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Joint energy and reserve markets: current implementations and modeling trends

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Abstract— The continuous penetration of intermittent technologies is gradually reinforcing the technical and economic importance of electricity ancillary services, which are responsible for guaranteeing the reliability and security of the power systems. Generation companies', regulating entities, system operators and other institutions (such as researchers on these fields) are more and more concerned on using market models to forecast most relevant outcomes for particular markets (such as energy and reserves cleared quantities and prices), under different simulation scenarios (such as costs or demand) and under different markets structures (such as more competitive or more oligopolistic). This paper reviews most energy and reserve markets implementations (mainly focusing on reserve types and dispatching methods), and discusses different approaches to model them. A theoretical equilibrium model for energy and reserve markets is also proposed.

Index Terms— Ancillary services, cooptimization, energy and reserve markets, Nash equilibrium, oligopoly.

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