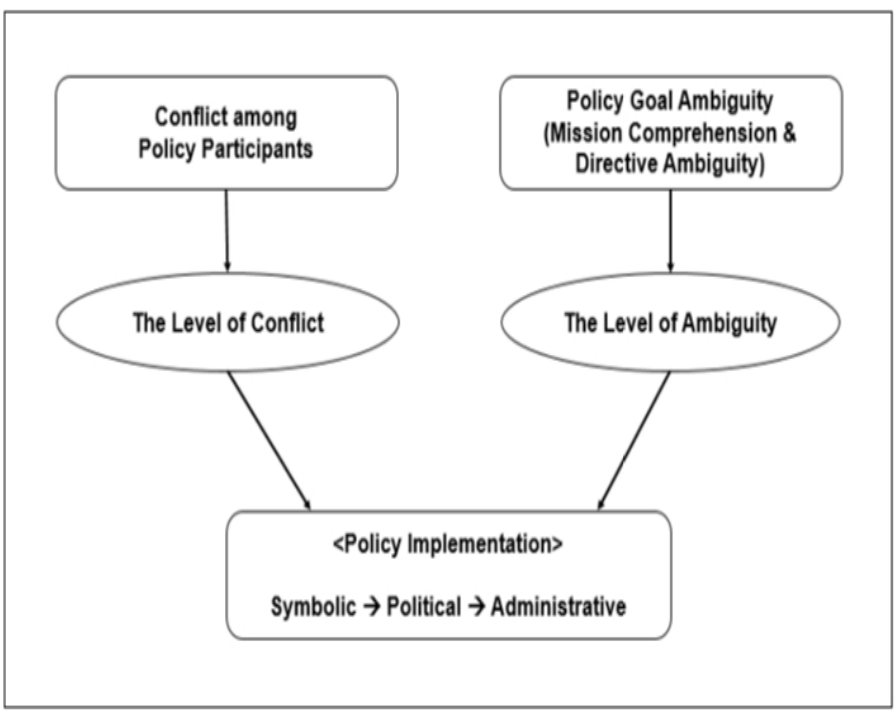
2. Analytical Framework

This study analyzes Korean RPS policy implementation with two variables: goal ambiguity and stakeholder conflict. Depending on the combination of these two variables, four propositions may appear. First, if low ambiguity and low level of conflict are combined, the policy implementation process becomes administrative. Second, if low ambiguity and high level of conflict are combined,

policy implementation becomes experimental. Third, if high policy ambiguity and low level of conflict are combined, the policy implementation will go through the political implementation process. Finally, if policy ambiguity and conflict level are both high, then symbolic policy implementation process will appear.

Figure 3.1. shows conceptual framework that analyzes the level of ambiguity in policy goals, and how the level of policy conflict caused by differences in policy goals and means has affected RPS policy implementation.

Figure 3.1. Analytical Framework.



3. Methods of Study

The purpose of this study is to analyze the implementation process of RPS policy in South Korea. As policy ambiguity or level of conflict between stakeholders is difficult to ascertain using quantitative analysis methods, deep case

analysis methods are used.

The study methodology is largely divided into literature review and interview. This study investigated related laws, government report of Korea, research report of the Korea Energy Economy Research Institute and the Korea Energy Research Institute, press releases, and budget proposals from the homepage of government and five power generation subsidiaries. In the case of RPS performance evaluation reports, many of them were not disclosed. Therefore, they were obtained through information disclosure requests.

In addition, in order to supplement literature survey, in-depth interviews were conducted with RPS service staff. Specifically, managers who werre working for the RPS in five power generation subsidiaries were interviewed. Each interview was conducted by telephone and lasted about half of an hour in May 2017. Conflicts with the Ministry of Commerce, Industry and Energy and ambiguity about policy goals were more clearly defined through interviews with managers of these five subsidiaries of KEPCO.

Gill, et al. (2008) have mentioned that interviews can be divided into structured, semi-structured, and unstructured ones. This study takes the form of a semi-structured interview with several key questions to identify variables. This study also gives enough discretion to allow interviewees to freely talk about the research topic. This is because the hidden story in the process of policy implementation is also helpful for this study.

Chapter 4. Results of Analysis

1. Symbolic Implementation (2012)

The year of 2012 was the first year that RPS duty supplies were introduced to power generation companies. The amount of RPS supply to be implemented by these five power generation subsidiaries of KEPCO was 3,685,445 REC. Non-solar PV sector accounted for 94.2% (3,471,545 REC) of the total duty requirement while solar power sector accounted for 5.8% (213,900 REC). At that time, the implementation rate of RRS was 53.5% while the default rate was 14.8%. During that period, the government introduced a new RPS policy. However, there was no clear consensus on policy instruments. As a result, conflicts had arisen among policy stakeholders.

1.1. High Level of Ambiguity

The policy to foster renewable energy is a policy that the government intervenes in the market to increase production of renewable energy. The increase of renewable energy production can increase the installation of related production facilities. It is expected to lead to development of the relevant industry. In addition, the increase in the production scale can bring about economies of scale and reduce production cost. If the high production cost of renewable energy, which is considered the biggest weakness compared to fossil fuel, is reduced, we can expect a virtuous cycle in which renewable energy investment and production are further increased. Finally, renewable energy will become the dominant energy, not just an alternative energy of fossil fuels.

