Effect of Combining Carbon Policies and Price Controls in Cross-Border Trade of Energy on Renewable Generation Investments

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Clean energy policies have played an important role in encouraging an early adoption of Renewable Energy Sources (RES). However, the high flexibility required to deal with the variability of some RES such as solar and wind is still the main challenge for the massive adoption of RES. One solution that can help in mitigating the variability of solar and wind energy is the diversification of generation portfolios across large geographical areas through cross-border trade of energy. Nevertheless, cross-border trade of energy usually reduces the economic welfare of some actors and increases the welfare of others. For instance, domestic consumers in exporter countries may experience price spikes due to interconnections, which may lead to undesirable political implications. Thus, particularly in South America, energy policies based on direct subsidies, or price controls that introduce indirect subsidies, are commonly implemented aimed at sheltering domestic consumers against rising electricity prices.

It has been shown that price controls on cross-border trade of energy may discourage RES investments due to the revenue reductions that base-load generation technologies (mostly RES) bear because of the price control. The assessment of the effectiveness of carbon policies, such as standard carbon tax and cap-and-trade programs, to promote RES investments when interacting with these price controls, is a very relevant aspect when developing a policy portfolio and, thus, is the focus of our research. For this assessment, we propose a two-stage equilibrium model, solved using a Gauss-Seidel algorithm. Several case studies, based on price controls in cross-border trade of energy between Chile and Argentina, are discussed. Results show that carbon policies can partially offset the negative impact of price controls on RES investments and that cap-and-trade programs are more effective than carbon taxes in preventing this negative impact. However, generation units supplying domestic demand bear higher revenue reductions in a cap-and-trade program than under a standard carbon tax policy. Moreover, a high level of carbon tax combined with price control regulation may increase renewable capacity investments, but without completely offsetting the negative effects of the price controls.

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