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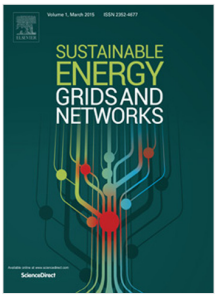

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The necessity of more temporal granularity in the Brazilian short-term electricity market

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Abstract: This work investigates the benefits of adding more temporal granularity in the Brazilian short-term electricity market. It shows that for this market more granularity leads to a better system operation and a more accurate short-term price. This work proposes a temporal granularity for the Brazilian short-term market and demonstrates that it is a robust technical-economic solution regardless of whether Brazil adopts a cost-based or a bid-based framework. Four cases to support the proposal are described.

Key-words: power system schedule, short-term market and, temporal granularity

1. Introduction

Brazil has a huge integrated power system that is responsible for delivering more than 99% of the country's electricity consumption. The supply side is hydro-dominated, providing about 70% of the electricity consumption, depending on the hydrological conditions of the year.

As a development country, the electricity demand is expected to increase 4.2% per year in the next ten years. Projections suggest that more than 73.5 GW of supply will be required to meet demand growth over this period [1].

Brazil's Independent System Operator (ISO) is responsible to schedule and operate the integrated power system. The ISO uses a cost-based dispatch model based on a stochastic dual dynamic algorithm [2] to support its decisions. One of the results produced by the algorithm is the Marginal Operation Cost (MOC), an approach of the short-term electricity price, which is called Difference Settlement Price (PLD, in Portuguese).

The PLD is calculated using the same computational stochastic models, data and, premises used to calculate the MOC. The differences between both are: (i) the PLD has a regulatory cap and floor and, (ii) the PLD calculus does not consider internal transmission constraints of each Brazilian zone market, or submarket, since each submarket must have the same short-term price in all electric nodes. When the MOC is between the PLD cap and floor and there are not internal transmission constraints in the submarkets, the PLD value is equal the MOC value.

The ISO schedules the plants and the system operation once a week based on three levels of load: heavy, medium and light. Therefore, there are three MOCs and three PLDs each week, one corresponding to each load level. This is the prices' temporal-granularity in the Brazilian short-term electricity market – week-ahead based on three levels of load. The ISO dispatches for the week on each level of load all thermal power plants with marginal cost lower than the MOC. Hydro power plants and other renewables supply the remaining demand. Table 1 defines the three load levels based on the hour of day and day of the week.

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