In other words, if forcible production and use of renewable energy above a certain level, such as RPS policy can increase the profit of renewable energy producing enterprises, that will result in substitution effect of increasing entry companies, thus increasing supply and decreasing reliance on other energy sources. The government policy is to act as a trigger that will raise the market for renewable energy and change the energy paradigm.

According to the press release by the Ministry of Knowledge Economy in March 2010, as a result of the revision of the "New and Renewable Energy Development, Use, and Promotion Law Amendment" passed by the National Assembly, goals of the RPS policy are as follows[12].

① It is expected that the rate of renewable energy supply will be greatly expanded and contribute to the reduction of greenhouse gas.

② It will reduce cost and induce new technology development by introducing competition principle and market principle between generation sources and increase economic efficiency of renewable energy supply and enhance competitiveness of new and renewable energy industry.

③ The creation of a large-scale renewable energy market through RPS will stimulate large-scale investment in the domestic industry and contribute greatly to industry fostering.*

** To create a market worth KRW 4.1 trillion by 2012, and KRW 54 trillion by 2022.*

④ The RPS system, which is based on direct transfer of electricity to electric power, is expected to solve the problem of excessive financial burden on the FIT system, which is funded by the electric power industry-based fund.

At that time, the mission ambiguity of five power generation subsidiaries of KEPCO was outstanding. They claimed that the amount of obligation was too excessive before RPS which was the same in 2012, the first year of RPS policy[13]. These five power generation subsidiaries of KEPCO claimed that RPS should be withdrawn or amended as they needed more money to fulfill the RPS than they

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[12] Retrieved June 1, 2017, from http://www.motie.go.kr/motie/ne/presse/press2/bbs/bbsView.do?bbs_seq_n=59508&bbs_cd_n=81&currentPage=11&search_key_n=title_v&cate_n=1&dept_v=&search_val_v=rps
(Press release by the Ministry of Knowledge Economy, March 8, 2010)

[13] According to interviews with executives who were in charge of executing RPS at a power company at that time, they continued to appeal to the Ministry of Industry and Commerce that RPS targets were unrealistic. However, the Ministry of Commerce, Industry and Energy rejected it because they had to show far better results than FIT.

had[14]. They also lacked awareness of why they had to meet RPS obligation. They were public enterprises operating coal-fired power plants. In order to achieve their RPS obligations, they had to invest a large amount of money in constructing renewable energy power plant or purchasing REC in the renewable energy market. However, they did not have an accurate understanding of why they should implement such policy. As a result, they had failed to fulfill most of their RPS obligations in 2012.

1.2. High Level of Conflict

This period of conflict occurred largely between the government and the five power generation subsidiaries of KEPCO, between the Ministry of Commerce, Industry and Energy and the Ministry of Environment. First, the five KEPCO power companies revealed conflicts over government policy through a large-scale RPS default. Table 4.1. shows the status of non-solar PV sector implementation of these five power generation subsidiaries.

Table 4.1. Status of non-solar PV sector implementation by the five power generation subsidiaries (2012)

(unit : REC)

	Requirements of the non-solar supply	Performances of the supply				Postpone-ment	Default
			Self-construction	External purchase	National REC		
South East Power	790,632	322,532 (40.7%)	43,554 (5.5%)	- (0%)	278,978 (35.2%)	248,909 (31.5%)	219,191 (27.7%)

[14] Retrieved November 10, 2018, from http://www.etnews.com/201201310023 (Electronic newspaper, January 31, 2012)
Retrieved November 10, 2018, from http://www.dt.co.kr/contents.html?article_no=2012111402010351713002 (Digital Times, November 13, 2012)

Midland Power	695,094	349,932 (50.2%)	9,162 (1.3%)	96,613 (13.8%)	244,157 (35.1%)	220,758 (31.7%)	124,404 (18.3%)
Southern Power	790,845	524,249 (66.2%)	102,275 (12.9%)	55,771 (7%)	366,203 (46.3%)	249,911 (31.6%)	16,685 (2.1%)
Western Power	717,647	398,784 (55.5%)	66,122 (9.2%)	21,678 (3%)	310,984 (43.3%)	224,684 (31.3%)	94,179 (13.1%)
East-West Power	691,227	379,785 (54.9%)	58,922 (8.5%)	51,459 (7.4%)	269,404 (38.9%)	220,284 (31.8%)	91,158 (13.1%)
Sum	3,685,445	1,975,282 (53.5%)	280,035 (7.5%)	225,521 (6.1%)	1,469,726 (39.8%)	1,164,546 (31.5%)	545,617 (14.8%)

Source: Ministry of Trade, Industry and Energy

The performance of total obligatory supply (3,685,445 REC) was 53.5% (1,975,282 REC). In the case of RPS implementation of South East Power, self-construction was only 5.5%, and the default rate was the highest at 27.7%. Western power implemented the mandatory amount of RPS with 1.3% for self-construction and 18.3% for default.

These mandatory measures are 7.4% for self-construction, 6% for external purchases, 39.5% for national REC[15] , 31.5% for postponement of implementation, and 15.3% for default. In fact, the share of renewable energy directly produced by the five power generation subsidiaries was only 7.4% in self-construction. It did not implement 46.3% (postponement 31.5% + default 14.8%), which was half of the mandatory amount.

