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Policy synergy or conflict for renewable energy support: Case of RPS and auction in South Korea

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ABSTRACT

Governments provide various incentives for the production of electricity from renewable energy sources (RES-E). South Korea has promoted the use of such electricity through various programmes, such as Feed-in Tariff from 2002 to 2011, and Renewable Portfolio Standard (RPS) since 2012. The RPS appears to have been particularly effective in stimulating the use of RES-E. However, there remain several issues regarding the current RPS' policy design. This study examines South Korea's RPS by focusing on two issues. The first issue is the regulation of technology competition under the RPS; and the second issue is risk mitigation, which is generally known as a weakness of the RPS policy.

This study suggests that one option for addressing both these issues is a policy mix of RPS and long-term contract auctions with a sliding premium. In particular, a technology-specific auction can be a complement to the technology-neutral RPS, not only in terms of minimising risk, but also in terms of cost and dynamic efficiencies. The synergy effect between these two policies is expected to be more significant than alternative policy combinations.

1. Introduction

Governments provide various incentives for the production of electricity from renewable energy sources (RES-E). South Korea has promoted the use of such electricity through various programmes. First, between 2002 and 2011, it supported RES-E by guaranteeing higher rates than market prices of electricity, which is called Feed-in Tariff (FIT). Then, in 2012, it introduced a Renewable Portfolio Standard (RPS) scheme. Under RPS, 18 power supply companies, whose individual capacities are over 500 MW, have compulsory targets, in which certain portions of electricity must be derived from RES-E. These 18 power suppliers can fulfil their targets by either supplying RES-E themselves or by obtaining Renewable Energy Certificates (RECs) from the REC market. RECs are issued for all RES-E.

In South Korea, RPS appears to have effectively stimulated RES-E. However, there remain several issues regarding the current RPS policy design. This study focuses on two issues in relation to the design elements of South Korea's RPS. The first issue is the regulation of technology competition under RPS. Currently, South Korea operates its RPS with technology banding. This study discusses the strengths and weaknesses of RPS with technology banding. The second issue is market risk mitigation, particularly for small RES-E suppliers. This study investigates the policy options for reducing market risks under RPS. A policy mix of RPS and long-term contract auctions can help address RPS' technology competition problems and/or market risk problems, as will be discussed in this study. An optimal combination of policy mix will be recommended based on the assessment of alternative combinations of RPS and auction policy mix.

2. Background and relevant literature

The FIT and RPS are the most popular renewable energy policies. FIT guarantees the price of RES-E by setting fixed prices or premiums over the market price of electricity for a long period, while an RPS obligates generators or power suppliers to acquire a certain percentage of electricity from RES-E. Power suppliers with an RPS obligation can fulfil their targets by either supplying RES-E themselves or by trading RECs, which are issued for all RES-E, in the REC market.

FIT may be a more effective means of encouraging RES-E investment because it guarantees prices (Dong, 2012; Haas et al., 2011; Menanteau et al., 2003; Mitchell et al., 2006 etc.), while providing differential support according to the maturity of technologies. However, guaranteed prices may have a negative effect on competitiveness, thereby lowering the incentive to reduce costs (Frondel et al., 2010). RPS is considered as a market-oriented policy as the market, and not guaranteed RES-E prices, determines winners in RES-E markets. Market competition produces strong incentives for cost reductions under RPS (Menanteau et al., 2003). However, RPS can impose some market risk

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on investors, thereby hindering the expansion of RES-E (Haas et al., 2011; Lipp, 2007). Moreover, technology-neutral RPS does not provide differential support according to the costs of RES-E technologies—as is possible under FIT—which may be essential in supporting immature technologies (Menanteau et al., 2003). In addition, FIT and RPS with technology banding have information asymmetry problems, leading to a rent-seeking behaviour of RES-E suppliers when governments determine FIT rates or RPS banding ratios (Kwon, 2015a). As there are pros and cons of each RES-E policy, some literature argues that the design, rather than type of instrument, is more important in RES-E support policy (Haas et al., 2011; del Rio and Linares, 2014). For example, considering FIT, it is important to mitigate information asymmetry problems and have a flexible tariff adjustment mechanism (Haas et al., 2011). Considering RPS, it is important to design a policy scheme that is able to mitigate market risk problems and support immature technology without incurring information asymmetry problems.

Auctions have recently been regarded as a useful alternative to other RES-E support schemes. Indeed, an increasing number of countries have introduced auctions as part of their RES-E support schemes (del Rio, 2014, 2017; Winkler et al., 2016; Smeets, 2017). One advantage of auctions in comparison to FIT, as mentioned in the literature, is the expectation that auctions will mitigate information asymmetry problems when setting remuneration levels (del Rio, 2017). Using South Korea as a case study, this study shows that auctions can also be a useful alternative when combined with RPS. It has the potential to mitigate the shortcomings of RPS: high market risk and weakness in supporting immature technologies. The case of South Korea is interesting as it has more than 15 years of experience using FIT and RPS policies, and recently introduced an auction scheme through a fixed price rule as a policy complementary to RPS. This study shows the merits of an RPS and auction policy mix. The structure of the study is as follows.

