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A review on the unit commitment problem: approaches, techniques, and resolution methods

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Abstract-

Optimizing the schedule of thermal generators is probably the most important task when the operation of power systems is managed. This issue is known as the unit commitment problem in operational research. It has been profoundly studied in the literature, where several techniques have been proposed to address a computationally tractable solution. In turn, the ongoing changes of paradigms in energy markets focus the attention on the unit commitment problem as a powerful tool to handle new trends, such as the high renewable energy sources penetration or widespread use of non-conventional energy-storage technologies. A review on the unit commitment problem is propo- sed in this paper. The easy understanding of the diverse techniques applied in the literature for new researchers is the main goal of this state-of-art as well as identifying the research gaps that could be susceptible to further developments. Moreover, an overview of the evolution of the Mixed Integer Linear Programming formulation regarding the improvements of commercial solvers is presented, according to its prevailing hegemony when the unit commitment problem is addressed. Finally, an accurate analysis of modeling detail, power system representation, and computational performance of the case studies is presented. This characterization entails a significant development against the conventional reviews, which only offer a broad vision of the modeling scope of their citations at most.

Index Terms- unit commitment; optimal thermal generation; numerical optimization; evolutionary optimization; optimization techniques; decomposition techniques; uncertainty management

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