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A new methodology to obtain a feasible thermal operation in power systems in a medium-term horizon

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Abstract-

Nowadays, electricity market paradigms are constantly changing. On the one hand, the deployment of non-dispatchable renewable energy sources is bringing out the necessity of representing hourly dynamics in medium-term fundamental models. On the other, the promotion of new interconnection capacity and the integration of markets (as is the case of the European market) makes necessary the simultaneous modeling of multiple electricity systems. Thus, the large size of power markets, together with the consideration of uncertainty in some inputs, make it computationally intractable to work rigorously on an hourly detailed time span. Temporal aggregation, integer programming relaxation or less accurate generation modeling are usually employed to obtain reasonable computation times. However, the application of these techniques often leads to infeasible or suboptimal operational outputs. This paper proposes a new soft-linking methodology to meet reliable results from medium-term models, such as hourly prices or aggregated productions, with a feasible and detailed representation of the thermal generation, considering technical constraints and risk aversion. The results of a fundamental model that represents the competitive behavior between market players in a multi-area power system are used as the starting point for the methodology. Then, a post-processing method is applied to optimize and make feasible the thermal portfolio of a market agent. The final output is a feasible hourly scheduling and an ample space for optimization, where the introduction of a strategic term represents the rational behavior of a player who tries to maximize its profit.

Index Terms- electricity markets; feasible operation; medium-term representation; optimization models; power systems; thermal generation; unit commitment

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