

WECC STUDY PROGRAM 2023

CHANGES IN GRID STRENGTH

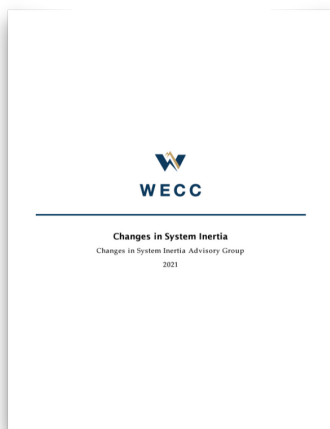
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OBJECTIVES

The evolution of the resource mix in the Western Interconnection affects the system at many levels, including the way the grid is protected and how it responds to events. In 2021, WECC's Changes in System Inertia (CSI) study found risks associated with large generator outages during conditions with low system inertia and recommended additional studies to understand how a reduction in synchronous resources might affect voltage stability. This study examines the strength of the system by assessing voltage profiles and how the system responds to transmission faults.



APPROACH

WECC developed an approach to evaluate grid strength by tracking the short-circuit ratio (SCR) as a measure of voltage stability, which is an indicator of grid strength. The study compared a baseline case with existing resources to a change case where 20% of synchronous generation was replaced with inverter based resources.

FINDINGS & RECOMMENDATIONS

Based on the current state of IBR modeling, replacing 20% of synchronous generation with IBRs would be unlikely to have any significant impact on protection system settings, according to the minor changes in SCR and fault current levels. By this measure grid strength would likely be minimally affected by some increased penetration of IBRs.

To meet clean energy goals, industry will need to replace more synchronous generation than the 20% modeled in this study. To understand the potential effects of higher IBRs adoption, additional studies could work to identify a point at which system strength is compromised.

The effects on the Short-Circuit Ratio and fault current were localized and the greatest impacts only showed up in the immediate vicinity of the replaced resources.

The results showed some anomalies in the modeling related to information about generators. Accurate representation of existing generation resources is critical to producing useful and relevant results. The lack of short-circuit modeling data for IBRs impedes the creation of accurate models for system strength.

- Recommendation: WECC's Short-Circuit Modeling Subcommittee should continue working with software vendors and industry to establish recommendations on how IBRs are represented in short-circuit models.
- Recommendation: Industry should urge inverter manufacturers to share modeling data to allow the creation of robust short-circuit models.

