REAL-TIME PRICING IN THE CYPRIOT ELECTRICITY MARKET

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Overview

This paper analyzes the impacts of real-time electricity pricing (i.e. marginal cost pricing for end consumers) in the Cypriot electricity market on power prices, peak and off-peak capacities, emissions from electricity generation, and renewable energy sources such as wind and solar. Although wholesale markets have been open to competition during the deregulation of many electric utilities in Europe, most end-use customers still pay fixed regulated retail prices for their consumption that do not vary with the time of day or level of demand. Application of fixed pricing of electricity today is come as a result of market regulation that is justified for various reasons including reliability, availability (keeping the lights on) and affordability of electric power. Therefore, electricity planning problems even today are merely focused on meeting a peak demand and preserving a reserve margin to maintain the desired level of reliability, given an assumed price-inelastic demand. This forces electric utilities to incur a high total cost of meeting the growing demand for electricity in a reliable way.

Methodology

This paper uses a merit order stack approach to generation investment and operation decisions. Effectively, a system planner minimises the total cost of capacity and output – this produces equivalent results to those that an efficient competitive market would give. Three types of conventional power station are modelled, representing peaking, mid-merit and baseload generators. The model also includes wind and solar generation as the two kinds of renewable power most suitable for Cyprus.

Following Borenstein and Holland (2005) and Borenstein (2005), we model consumers' demand with a constant elasticity functional form. We compare the impacts of time-varying prices on load profile by splitting customers into two: those pay their electricity bills at time-varying prices and at flat-rate electricity prices. We apply the model real electricity market using real market data such as hourly load demand and power supply data of the island.

Results

Based on empirical results, we clearly see that the load curve is flattened with real-time pricing, and in turn have the following impacts in tge Cypriot electricity market. Compared to status quo, with a demand elasticity of -0.025 and 0.33 RTP participation, off-peak capacity increases from 1023.45 MW to 1036.35 MW, peak capacity drops from 144.31 MW to 127.32 MW, fixed MWh price of electricity decreases from 198 Euro to 197.48 Euro, and emissions from electricity generation decreases from 2,610, 029 tonnes to 2,605, 217 tonnes. If demand is more elastic (from -0.025 to -0.1) but the share of RTP customers remains the same, we find that off-peak capacity increases from 1036.35 MW to 1068.33 MW, peak capacity drops from 144.31 MW to 109.84 MW, fixed MWh price of electricity decreases from 197.48 Euro to 197.06, price for the last peak demand drops from 4084.92 to 1190.87, emissions from electricity generation decreases from 2,605, 317 tonnes to 2,593, 317 tonnes. Similarly, if participation to the RTP programme increases (from 0.33 to 0.66) but the demand elasticity remains the same (-0.025), we find that off-peak capacity increases from 1036.35 MW to 1040.90 MW, peak capacity drops from 144.31 MW to 127.32 MW, fixed MWh price of electricity decreases from 197.48 Euro to 197.36, price for the last peak demand drops from 4084.92 to 2802.08, and emissions from electricity generation decreases from 2,605, 17 tonnes to 2,597, 206 tonnes. With an introducing renewables such as wind and solar, we find that peak capacity decreases further so capacity credits from solar and wind has greater load factor as a percentage of peak demand. Thereore, we can conclude that there is a potential gain from smart metering even at small consumer response, and/or with a higher participation to the programme.

Conclusions

The overall conclusion for Cyprus is that dynamic pricing of electricity will increase capacity utilization during off-peak hours, decrease peak capacity, reduce power prices in Cyprus for poor off-peak users, reduce emissions from electricity generation and increase the use of wind resources in the island. Hence, the Cypriot authorities should let market participants react to changes in electricity prices. This means that the country should switch to smart metering and shift away from an average pricing of electricity. Given the estimates and problems about demand response programs, we recommend two things to the authorities in Cyprus. First, starting voluntary pilot programs in order to estimate the price sensitivities from these programs. Later on, relevant authorities must also provide customers with accurate expectations about their bill savings from such programmes so that program will yield higher benefits to cover the cost of implementing the programme.

Refences

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