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Policy note

Is the renewable portfolio standard an effective energy policy?: Early evidence from South Korea

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ABSTRACT

This study provides preliminary evaluation of South Korea's Renewable Energy Portfolio Standard (RPS) apropos capacity growth, technological innovation, cost impact, and market risk, compared to Feed-in Tariffs (FITs). Findings indicate that both effectively expand electricity generation from renewable energy sources (RES-Es). Early evidence suggests that the RPS appears to have further strengthened RES-Es' market growth, particularly biomass and solar PV. For most technologies, policy costs appear higher under the RPS than FITs, except for PV and fuel cells. Under the RPS, higher market risks are a major concern, particularly for smaller suppliers in the PV market, despite growing PV capacity.

1. Introduction

Two popular policies for expanding the market share of electricity from renewable energy sources (RES-E) are Feed-in Tariffs (FITs) and Renewable Portfolio Standards (RPSs). FITs guarantee the price of RES-Es by setting fixed prices or price premia over the market price of electricity for a specified time period. RPSs obligate electricity suppliers to acquire a certain percentage of electricity from renewable energy sources. Renewable Energy Certificates (RECs) are issued for all RES-Es produced. Thus, electricity suppliers can fulfill their allocation by producing it themselves or by purchasing RECs from other RES-E producers.

FITs are thought to have an advantage in encouraging long-term investment in RES-Es by guaranteeing prices over a long-term (15–20 years). Additionally, FITs can differentiate subsidy levels for each energy source or technology. Thus, high-cost technologies, such as solar PV and fuel cells, can readily enter the market under FITs. However, a guaranteed price over a long period may have a negative effect on market competition among RES-E suppliers. An RPS is considered a somewhat more market-oriented policy. The "winner" of RES-E technologies is decided by the market, not by regulators. Thus, RPSs are thought to provide more incentives for RES-E suppliers to innovate and reduce costs. However, under an RPS, RES-E suppliers face a greater market risk, which may have a negative impact on policy effectiveness. Numerous studies have surveyed the strengths and weaknesses of FITs and RPSs, including Bergek and Jacobsson (2010), Buckman (2011), Del Rio (2012), Finon (2013), Frondel et al. (2010), Haas et al. (2011), Lipp (2007), Menanteau et al. (2003), Mitchell et al. (2006), and Verbruggen (2009).

As of 2012, 68 nations, including Germany, were using FITs as an RES-E support policy. RPSs are in place in 25 countries at the national level as well as 54 states and provinces in the United States, Canada, and India (REN21, 2014). The case of South Korea is interesting because it has had experience with both FITs and an RPS over the past 10 years. After about a decade of experience with FITs, South Korea replaced them with an RPS scheme in 2012. This study examines the effect of that policy change in South Korea. It is a preliminary evaluation because more data and experience are needed to evaluate the long-term effects of the RPS in South Korea.

2. Review of RES-E policy in South Korea

2.1. FIT policy: 2002–2011

South Korea introduced an FIT scheme in 2002, guaranteeing fixed tariffs for small-scale power generation from hydropower, biomass, waste, fuel cells, wind, and solar photovoltaics (PV) over a period of 15–20 years. RES-E producers of hydropower and

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0957-1787/

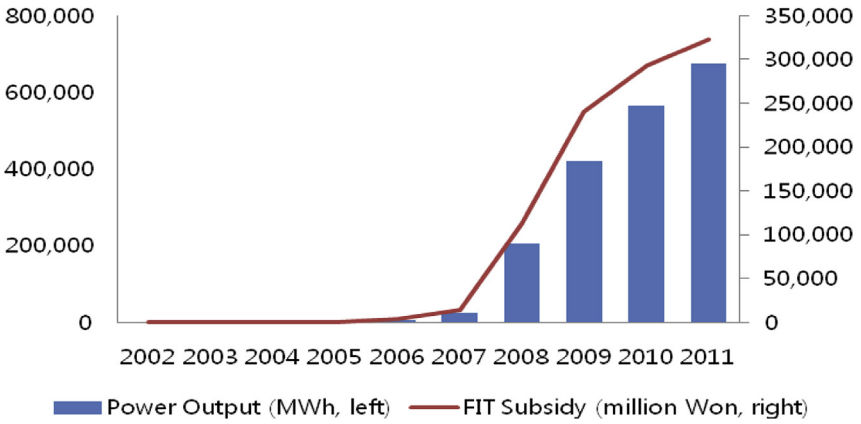

Fig. 1. Total FIT subsidies and power outputs for solar PV.
Data source: Korea Energy Management Corporation.

bioenergy were also allowed to choose variable tariffs, set at 5–20 Won[1] above the wholesale market price of electricity. The tariffs for PV were varied according to location and capacity. Generally, the tariffs for PV were much higher than other RES-Es due to high generation costs.