In particular, they chose to report a default of 14.8% and be subjected to penalties. Since the implementation postponement should be preceded by the amount of implementation in the next year, all suppliers cannot postpone the all implementation. Default of implementation means that suppliers have abandoned such implementation. As power generation subsidiaries, they chose to pay fines, since there was no guarantee that the unfamiliar RPS could be implemented in the

[15] National REC is issued by state-owned for the amount of electricity produced by the FIT facility and the amount of electricity produced by the facility that received national grants.

following year. This could be interpreted that these five power companies regarded RPS target set by the Ministry of Commerce, Industry and Energy as impermissible, leading to their abandonment of the implementation.

On the other hand, conflicts had also arisen among government ministries because goals and means pursued by ministries were different. Both the Ministry of Commerce, Industry and Energy and the Ministry of Environment agreed with environmental protection through cultivation of renewable energy. However, the Ministry of Commerce, Industry and Energy pointed out that it was necessary to deregulate construction of renewable energy power plants, while the Ministry of Environment was cautious about the possibility that construction of renewable energy power plants could lead to another environmental pollution.

According to data submitted by the five power generation subsidiaries to the Ministry of Industry and Commerce in 2012 due to non-compliance with REC obligations, a total of 26 renewable energy self-construction projects were delayed. There were 18 delayed licenses, 4 fuel shortages, and 4 others. Among these 26 delays, delayed licensing was the biggest reason for 18 cases.

In case of licenses for new and renewable energy generation projects, various organizations such as permission of the power generation business (Ministry of Commerce, Industry and Energy), environmental impact assessment (Ministry of Commerce, Industry and Energy, Ministry of Environment, local government), and approval of implementation plan (Ministry of Land Transportation and Local Government) were involved and eacf procedure was complex. In addition, if a complaint was raised, the project period was unpredictably delayed.

For example, in 2004, western power developed a business plan for the tidal power generation project. In 2010, it acquired the power generation business license from the Ministry of Knowledge Economy. However, it failed to pass environmental impact assessment. Thus, western power submitted the Environmental Impact Assessment Report which was prepared with a cost of 700 billion KRW in 2011 to the Ministry of Environment. However, the Ministry of Environment rejected it after the environment group and local members of the parliament raised complaints in 2016.

In this way, the five power generation subsidiaries of KEPCO were obliged to fulfill these goals that they did not set. Complaints about the government were heightened because the government did not have enough policy means due to differences between ministries. The Ministry of Commerce, Industry and Energy did not take any action on the Ministry of Environment. This was because there was no organization capable of coordinating conflicts among ministries. In addition, both the Ministry of Commerce, Industry and Energy and the Ministry of Environment wanted to avoid responsibility for external objections, such as environmental groups and members of parliament. In the case of the Ministry of Environment, if it passed the environmental impact assessment for renewable energy power plants, there was a concern that environmental groups and local residents would rebel. The Ministry of Commerce, Industry and Energy was one step away from watching conflicts with the Ministry of Environment and the five companies rather than aggressively adjusting them. Therefore, the conflict surrounding implementation of the RPS policy had not been adjusted. It had continued at a high level.

1.3. Summary : Symbolic Implementation

According to the analytical framework, year 2012 can be classified as a symbolic implementation stage. Symbolic implementation is mainly done by consolidating new policy goals, reaffirming existing policy objectives, or exploring important values and principles (Jeong, 2005). This period of implementation encompasses these characteristics. RPS policy was introduced as a new policy. However, the government failed to provide a clear vision for agents. The five power generation subsidiaries of KEPCO lacked understanding of why they should fulfill these goals set by the government. If KEPCO's five power generation subsidiaries had a strong understanding of their mission, they would have met their RPS obligations even if they had to purchase RECs in the renewable energy market. However, they lacked understanding of the importance of implementation. In addition, unilateral imposition of a mandatory policy on the ground that policy

measures for fulfilling the RPS obligations were unclear intensified the resistance of these five power generations of KEPCO. In addition, there had been a conflict between ministries around policy measures. These five power generation subsidiaries of KEPCO had continued to complain about the government. In the end, this period was a period of continued exploration of the newly introduced policy objectives and means.

In summary, this period was the first time the RPS policy was introduced. However, both ambiguity and conflicts of the policy were high. Thus, it was a time when the new policy goal of RPS was symbolically introduced.

Table 4.2. Summary of first stage

Ambiguity	Conflict	Expected Stage of Implementation	Actual Stage of Implementation
High	High	Symbolic	Symbolic

2. Political Implementation (2013)

Year 2013 was the second year of RPS policy implementation. RPS obligations for the five power generation subsidiaries of KEPCO were 5,352,799 RECs for the non-solar PV sector. In the solar PV sector, the RPS requirement was 553,095 REC. This was an increase of 54.2% (1,881,254 REC ↑) and 158.6% (339, 195 REC ↑) respectively from 2012. The mandatory supply ratio for each year of RPS was designed to increase continuously[16]. At that time, the implementation rate of RRS was 60.3% and the default rate was 12.3%.

During this period, the ambiguity of the five power generation subsidiaries of

[16] 2% of total electricity generation should be supplied as renewable energy in 2012. It was increased to 2.5% in 2013.

KEPCO had been resolved. They had begun to actively pursue policy means. However, conflicts among stakeholders over policy measures were still high.

2.1. Low Level of Ambiguity

The five power generation subsidiaries of KEPCO reported RPS performance in 2012 to the Ministry of Industry, Trade and Energy in April 2013. As mentioned above, the implementation performance was only 53.5% of the target. In response, the media criticized the introduction of the RPS policy, expressing strong suspicions about the success of the RPS policy. The Ministry of Commerce, Industry and Energy had taken a compulsory measure to the five companies in order to overcome this phenomenon.

