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Self-unit commitment of combined-cycle units with real operational constraints

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Abstract-

This paper highlights the importance of accurately modeling the operational constraints of Combined-Cycle Gas Turbines (CCGTs) within a unit-commitment framework. In practice, in Colombia, when given an initial dispatch by the Independent System Operator, CCGT plants are operated according to the results of heuristic simulation codes. Such heuristics often omit technical operating constraints, including hot, warm, or cold startup ramps; the minimum operation hours required for a gas turbine to start a steam turbine; the relationship between the dispatched number of steam and gas turbines; the load distribution among gas turbines; and supplementary fires. Most unit-commitment models in the literature represent standard technical constraints like startup, shutdown, up/down ramps, and in some cases, supplementary fires. However, they typically overlook other real-life CCGT operating constraints, which were considered in this work. These constraints are crucial in integrated energy systems to avoid equipment damage, which can potentially put CCGT plants out of service and ultimately lead to lower operating costs.

Index Terms- Combined-Cycle Gas Units (CCGs); unit commitment; steam turbines; startup ramps

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