

The Effects of Clean Electricity Certificates on the Value of Transmission Rights

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Overview

Many consumers are placing a premium on products and services produced in an environmentally friendly manner. This has led to a variety of labeling and certification programs. In the electricity sector such clean electricity certificates are known as Renewable Energy Certificates (US), Guarantees of Origin (EU), Renewable Energy Guarantees of Origin (UK) among others. Such clean electricity certificates are issued for each unit of electricity generated with an eligible technology. The electrical energy may be bundled with the certificate or sold separately.

Generation of clean electricity may take place in different locations from the key demand locations. Transmission of electricity between different locations are governed both by the physical properties of the transmission grid and relevant institutional rules including market design. If the certificates are traded separately from the energy the existence of certificates does not influence neither the flow of electricity nor the prices. On the other hand, if the certificates are more or less bundled with the corresponding energy the demand for certificates influences both the flow and possibly also energy prices. Transmission capacity between different areas can be allocated implicitly in the market clearing price mechanism, or explicitly through the sale of financial or physical transmission rights. When clean certificates are directly linked to a corresponding energy quantity physical transmission rights may be required for the corresponding energy flow. The purpose of this paper is to investigate the electricity market consequences of a system with clean energy certificates in a theoretical model, and to empirically test the theoretical findings.

Methods

We use a basic partial equilibrium model with two interconnected electricity markets where one market is a supplier of clean energy certificates while the other market has a large demand for clean energy. We discuss different market designs for the transmission border with a joint market clearing design where the transmission capacity is implicitly allocated (either through market splitting or market coupling) and a design with separate markets and an explicit auction of physical transmission rights (obligations/options). The transmission capacity between Switzerland and Italy allocated through explicit auctions of the physical right. Italy implemented an electricity origin disclosure program in 2009. Following the introduction of a new support scheme for new renewable production sources in 2012, the Italian rules for clean energy certificates stated that certificates originating outside Italy should be matched with a corresponding physical flow of electricity into the Italian market. This policy was in effect for 2013 and most of 2014. Our theoretical model shows that such a policy would increase the demand for physical transmission rights and hence their price. The policy was challenged as being in violation of EU single market idea, and it was struck down by a court decision in November of 2014. We are using the period in which the Italian law required clean electricity certificates to be matched with a physical flow as a natural experiment to test the predictions from our theoretical model. Utilizing data for spot prices in Switzerland and Italy as well as for prices for the physical transmission rights between the these two countries, we specify and estimate hourly transmission capacity price equations.

Results

Our econometric estimates shows clearly that the transmission capacity prices were substantially higher in 2013 when the policy was in effect as compared to 2011-2012 and 2015. This is in accordance with our theoretical model. The prices are somewhat higher in 2014, but not as much as in 2013. We attribute this in part to litigation that took place in 2014 and the ultimate court decision handed down late in 2014.

Conclusions

The existence of clean energy certificates in an electricity market has no impact on the market allocation and energy prices if the certificates are traded separately from the energy. Our theoretical model shows that requiring bundling of energy and certificates can have a clear impact on energy flow, transmission and prices. Ensuring a flow of clean energy from an area with excess demand to an area with excess supply requires explicit use of physical transmission rights (not options) across borders with clear implications for energy market prices and transmission rights prices. Using data from the Swiss-Italian border and energy prices from the Italian and Swiss markets we test the predictions from the theoretical model, and find that the market behavior is consistent with the model predictions.