

## **Dynamics of market power in ERCOT system: a fundamental CSFE with network constraints**

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**Abstract—** Previous studies of market power within a regional system have considered multiple competing generation operators and the role of transmission constraints. However, these studies typically assume simplified structures in which each operator is restricted to a unique node in a transmission constrained network. Real systems typically have operators making decisions for units in several zones at once. Past studies also implicitly treated market power as a static concept for a given set of market rules and network configuration. We demonstrate that market power is dynamic, and can vary significantly with fuel prices and even with large-scale weather patterns. We also demonstrate the impact on region-wide market power of operators that manage units in multiple zones. We use the Electric Reliability Council of Texas (ERCOT) as an illustrative case study, and apply a Conjectured Supply Function Equilibrium (CSFE) approach that accounts for transmission constraints. We show that the companies with greater influence on the market price will depend on the relative prices of coal and natural gas. We also show that a weather event, such as a period without any wind, can have a substantial impact on market power.

**Index Terms—** ERCOT system, market power, conjectured supply functions, transmission network constraints, technological representation, Nash equilibrium.

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