

Modeling the major overhaul cost of gas-fired plants in the unit commitment problem

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Abstract— The operation and maintenance (O&M) costs of gas-turbine-based generation technologies have traditionally been introduced in unit commitment problems by means of simplified formulations (such as the approach of including an additional energy cost adder component). We argue that, in the new context characterized by the increasing need for cycling operation, such simplified approaches do not realistically reflect the impact that these new operation regimes have on the OandM costs for both open and combined cycle gas turbines. We first review the role of the so-called long-term service agreements (LTSA), which is a commonly used type of contract offered by gas-turbine manufacturers to plant owners. We analyze how these contracts implicitly determine the maintenance intervals as a function of the operating regime, and, as a consequence, determine the impact of cycling operation on OandM costs. Based on this analysis, we develop a formulation based on linear constraints that makes possible a realistic modeling of OandM costs (as defined in LTSA contracts) in the unit commitment problem. This formulation is then tested using some examples, so as to illustrate how a proper modeling of these contracts significantly changes the scheduling resulting from the traditional unit commitment problem formulation.

Index Terms— Cycling, combined cycle gas turbine (CCGT); major overhaul; operation and maintenance (O&M) cost; power generation dispatch; unit commitment

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