EVALUATING THE IMPACT OF CROSS BORDER INTERCONNECTIONS ON SECURITY OF SUPPLY IN THE PRESENCE OF HIGH SHARE OF RENEWABLES

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Overview

To ensure security of supply, different resource aqeduacy policies have been implemented or are being considered across electricity markets in the world. Capacity markets have been widely regarded as one of the most significant policy instruments for ensuring security of supply. Many power systems in the US and Europe, have already implemented capacity markets for many years now. In this paper, we analyse the impact of cross border interconnection capacity on capacity markets, in the presence of a growing portfolio share of intermittent renewable energy sources electricity (RES-E). We use EMLAB-Generation, a hybrid electricity market model that uses optimization for short term market operations and is agent based in the long term. The objective of this paper is to study the effects increased interconnectivity among regional power systems is having on capacity markets. Considering a large geogrpahical area, the peak hours in each zone with a capacity market will be different (mainly due to distinct weather conditions). If the cross border interconnection capacity is increased, then much of the peak load is going to be served by generation from across the border. This in turn reduces the demand for capacity credits in the capacity markets. High cross border interconnection capacity also opens the possibility of cross border trade of capacity credits. If consumers in zone A are paying for capacity credits that are also being utilized for security of supply in zone B, then consumer costs in zone A will unacceptably increase, which could turn out to be the case in central western european electricity markets. This paper analyzes a novel approach to dealing with interconnected power systems while ensuring security of supply.

The paper is organised as follows: After the introduction the second section gives a brief overview about the literature review and proposed legislations. The third section describes EMLAB-Generation, the market model that we use along with the capacity market clearing algorithm. In section four we describe the conducted experiments and analyze the results. In the final section policy implications and conclusions are derived.

Methods

EMLAB-Generation, a hybrid electricity market model that uses optimization for short term market operations and is agent based in the long term[1].

Results

First, different scenerios are presented, discussing in detail the different possible sets of conditions we have tested.

Second, the change in consumer costs and producer costs is discussed along with the changes due to capacity market clearing

Third, the different parameters of capacity markets are analyzed and discussed.

Conclusions

Security of supply is the foremost goal in every power systems and capacity market is one of the most effective polciy instrument in achieving this goal. When dealing with power systems with high cross border interconnection capacity, we need to ensure that the consumers and power production companies on both sides of the border are benefited. The overall system costs reduces and security of supply is ensured across the region.

[1] http://emlab.tudelft.nl/

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