In April 2013, the Ministry of Commerce, Industry and Energy applied very stringent standards when determining fines for the five companies. First, the Ministry of Commerce, Industry and Energy did not recognize delayed licensing of renewable energy power plants submitted by five companies as a cause of default. The Ministry of Commerce, Industry and Energy imposed penalties at a much higher level after calculating economic benefits that five companies could achieve based on REC defaults (Table 4.3.). In the case of South East Power, which had the largest amount of REC defaults, the penalty charge rate was the highest at 150%, resulting in a penalty of 10.6 billion won.

Table 4.3. Status of imposition of penalties for the five power generation subsidiaries

(unit : REC, million won)

	Default (A)	Economic Benefits from Default (B=A*32,331won/REC)	Penalty charge rate	Penalty
South East Power	219,191	7,086	150%	10,629
Midland Power	124,404	4,022	120%	4,826
Southern Power	94,179	3,044	135%	4,110
Western Power	16,685	539	110%	593
East-West Power	91,158	2,947	120%	3,536

Source: Ministry of Trade, Industry and Energy

As mentioned above, in order to improve RPS implementation rate, policy measures were imposed such as imposition of penalties. The imposition of penalties can be a new policy goal for the five power generation subsidiaries, leading to concrete measures to achieve RPS implementation rate.

These five power generation subsidiaries of KEPCO solved the ambiguity of their policy goals through learning through penalties for non-performance in 2012[17]. They have a firm grasp of the need to implement RPS obligations[18]. As the understanding of policy became higher, they actively sought policy instrument to achieve the policy goal.

Bio-combined power plant is a method of burning wood pellets mixed with coal by converting boilers of existing coal-fired power plants. This method can save a great deal on the cost of power generation such as equipment cost and

[17] According to interviews with executives of the five power generation companies, delayed licensing of renewable energy power plants was due to actions of government such as the Ministry of Environment. They thought they would not pay a penalty because they could not keep up with RPS obligations due to the government.

[18] According to the report of Midland Power in 2013, if the current trend is expected, penalties of KRW 227.4 billion will be expected by 2024. Thus, it is necessary to take an innovative countermeasure.

operating cost rather than using whole bio-power plant[19] that needs to be newly built[20] and operate[21]. Wood pellets and wood chips are main raw materials for bio-combined power generation. They accounted for 80% or more of overseas imports. Thus, it is difficult to expect the activation effect of renewable energy-related industries. However, RPS policy goal was being evaluated as if it was improving the RPS implementation rate. Therefore, bio-combined power generation can be a good way for suppliers to increase RPS implementation at a low cost.

The reason why this method can be possible is because REC multiplier of 1 recognized by the Ministry of Industry for bio-power generation was applied to bio-combined power generation. Since bio-combined power generation has a much lower cost than bio-power generation and industry-related effects are different, REC weights need to be analyzed separately. However, the Ministry of Industry applied REC multiplier of 1 to both bio-power generation and bio-combined power generation.

The five power generation subsidiaries had been actively promoting bio-combined power generation that could fulfill RPS implementation by applying high REC multiplier with low cost. In particular, because they had coal-fired power plants, bio-combined power generation was a very easy instrument. Of bioenergy produced by the five power generation subsidiaries in 2013, the bio-power generation accounted for 20% while bio-combined power generation accounted for 80%. To fulfill RPS implementation, South East Power and South Power imported 190,000 tons (44.6 billion won) and 140,000 tons (30 billion won) or wood, respectively (The Board of Audit and Inspection, 2016 : 41).

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[19] The renewable fuel is used 100% instead of being mixed with other fuel such as coal.

[20] The construction cost of Ha-dong Thermal Power Plant No. 1 ~ 6 of South East Power is 1,003,042 won / kW, while the cost of building the bio-combined power plant is only 1,688 won / kW, which is 0.002% (The Board of Audit and Inspection, 2016: 40).

[21] Compared with the operating cost of coal-fired power plants (annual operating cost of 500 megawatts of 52,920 won/㎾, the 7th power supply basic plan), the operation cost of bio-combined development is only 0.26% (135 won/52,920 won) (The Board of Audit and Inspection, 2016: 40).

2.2. High Level of Conflict

After the launch of Park Geun-hye government in 2013, the Ministry of Strategy and Finance strongly encouraged debt reduction of public institutions[22]. As a result, five power generation subsidiaries sought a way to easily achieve RPS in a given environment, rather than seeking ideal RPS implementation. Table 4.4. shows the status of non-solar PV sector RPS implementation of the five power generation subsidiaries.

Table 4.4. Status of non-solar PV sector RPS implementation by the five power generation subsidiaries (2013)

(unit: REC)

	Require-ment of the non-solar supply	Performance of the supply	Self-construction	External purchase	National REC	Postpone-ment	Default
South East Power	1,405,505	1,013,786 (72.1%)	364,320 (26%)	224,880 (16%)	424,665 (30.2%)	380,164 (27%)	11,558 (0.8%)
Midland Power	1,165,482	653,173 (56%)	164,048 (14%)	116,549 (10%)	372,576 (32%)	316,602 (27.1%)	195,707 (16.7%)
Southern Power	1,424,794	925,823 (65%)	293,319 (20.6%)	185,223 (13%)	447,281 (31.4%)	385,650 (27%)	113,321 (7.9%)
Western Power	1,254,944	560,226 (44.6%)	79,403 (6.3%)	100,395 (8%)	380,428 (30.3%)	342,263 (27.2%)	352,455 (28%)
East-West Power	1,266,620	780,895 (61.7%)	159,792 (12.6%)	189,993 (15%)	431,110 (34%)	347,986 (27.4%)	137,859 (10.8%)
sum	6,517,345	3,933,903 (60.3%)	1,759,683 (27%)	1,042,775 (16%)	2,056,060 (31.5%)	1,772,665 (27.2%)	810,900 (12.4%)