Section 3 briefly reviews South Korea's RPS. Similar to other RPS schemes, RPS in South Korea also has drawbacks: high market risk, particularly for small RES-E suppliers, as well as difficulty in designing a banding scheme. Each of these issues is discussed in the South Korean context in Sections 4 and 5. High market risks and difficulty in supporting immature technology are key issues for any country with RPS as its main RES-E support scheme. Therefore, policy designs that are able to tackle these issues will be of interest to other countries relying on RPS.

South Korea recently introduced a long-term contract auction scheme. A policy mix of auction and RPS may be a useful alternative to tackle the shortcomings of RPS. Section 6 assesses the policy mix of auction and RPS, evaluating whether they are in synergy or have conflicting effects. In the literature, analyses of a policy mix strategy are concerned with designing an optimal combination of policy instruments under the assumption that certain combinations of policy tools are more 'complementary' than others (Fischer, 2010; Howlett and Rayner, 2013; Rogge et al., 2017). Policy schemes mutually interact, leading to conflicts or synergies (del Rio, 2014).

The assessment of a policy mix is based on the criteria of 'effectiveness' and 'efficiency', which have been widely used for the assessment of RES-E policies in the literature (del Rio, 2014; del Rio et al., 2017; Sovacool, 2010 etc.). Essentially, the issue of market risk is one of the key factors determining the 'effectiveness' of RES-E policies, and technology banding issues are closely related to the 'efficiency' of RES-E policies. A detailed explanation of the assessment criteria for 'effectiveness' and 'efficiency' will be provided in Section 6. In addition to 'effectiveness' and 'efficiency', there are other criteria in the literature, such as 'equity', 'socio-political feasibility', 'actor diversity', and 'local impacts' (del Rio, 2014; del Rio et al., 2017; Sovacool, 2010). However, this study focuses on 'effectiveness' and 'efficiency' as the main objectives of RES-E policies are to increase the share of RES-E in the market (effectiveness) at a minimum cost (efficiency). Finally, Section 7 concludes this paper by suggesting a policy alternative for the Korean RES-E policy.

3. Overview of RPS in South Korea

In 2002, South Korea introduced the FIT scheme. Under FIT, RES-E was guaranteed higher rates over 15–20 years. In addition, FIT provided different rates for each RES-E technology. For example, high cost technologies, such as solar PV and fuel cells, were given much higher rates than wind or bio-energies. Under FIT, RES-E in South Korea increased rapidly. However, the government's concern about the rapidly escalating expenditures for FIT subsidies prompted the Korean government to introduce an RPS scheme in 2012 (Kwon, 2015b).[1] In addition, RPS was expected to create more competition among RES-E technologies (Frondel et al., 2010).

Under RPS, 18 power supply companies, whose capacities are over 500 MW, have compulsory targets, in which certain portions of electricity must be derived from RES-E. The RES-E target increases from 2% in 2012 to 10% in 2023 (Table 1). A power supplier can fulfil its target by either supplying electricity from RES-E itself or by obtaining RECs from the REC market.

RPS is attractive to the Korean government as it is a market-friendly policy. While each RES-E technology was guaranteed different rates over 15–20 years according to the costs of each technology under FIT, under RPS, RES-E technologies compete with each other in the REC market. Therefore, there are bigger incentives for RES-E suppliers to reduce generation costs under RPS. However, there are some well-known drawbacks of RPS. First, it creates a high market risk for RES-E suppliers, particularly small RES-E suppliers. Unlike FIT, which guarantees RES-E rates over longer periods, RPS poses the risk of rapid revenue changes for RES-E suppliers. Second, RPS may lead to low-cost technology market saturation. Unlike FIT in which differentiated rates are guaranteed according to the generation cost of each RES-E, market competition under RPS may force high-cost technologies out of the market, even if the potential of their long-term innovation is evident. In response to these concerns, many countries have introduced policy design elements into RPS schemes. South Korea's RPS scheme also has these elements in its design. However, debates continue regarding an appropriate solution which will provide both, a fair competition rule among RES-E technologies and reduced market risks for RES-E suppliers. Each of these issues will be examined in Sections 4 and 5.

4. Regulating technology competition under RPS: with or without banding?

4.1. Technology-neutral RPS and excess profits for non-marginal technologies

The costs of RES-E vary according to energy sources and technologies. Although FIT guaranteed different rates according to generation costs of technology, RPS requires RES-E technologies to compete with each other in the market. As mentioned earlier, one drawback of technology-neutral RPS schemes is that mature technologies with low costs earn excess profits, whereas immature technologies with high costs are forced out of the market, even if they have the potential to substantially reduce costs in the long run. In other words, non-marginal RES-E suppliers earn rents, which entail excess profits persisting in the long run (Bergek and Jacobsson, 2010; Haas et al., 2011; Kwon, 2015a; Verbruggen, 2009).

As shown in Fig. 1, the revenues of RES-E suppliers are the sum of the prices of renewable certificates (P_{REC}) and the market price of

[1] The Korean government only partially succeeded in cutting policy costs by changing to an RPS scheme. Under RPS, subsidies for RES-E suppliers were reduced for solar PV, but increased for other RES-Es (Kwon, 2015a). More importantly, the Korean government changed its policy design, where subsidies came from the government budget under FIT and they were financed by raising the electricity rates under RPS (Kwon, 2015b).