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Efficiency of Markets for Generator Ramp Capability in Electricity Spot Markets

Markets for ramp products ("flexiramp") are proposed by some US ISOs to address the problem of inadequate generator up- and down-ramp that is anticipated to worsen with increased renewable penetration. Flexiramp is capacity reserved to accommodate unexpected ramps in net load. We evaluate flexiramp market designs by comparing solutions of (1) a model simulating a ISO real-time market (a deterministic real-time unit commitment (RTUC) model with a flexiramp requirement) with (2) a stochastic RTUC model. Since the stochastic model minimizes expected cost, it is a standard for evaluating solutions. The flexiramp constraint improves the expected performance of ISO real-time markets, but is inefficient compared to stochastic RTUC. Flexiramp markets are less efficient in part because the deterministic flexiramp disregards energy costs from capacity reserved for upwards ramp; thus, capacity with low commitment costs but high running costs might be overcommitted, increasing energy costs under high ramp outcomes. The amount of flexiramp acquired strongly affects costs. Too little, and the result is under-commitment and high price fluctuations and even demand curtailment; too much, and over-commitment occurs, inflating production costs. Hence, careful design of the ramp market and, ultimately, transition to the use of full stochastic dispatch and commitment models is recommended.