Source: Ministry of Trade, Industry and Energy

The non-PV RPS duty rate for the five power generation subsidiaries was 60.3%. Self-construction and external contracts increased dramatically from 7.4%

[22] The Ministry of Strategy and Finance asked each public corporation to submit a debt reduction plan and reflected it in the public institution management evaluation.

to 27% and from 6% to 16%, respectively. As RPS duty implementation increased, default rate decreased from 15.3% to 12.4%.

At this time, the five power generation subsidiaries of KEPCO were looking for ways to expand renewable energies. However, their performance has not improved significantly. So far, only 26.9% of their own construction has been generated. Most of their performance has been supplied through REC purchases and external contract. By 2022, the obligation ratio is expected to rise by 0.5 percentage points to 1 percentage point each year. It was predicted that the implementation of RPS obligation was becoming increasingly difficult.

As a result, the demand for mandatory contractors to reduce the amount of RPS implementation has become more severe. They said that it would be highly likely that RPS obligation will be covered by purchases of renewable energy from other companies or paying fines in situations where it is not easy to increase their own generation, raising concerns about the effectiveness of the RPS system. A manager in power generation subsidiary insisted that "it is better to lower the rate of fulfillment of power generation companies more realistically.[23]"

Also, in 2012, power generation companies had complained about the government regulations on the construction of renewable energy generation facilities such as wind power and tidal power. The Ministry of Environment's strict evaluation of the construction of renewable energy power plants continued while the Ministry of Industry, Trade and Energy did not have the authority to request the Ministry of Environment Affairs. The Ministry of Strategy and Finance's policy to reduce debt for public corporations further heightened the conflict surrounding implementation of RPS policy.

External stakeholders also expressed doubts about the success of the RPS policy due to conflicts among government departments[24]. There was also a voice

[23] Retrieved November 10, 2018, from http://www.dt.co.kr/contents.html?article_no=2012111402010351713002 (Digital Times, November 13, 2012)

[24] According to an interview with an environmental group official, the government was guiding to reduce the debt-to-equity ratio of the public sector, making it difficult to invest in renewable energy, which is the same principle as suppressing children's education in families with debt. Also, it was argued that RPS policies that require large-scale investment made small-scale companies difficult to manage.

saying that the FIT policy is better. On July 10, 2013, the Korea Chamber of Commerce insisted on increasing the amount of renewable energy generation and resurrecting the FIT in the "New Government Proposal for Climate Change New and Renewable Energy Policy.[25]"

2.3. Summary : Political Implementation

Year 2013 shows the characteristic of political implementation. Political implementation occurs when actors have different policy objectives or policy instruments. However, outcome of the policy is ultimately determined by power relations. Although these five power generation subsidiaries of KEPCO opposed the RPS target, when the Ministry of Commerce, Industry and Energy imposed a penalty of 134% on the default amount, they actively sought RPS policy instrument. The process of implementation was developed by power relations without reaching consensus on higher policy objectives. In addition, since conflicts between government departments on policy instruments could not be solved, these five companies were found to have low-cost and easy-to-implement policy instruments.

Thus, they had started to made efforts to implement the RPS unlike previous year. As shown in Table 4.5., construction by self-construction was increased by 528%. Self-construction was mainly invested in building bio-combined power generation. This is because, as mentioned above, other renewable energy power plants such as wind power and tidal power were very difficult to implement if there were opposition from the Ministry of Environment or local residents. Power generators have attempted to fulfill the RPS mandate for bio-combined power generation that converts existing thermal power plants.

[25] Retrieved November 10, 2018, from http://www.e2news.com/news/articleView.html?idxno=71126 (Energy & Environment News, July 12, 2013)

Table 4.5. Comparing RPS implementation measures of five development subsidiaries

(unit: REC)

	2012 year	2013 year	Increase/ Decrease
Requirements of the non-solar supply	3,685,445	6,517,345	2,831,900 (76%)
Performances of the supply	1,975,282	3,933,903	1,958,621 (99%)
Self-construction	280,035	1,759,683	1,479,648 (528%)
External purchase	225,521	1,042,775	817,252 (362%)
National REC	1,469,726	2,056,060	586,334 (40%)
Postponement	1,164,546	1,772,665	608,119 (52.2%)
Default	546,617	810,900	264,283 (48%)

Source: Ministry of Trade, Industry and Energy

The Ministry of Commerce, Industry and Energy recognized the REC multiplier for bio-combined power generation. This process is consistent with political practice typified by Matland as a political behavior.

Table 4.6. Summary of Second Stage

Ambiguity	Conflict	Expected Stage of Implementation	Actual Stage of Implementation
Low	High	Political	Political

3. Administrative Implementation (2014)

The amount of RPS for five power generation subsidiaries in 2014 was 7,927,877 REC for the non-solar PV sector. RPS requirement for the solar PV sector was 1,028,745 REC. These were increases of 48% (1,410,532 REC ↑) and 86% (475,650 REC ↑), respectively, from 2013. The implementation rate of RRS at that time was 73.6%. There was no default. During that period, the level of ambiguity and the level of conflict were both low.