Under FITs, the RES-E capacity of South Korea grew from 1047 MW in 2002 to 4682 MW in 2011. In particular, the growth of wind energy (from 2.2 MW to 421.8 MW) and PV (from 0 MW to 359.4 MW) was remarkable. The number of companies in the renewable energy sector also increased, from 49 in 2004 to 225 in 2011. In particular, the number of PV companies rose from 12 in 2004 to 99 in 2011.

The policy costs of FITs rose rapidly as the market share of RES-Es increased steadily under them. In particular, the rapid increase of FIT subsidies for solar PV was a key reason for its being replaced by the RPS in 2012. Figs. 1 and 2 show FIT subsidies and power outputs for solar PV and wind power between 2002 and 2011, respectively. Power outputs increased continuously for PV and wind power. However, while total FIT subsidies for solar PV increased steadily, those for wind power experienced both an increase and a decrease during this period. In fact, the FIT subsidy expenditure for wind power was negligible in 2011, as the wholesale market price of electricity was higher than the FIT rates of wind power for most of this time period.

To limit budget expenditures for FIT subsidies, the South Korean government introduced a capacity cap on the FIT for solar PV. The upper limits for new PV installations were 50, 70, and 80 MW, in 2009, 2010, and 2011, respectively. Greater expansions of solar PV and higher budget expenditures would be expected if there were no capacity limit.[2]

2.2. RPS policy: 2012-present

After about a decade of experience with FITs in South Korea, the government grew concerned about the rapid increase in the budget for FITs and in 2012 replaced it with an RPS scheme. The RPS was also expected to bring market competition to RES-E. Under the RPS, power suppliers providing more than 500 MW must generate a certain amount of total power from RES-Es. The obligatory supply rate of RES-Es is scheduled to rise from 2% in 2012 to 10% in 2022, as shown in Table 1.

To ensure fair competition among various RES-E technologies, banding and set-aside schemes were introduced. In the banding scheme, different multiples of tradable certificates are issued for each unit of generation based on the RES-E type. Set-aside or carve-outs comprise part of the RPS market reserved for particular types of RES-E (Buckman, 2011). In South Korea, solar PV has a separate market for RECs. Table 2 shows the multipliers for RES-E banding in South Korea. Higher and lower weights were assigned to high-cost and low-cost technologies, such as fuel cells and bioenergy, respectively. Borrowing is allowed for up to 20% of the quota in the RPS scheme. Additionally, if electricity suppliers do not fulfill their targets, they have to pay a penalty, amounting to 150% of the yearly average market price of RECs. In 2012, electricity suppliers paid 23.7 billion Won in penalties for not fulfilling their targets.[3] Penalties collected are reverted to the financial resources of the Electrical Industry Foundation Fund.

3. How effective is the RPS in South Korea?

3.1. Capacity growth

Fig. 3 shows the growth of RES-E capacity under the FITs and RPS. RES-E capacity grew rapidly following the introduction of FITs in 2002, and this trend appears to have strengthened under the RPS. In fact, the growth rate of RES-E capacity in 2013 exceeded 20%, the highest in the past 10 years. The biggest early winner in the first phase of the RPS seems to be bioenergy (biogas and biomass). Bioenergy is an attractive option for electricity suppliers to achieve the RPS target because of its low investment costs and short lead time. Bioenergy's capacity grew from 14.05 MW in 2011 to 68.34 MW in 2013. In particular, biomass increased from 10 MW in 2011 to 56.4 MW in 2013.[4] This trend appears likely to continue

[1] $1 USD is approximately equal to 1100 Won.

[2] Many governments that introduced FIT schemes without budget caps experienced expenditure greater than expected. For example, Ontario reduced rates for solar PV in 2010, less than a year into the program, because applications were higher than anticipated (Mabee at al., 2012; Stokes, 2013; Yatchew and Baziliauskas, 2011). In 2012, the UK government hurried to cut FIT rates of small PV when its deployment was far greater than planned (Guardian, 2012.02.08). Germany also experienced similar rapid rate cuts for solar PV.

[3] Electricity suppliers insist that high penalties are unavoidable because of short REC supplies. They are consistently demanding that the government lower the target of the RPS. In addition, the carbon emissions trading scheme, launched in 2015, may add a burden to electricity suppliers. The government did not accept their request that carbon credits be issued for all electricity from renewable energy sources. At present, there is no institutional linkage between the RPS and the carbon emissions trading scheme in South Korea.

[4] There is some concern regarding the rapid growth of this market, as most biomass used in South Korea is imported.