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Capacity Markets

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This work aims at studying an ideal capacity market model, a free-market competition model that allows all entities to commercialize power. The proposed capacity market differentiates itself from other market models mainly through implementing the possibility of any energy entity to participate. This new model allows a domestic consumer to become consumer and producer of capacity at the same time.
This work focuses on the limits of wind penetration in the power network and the creation of a capacity market that allows the commercialization of domestic capacity. It is also addressed the contribution of capacity market for the electrical system and its actors.

Capacity Markets - Proposed Model

This paper addresses the modeling of an ideal capacity market. A model of a market where there is a free competition. A market that is open to all holders of capacity.
This definition is particular important because it doesn't restrict the entry of potential new suppliers. In this situation it is possible for a domestic consumer to become a capacity supplier. The capacity market operates in an auction system. In the case of a free market, all entities can submit capacity bids on the market. This market has capacity auctions that aim to satisfy the capacity consumption for a defined year. To make this happen two or three auction may be needed, during that period. The auctions will be held with three years in advance for the chosen year. It allows potential producers/consumers to submit capacity bids for this year.

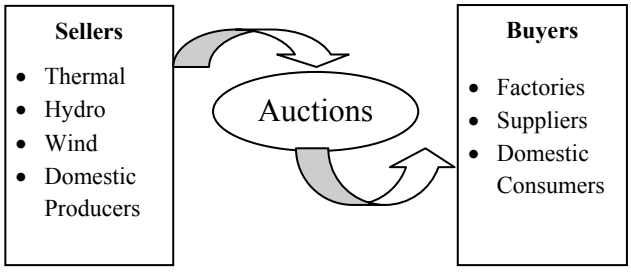

Diagram of the proposed capacity market model.

Case study

Consider wind power as a negative power demand.

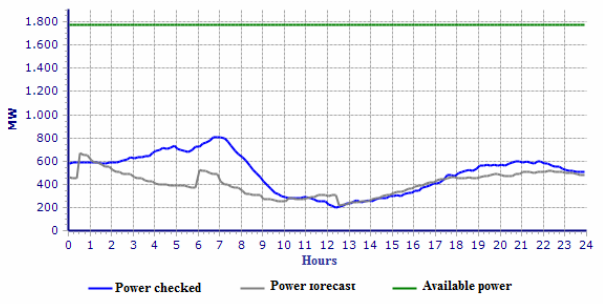

Figure 4 – Forecast wind power (gray) and actual wind power (blue) for the 7th of July 2009 Error! Reference source not found..

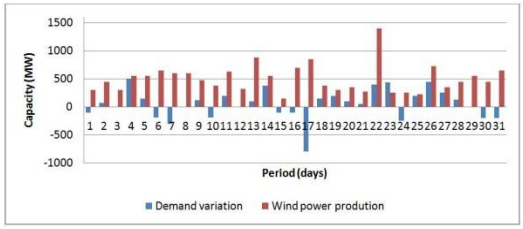

Figure 6 - Variation between forecast load and actual load, wind power capacity produced (July 2009).

Our results show the possibility of increasing the number of wind farms and thus to increase the wind capacity.

Today's use of wind power is minute compared with the wind potential available on earth. The use of global wind resources would be sufficient for the needs of global energy consumption [11]. Another problem studied in this work relates to the existence of a penetration limit of renewable power plants in the electric power grid. The market structure analyzed in this paper is based on the structure of an options market, based in the New England Forward Capacity Market [8][9]. The model analyzed here adds more complexity to the market, since it allows the entry of all entities wishing to transact capacity.
In conclusion, in the near future it is possible to connect more wind power plants into the power grid. The penetration limit of wind resources is not possible to determine, it depends on the topology of the network.
It is unattractive to electric companies to buy all domestic capacity. It only becomes attractive to buy domestic power from a certain amount of power.