3.1. Low Level of Ambiguity

Table 4.7. shows status of non-solar PV sector RPS implementation of the five power generation subsidiaries.

Table 4.7. Status of non-solar PV sector RPS implementation by the five power generation subsidiaries (2014)

(unit : REC)

	Requirements of the non-solar supply					Postpone-ment	Default
		Performances of the supply	Self-construction	External purchase	National REC		
South East Power	1,771,178	1,771,178 (100%)	1,579,102 (89.1%)	93,574 (5.3%)	98,502 (5.5%)	0 (0%)	0 (0%)
Midland Power	1,367,294	985,331 (72%)	625,751 (45.7%)	198,355 (14.5%)	161,225 (11.8%)	381,963 (27.9%)	0 (0%)
Southern Power	1,956,622	1,145,452 (58.5%)	899,805 (46%)	336,911 (17.2%)	189,736 (9.7%)	530,170 (27%)	0 (0%)
Western Power	1,445,591	989,961 (68.5%)	435,849 (30.1%)	391,921 (27.1%)	162,191 (11.2%)	455,630 (31.5%)	0 (0%)
East-West Power	1,387,192	947,597 (68.3%)	704,344 (50.8%)	86,767 (6.2%)	156,486 (11.3%)	439,595 (31.7%)	0 (0%)
sum	7,927,877	5,839,519 (73.6%)	4,244,851 (53.5%)	1,137,528 (14.3%)	768,140 (9.7%)	1,807,358 (22.8%)	0 (0%)

Source: Ministry of Trade, Industry and Energy

The non-PV RPS duty rate for the five power generation subsidiaries was 73.6%. This was a remarkable improvement compared to 2012 (53.5%) or 2013 (60.3%). Self-construction increased dramatically from 27% in 2013 to 53.5% in 2014. Since RPS duty implementation was increased, the default rate was 0. As a result, penalties for not fulfilling the obligation became 0 won for the first time ever.

As mentioned above, this was mainly due to the approval of bio-combined power. In addition to low investment cost of facilities, bio-combined power plant is not limited in terms of demanding licenses and location, civil complaints, or long construction periods compared to other renewable energy businesses such as onshore wind and tidal power.

During this period, the five power generation subsidiaries of KEPCO actively sought to achieve their goals with a firm understanding of the necessity of implementing RPS. The fact that the implementation performance had increased despite an increase in absolute RPS obligations amount, indicates that these five power generation subsidiaries had made considerable efforts to implement RPS obligations.

Meanwhile, they solidified bio-combined power generation using wood pellets as a means of achieving their goals[26]. Bio-energy among RPS implementation means of five power generation subsidiaries was 41.2% in 2014. Wood pellet imports of five power generation subsidiaries were KRW 337.2 billion in 2014. As a result, the share of bioenergy in new renewable energy in Korea had increased by 11.2% from the target of 13.3% in “Fourth Basic Plan for New and Renewable Energy” by Ministry of Trade, Industry and Energy (Table 4.8.).

[26] Retrieved June, 1, 2017 from http://www.electimes.com/article.php?aid=1441005081126791005 (Electric Newspaper, August 31, 2015)

Table 4.8. Proportion of major new and renewable energy sources

	Solar power		Wind power		**Bio energy**	
	target*	performance	target	performance	target	performance
2012(%)	2.7		2.2		15.2	
2014(%)	4.9	4.7	2.6	2.1	13.3	**24.5**

* the target in "Fourth Basic Plan for New and Renewable Energy"

Source: The Board of Audit and Inspection, 2016 : 44

Nevertheless, the Ministry of Commerce, Industry and Energy acknowledged the implementation of bio-combined power for RPS fulfillment and promoted an increase in RPS implementation rate.

Significant improvement in implementation performance of mandatory new renewable energy[27]

The RPS system has been expanded to include power generation facilities with a capacity of three times the capacity of the power generation facilities built for 10 years from FIT ('01 ~ '11) within two years and eight months ('12 ~ '14. 8). It is estimated that there is a great effect on spreading energy supply.

FIT('01. 10~'11)		RPS('12~'14. 8)		Rate of increase(%)	
Power generation (MW)	Number of companies	Power generation (MW)	Number of companies	Power generation (MW)	Number of companies
1,031	2,090	3,097	6,283	200.4	200.6

As the RPS system is stabilizing, 14 companies are obliged to actively invest in the new and renewable energy sector. This is due to government's consistent policy to support the expansion of new and renewable energy.

In particular, in the second half of the last year, wind-related location and

[27] Retrieved June, 1, 2017 from http://www.motie.go.kr/motie/ne/presse/press2/bbs/bbsView.do?bbs_seq_n=157488&bbs_cd_n=81&currentPage=1&search_key_n=title_v&cate_n=1&dept_v=&search_val_v=rps (Press release by the Ministry of Knowledge Economy, August 31, 2015)

environmental regulation have been clarified through collaboration between ministries and agencies. RPS performance and implementation rate are likely to continue to rise in the near future, when situation and transition conditions are improved.

