ANALYSIS OF SOLAR PANEL INTEGRATION IN THE DUKU FEEDER DISTRIBUTION NETWORK OF ULP RUMBIA, CENTRAL LAMPUNG USING ETAP 19.0 SOFTWARE

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ABSTRACT

The increasing demand for electricity in Indonesia encourages the utilization of renewable energy sources such as Solar Power Plants (PLTS) to support energy transition and achieve the national energy mix targets. This study aims to analyze the maximum PLTS capacity that can be integrated into the ULP Rumbia distribution network, specifically in the Duku feeder, and to evaluate its impact on voltage profiles and power losses. The methodology is based on the Hosting Capacity approach with power flow simulations using ETAP 19.0 software. The PV system placement was tested at three locations: the beginning, end, and between two major loads, with inverter power factor variations of 1.0, 0.95, and 0.85. PV capacity was increased from 0 kW to the maximum limit that still met the voltage standard. Results show a maximum PLTS capacity of 4832 kW with a power supply of 4267 kW and 1402 kVAR in 2025, and a maximum PLTS capacity of 4366.5 kW with a supply of 3869 kW and 1272 kVAR in 2030, with the optimal location at bus SS012 and a power factor of 0.95. This PLTS integration improved the minimum voltage from 79.69% to 96.38% in 2025, and from 73.74% to 90.01% in 2030. Active and reactive power losses were significantly reduced from 519.5 kW and 865.7 kVAR to 74.3 kW and 83 kVAR in 2025, and from 825.5 kW and 1450.6 kVAR to 147 kW and 277.9 kVAR in 2030. With proper placement and capacity, PLTS integration can improve voltage profiles and reduce power losses in the distribution system.

Keywords: Solar Power Plant (PLTS), Distributed Generation, Hosting Capacity, Distribution Network, Voltage Profile.