RINGKASAN

ANALISIS SENSITIVITAS PARAMETER *SPEED DROOP GOVERNOR* TERHADAP DEVIASI FREKUENSI SISTEM TURBIN-GENERATOR PADA PLTU BANTEN 3 LONTAR

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PLTU Banten 3 Lontar merupakan salah satu pembangkit penting dalam sistem Jawa-Bali. Dalam pengoperasiannya, unit pembangkit sering mengalami gangguan sistem seperti *step load* maupun *ramp load* yang dapat menimbulkan deviasi frekuensi. Pengendalian utama terhadap deviasi frekuensi dilakukan oleh sistem *governor* melalui mekanisme *speed droop.* Tujuan dari penelitian ini yaitu untuk menganalisis sensitivitas parameter *speed droop governor* terhadap deviasi frekuensi. Dengan menggunakan pendekatan kuantitatif berbasis data operasional PLTU Banten 3 Lontar dan simulasi model dinamik menggunakan perangkat lunak MATLAB dan simulink. Hasil penelitian menunjukkan bahwa variasi *speed droop* berpengaruh signifikan terhadap karakteristik respon frekuensi sistem. *Speed droop* kecil menghasilkan respon yang cepat dan sensitif, sedangkan *speed droop* besar meningkatkan kestabilan namun memperlambat respon dan memperbesar deviasi frekuensi. Berdasarkan analisis *trade-off* dan hasil validasi, diperoleh bahwa nilai *speed droop* sebesar ±4% memberikan keseimbangan terbaik antara kecepatan respon dan kestabilan sistem frekuensi dengan *overshoot* bernilai $8{,}962975\times10^{-4}$, settling time yang menengah yaitu 7,52 s, dan *steady state error* yang masih dapat diterima $6{,}025238\times10^{-4}$. Nilai ini direkomendasikan sebagai pengaturan optimal governor untuk mendukung operasi PLTU Banten 3 Lontar yang stabil dan andal.

Kata kunci : *Speed droop,* deviasi frekuensi, *Governor, step load, ramp load.*

SUMMARY

SENSITIVITY ANALYSIS OF SPEED DROOP GOVERNOR PARAMETERS ON FREQUENCY DEVIATION OF THE TURBIN*E-GENERATOR SYSTEM AT PLTU BANTEN 3 LONTAR*

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PLTU Banten 3 *Lontar is one of the key power generation units within the Java–Bali interconnected power system. During its operation, the generating unit frequently experiences system disturbances such as step load and ramp load variations, which may lead to frequency deviations. The primary control mechanism for mitigating frequency deviations is the governor system through the speed droop characteristic. The objective of this study is to analyze the sensitivity of the governor speed droop parameter to frequency deviations. This research employs a quantitative approach based on operational data from* PLTU Banten 3 Lontar *and dynamic system modeling using MATLAB and Simulink. The results indicate that variations in speed droop have a significant influence on the frequency response characteristics of the system. A smaller speed droop produces a faster and more sensitive response, whereas a larger speed droop enhances system stability but results in a slower response and larger steady-state frequency deviations. Based on trade-off analysis and validation results, it is found that a speed droop value of approximately* ±4% *provides the best balance between response speed and frequency stability, with an overshoot of* 8.962975×10^{-4}, *a moderate settling time of* 7.52 s, *and an acceptable steady-state error of* 6.025238×10^{-4}. *This value is therefore recommended as the optimal governor setting to support stable and reliable operation of PLTU Banten 3 Lontar.*

Keywords: : *Speed droop, frequency deviation, Governor, step load, ramp load.*