ABSTRAK

PENERAPAN *PARALLEL RESONANCE FAULT CURRENT LIMITER* UNTUK MENINGKATKAN STABILITAS TRANSIEN PADA TURBIN ANGIN BERBASIS *DOUBLY FED INDUCTION GENERATOR*

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Peningkatan integrasi energi terbarukan, khususnya dari turbin angin berbasis *Doubly Fed Induction Generator* (DFIG), menimbulkan tantangan baru terhadap stabilitas transien sistem tenaga listrik. Salah satu metode mitigasi yang menjanjikan adalah penggunaan *Parallel Resonance Fault Current Limiter* (PRFCL) untuk membatasi arus gangguan dan meredam osilasi sistem saat terjadi gangguan besar. Penelitian ini melakukan simulasi pada sistem IEEE 9 Bus menggunakan MATLAB/Simulink dengan skenario gangguan tiga fasa ke tanah di Bus 5, 6, dan 8. Parameter yang dianalisis meliputi deviasi tegangan, fluktuasi daya aktif, kecepatan rotor, dan frekuensi sistem. Hasil menunjukkan bahwa penerapan PRFCL secara signifikan mengurangi deviasi parameter transien, mempercepat pemulihan frekuensi, serta meredam osilasi sudut rotor. Efektivitas tertinggi tercapai saat PRFCL dipasang dekat dengan titik gangguan. Dengan demikian, PRFCL meningkatkan kemampuan *Fault Ride-Through* (FRT) sistem DFIG serta mendukung keandalan sistem tenaga listrik dengan penetrasi energi angin tinggi.

Kata kunci: PRFCL, DFIG, Stabilitas Transien, Gangguan Tiga Fasa ke Tanah, MATLAB/Simulink, *Fault Ride-Through* (FRT).

ABSTRAC

IMPLEMENTATION OF PARALLEL RESONANCE FAULT CURRENT LIMITER TO ENHANCE TRANSIENT STABILITY ON WIND TURBINES BASED ON DOUBLY FED INDUCTION GENERATOR

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The increasing integration of renewable energy, especially wind power using Doubly Fed Induction Generators (DFIG), presents challenges to power system transient stability. One promising solution is the application of a Parallel Resonance Fault Current Limiter (PRFCL) to limit fault currents and suppress system oscillations during severe disturbances. This study models the IEEE 9 Bus system in MATLAB/Simulink, simulating three-phase-to-ground faults at Buses 5, 6, and 8. The analysis focuses on voltage deviation, active power fluctuation, rotor speed, and frequency recovery. Simulation results demonstrate that PRFCL significantly improves transient performance by reducing parameter deviations, accelerating frequency restoration, and damping rotor angle oscillations. The highest effectiveness is achieved when PRFCL is installed near the fault location. Therefore, PRFCL enhances the Fault Ride-Through (FRT) capability of DFIG-based systems and supports the reliability of power systems with high wind energy penetration.

Keywords: PRFCL, DFIG, Transient Stability, Three-Phase to Ground Fault, MATLAB/Simulink, Fault Ride-Through (FRT).