As mentioned above, RPS requirement of five power generation subsidiaries of KEPCO was achieved. However, the proportion of solar and wind energy that was targeted at the time of the policy introduction was rather low. The proportion of bio-energy accounted for a whopping 41.2%. However, the Ministry of Commerce, Industry and Energy did not evaluate whether this phenomenon strengthened the competitiveness of domestic renewable energy industry or whether the technology of renewable energy was secured. Rather, they promoted that RPS mandate and policy objectives were achieved. This can be interpreted that as the ambiguity of policy goal is resolved, goal displacement appears.

3.2. Low Level of Conflict

The five power generation subsidiaries of KEPCO reported RPS performance in 2013 to the Ministry of Industry, Trade and Energy in April 2014. Since the Ministry of Commerce, Industry and Energy knew the dissatisfaction of these five power generation subsidiaries of KEPCO, they applied fines levying criteria more generously than 2012. As these five power generation subsidiaries made efforts to fulfill their obligations to RPS, the government applied a 95% charge rate which was smaller than the 134% rate in 2012. However, the total amount of penalties increased from KRW236.9 billion to KRW439.8 billion due to increase in REC price. As shown in Table 4.9., unlike South East Power, which saved KRW 10 billion in penalties compared to the previous year, penalties paid by the other four power generation subsidiaries increased.

Table 4.9. Comparing imposition of penalties for the five power generation subsidiaries

(unit : REC, million won)

	Default(A)	Economic Benefits from Default (B=A*57,039won/REC)	Penalty charge rate	2013 Penalty (increase/ decrease)	2012 Penalty
South East Power	11,558	659	93%	613 (-10,016)	10,629
Midland Power	196,707	11,219	101%	11,274 (6,448)	4,826
Southern Power	113,321	6,463	95%	6,140 (2,030)	4,110
Western Power	352,455	20,103	90%	18,093 (17,500)	593
East-West Power	137,859	7,863	100%	7,863 (4,327)	3,536

Source: Ministry of Trade, Industry and Energy

Conflicts between ministries of government in this period also drastically decreased. Since the five companies selected bioenergy as a policy tool with low investment costs, they did not have conflict with the debt reduction policy of the Ministry of Strategy and Finance. The Ministry of Environment did not have much dispute because the bio-energy system that used existing thermal power plants was not a new area for environmental impact assessment. There was no need for a mechanism to coordinate conflicts as there was no conflict between ministries on bio-energy development. Local residents also had no reason to object to a bio-energy plant because it was not a newly built power plant. Environmental groups were also satisfied that the renewable energy target was met.

3.3. Summary : Administrative Implementation

The combination of a low level of policy goal ambiguity and a low level of conflict is expected to lead to administrative implementation. At that time, power generation companies have a strong will to achieve RPS targets. Technical policy instrument for bio-combined power has been established. The Ministry of Commerce, Industry and Energy recognizes bio-combined power generation method which is mixed with bituminous coal and wood pellet as renewable energy generation method to reduce the repulsiveness of generators by applying more generous standards for calculating fines. There was no conflict between stakeholders over bioenergy in the way that conventional thermal power plants were modified and used. Thus, administrative implementation can be conducted. Since then, RPS policy implementation has evolved similar to that method.

However, no evaluation has been made on how the bio-energy system, which has been developed by converting existing thermal power plant and importing raw materials, meets the original RPS policy goal. In other words, the RPS policy was assessed as work-load-oriented indicator instead of performance index. There is a tendency of goal displacement in which policy instruments themselves are promoted as policy goals, without analyzing whether final policy goals have been achieved.

Table 4.10. Summary of Third Stage

Ambiguity	Conflict	Expected Stage of Implementation	Actual Stage of Implementation
Low	Low	Administrative	Administrative

Chapter 5. Conclusion

5. 1. Summary

So far, this study has reviewed the implementation of RPS centering on five power generation subsidiaries of KEPCO. This study tried to analyze characteristics of policy implementation according to the ambiguity of goals and level of conflict rather than evaluating the RPS system.

In 2012, the first year of RPS policy introduction, the level of implementation of the five power generation subsidiaries was low due to lack of understanding of the mission and lack of appropriate policy measures. Renewable power plants such as wind power and tidal power have been delayed for a long time due to the Ministry of Environment or civil affairs. However, the Ministry of Commerce, Industry and Energy did not actively mediate conflicts because it was the work area of the Ministry of Environment. As a result, policy conflicts have arisen, including suggesting that the Ministry of Industry, Trade and Energy should lower RPS obligations. This high policy goal ambiguity and conflict led to symbolic implementation of the newly introduced RPS policy. Although the policy was newly introduced at this time, it was regarded as a symbolic implementation period in which policy ambiguity and conflicts among stakeholders were so high that policy was not implemented properly.

In 2013, the Ministry of Commerce, Industry and Energy strictly levied penalties on power generation companies that failed to comply with RPS obligations. These five power generation subsidiaries of KEPCO understood the need to implement RPS. However, it had been difficult to invest a large amount of money in accordance with the policy of Ministry of Strategy and Finance to reduce debt. There was also external concern about the feasibility of RPS policy. These five power generation subsidiaries of KEPCO started to introduce bio-combined energy method, which used imported wood with existing thermal power plant. In addition, they requested the Ministry of Commerce, Industry and Energy to relax regulations for the construction of renewable energy power plants and complained

that the amount of RPS obligations was too high to meet reality. The Ministry of Commerce, Industry and Energy acknowledged bio-combined generation by imposing a high multiplier. In this period, the ambiguity of the policy goal was low. However, the conflict was still high. Thus, political implementation was conducted.

