

Dynamic Cascading Simulations of Hybrid AC/DC Power Systems in PSS/E

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Abstract-

Power system blackouts remain a major concern for modern electricity networks, as they often result from cascading failures that lead to substantial load shedding and widespread service disruptions. This paper presents a dynamic resilience assessment of hybrid AC/DC power systems and investigates the effectiveness of voltage-source-converter-based high-voltage direct current (VSC-HVDC) technology in enhancing system resilience under outage contingencies. The study contributes by integrating protection devices and their settings into the analysis and by providing a quantitative evaluation of the system response to N-2 and N-3 contingencies using PSS/E simulations. The demand not served index is used as a measure of resilience, and its cumulative distribution functions are computed to compare the performance of AC and DC interconnections. The results underscore the importance of VSC-HVDC links in mitigating cascading failures, highlighting their potential as a resilience-enhancing component in modern power grids.

Index Terms- resilience; dynamic simulation; contingency analysis; VSC-HVDC

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