Tests of approximations to Unit Commitment models

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Planning models must consider the impacts of generator and transmission investments upon operating costs and prices. It is often impractical to solve full unit commitment models as subproblems of planning optimization models. We ask what modifications and approximations to the unit commitment problem make it computationally efficient while still accurately characterizing energy and operating reserve prices and total costs. Specifically, we look at formulating a linear program (as opposed to a MIP), that aims to capture most of the characteristics of a unit commitment problem. This LP can be viewed as the limiting case as the unit size shrinks to zero; start-up and minimum run levels are treated as continuous variables. Furthermore, we also explore selective hour sampling techniques and a clustering approach in which different hours are clustered into various system-states based on their characteristics such as demand and wind availability, that helps reduce the dimensionality of the traditional unit commitment MIP problem. Transitions among the states are modeled as potentially incurring start-up costs and be limited by ramp constraints. Numerical test cases are used to compare these methods and full unit commitment models.

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