In 2014, REC implementation rate reached 74% (bio-combined generation took up 41%) as five power generation subsidiaries of KEPCO established bio-combined generation as a policy tool. The Ministry of Commerce, Industry and Energy recognized bio-combined generation as a renewable energy source and promoted successful implementation of the RPS system externally. In addition, the Ministry of Commerce, Industry and Energy had sought to reduce opposition of power generators by mitigating the standard for imposition of penalties from the previous year. This period was characterized by administrative implementation where policy was stably implemented with low ambiguity and low conflicts of policy stakeholders.

5. 2. Policy Implications

It is significant that this study applied Matland's Ambiguity-Conflict model to Korea's early RPS policy implementation cases.

From 2012, the Korean government has implemented RPS policy. It is a new policy for everyone. As a result, policy goals were ambiguous at first. However, such ambiguity was later mitigated through learning. Conflicts between stakeholders also had a negative impact on the outcome of RPS implementation.

There were also conflicts within governmental organizations regarding licenses for renewable energy power plants. KEPCO’s five power generation companies had faced opposition from the Ministry of Environment and local governments. They were hurt by the originally planned promotion of renewable energy power plants such as wind power and tidal power. In the process, the coordination role of the Ministry of Commerce, Industry and Energy was insignificant. As a result, bio-combined power generation has become a major means of implementing RPS policy much more than the government originally

planned at the time the policy was introduced.

In conclusion, this study confirms that policy ambiguity and policy conflicts between policy stakeholders are causes of policy drift. Policy ambiguity and policy conflict can lead to a phenomenon of policy goal displacement. Therefore, it is important for policy makers to specify the reason for setting the policy goal, the necessity of implementation, the implementation method, and understand the policy agent to minimize conflict of policy. In addition, this study shows that a control tower on how to regulate the renewable energy industry is essential for smooth policy implementation.

This study has some limitations. First, this study analyzed the policy implementation process as variables of goal ambiguity and conflict. However, it did not analyze whether contents of RPS interpreted by the Ministry of Commerce, Industry and Energy and five power generation subsidiaries of KEPCO were desirable or whether the original aim of policy was achieved through implementation of the policy.

In the future, research on achievement of the original aim through RPS policy implementation is required. It is also necessary to analyze whether RPS implementation rate is acting as a policy tool for policy goals such as fostering renewable energy industries, creating renewable energy markets, and developing renewable energy technologies. It is also necessary to analyze whether the government has adopted the policy measure as its evaluation standard and set policy outcome indicators appropriately.

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국문초록

한국의 신재생에너지 공급의무화정책 집행에 관한 연구

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우리나라는 세계 7위의 에너지 소비국이면서도 에너지 원료 대부분을 수입에 의존하고 있다. 또한, 정부는 최근 더욱 악화되고 있는 미세먼지와 지구 온난화 등의 자연환경 오염, 그리고 방사능 안전을 우려하여 신규 석탄화력 발전소와 원자력발전소를 되도록 건설하지 않기로 방침을 정한 바 있다. 이에 따라 기존 화석연료를 대체할 신재생에너지 육성은 필수불가결한 정책 방향이다.

우리 정부는 신재생에너지 생산량을 증가시켜 신재생에너지 생산 규모의 증가, 생산 비용의 감소, 투자와 생산 증대, 기술혁신 등의 선순환을 기대하고 2002년부터 2011년까지 신재생에너지에 대해 발전차액지원제도를 실시하였다. 그러나 2012년 신재생에너지 공급량은 전체 1.9%에 불과하는 등 제도의 효과가 크게 나타나지 않자 2011년 발전차액지원제도를 종료시키고 2012년부터 신재생에너지 공급의무화 제도를 실시하고 있다. 이 제도는 전력회사들에게 정부가 설정한 비율을 신재생에너지로 생산하도록 의무화하는 제도로 2024년 전체 전력의 10%를 신재생에너지로 공급하는 것을 목표로 하고 있다. 그러나 이 제도 역시 목표 달성 여부에 대한 논란이 끊이지 않고 있다.

본 연구는 한국의 RPS 정책을 사례로 하여 정책의 모호성과 정책 당사자들간의 갈등이 RPS 정책집행에 미치는 영향에 대해 분석하였다. 이론적 분석틀로는 Matland의 모호성-갈등 모형을 적용하였다. 분석결과 정책시행 초기 정책을 집행하는 발전업체들의 사명이해 모호성과 정부와의 갈등을 확인할 수 있었다. 이에 따라 우리나라 RPS 정책은 상징적 집행 → 정치적 집행 → 행정적 집행의 변동과정을 거쳐왔다는 것을 확인할 수 있었다.

이 연구를 통해 정책 목표 모호성과 이해관계자들간의 갈등을 근원적으로 해결하려 노력하지 않는다면 정책 업무량 지표가 정책 목표 모호성과 갈등 해소 수단으로 기능할 수 있다는 점이 확인되었다. 그리고 객관적인 성과지표가 아닌 정책 업무량 지표에 집착하면 정책 목표 전치가 일어난다는 것도 확인하였다. 따라서 정책의 성공적 집행을 위해서는 정책형성자가 정책목표를 구체화하고 객관적인 성과지표를 설계하는 한편, 이해관계자들간의 갈등을 조율할 조정 기구의 역할이 중요하다고 판단된다.

주요어 : 신재생에너지, 신재생에너지 공급의무화정책, 정책 목표 모호성, 모호성-갈등 모형, 정책 집행

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