

CAPACITY PRICES UNDER HIGH RENEWABLE PENETRATION SCENARIOS

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Overview

In this paper we consider a capacity pricing model, which includes a resource adequacy standard, a demand curve for reliability, the capacity contribution (or credit) of resources, and alternative capacity expansion plans. We apply the model to the Mexican electricity market under a base and several alternative high renewable penetration scenarios. The topic is significant for generation resource developers – conventional and renewable, – as well as policy makers, as it sheds light on the dynamics of capacity markets and the interaction between renewable energy policy, planning criteria, and competitive electricity markets.

Methods

The capacity pricing model employed in this study requires the development of capacity expansion plans, simulated firm (or delivered) capacity from each resource in the system, and simulation of a reference technology. We use a capacity expansion (optimization) model to develop the alternative capacity expansion scenarios, a system adequacy model to simulate firm capacity, critical hours and reliability metrics, and a dispatch model to evaluate the reference technology, and offset the cost of new entry of the same.

Results

The results of this study consist of simulated expansion plans, critical hour identification, reliability metrics, and capacity prices for the Mexican market.

Conclusions

We find, consistent with other studies, higher capacity prices under higher renewable penetration, the results however varying broadly given the diversity in the resource mix and underlying renewable profiles. The implications for planners consist of the tight relationship between reliability metrics and capacity prices. For generators, the sheds light on risks and opportunities related to renewable development policy and capacity revenue streams.

References