

Role of Energy Storage in Renewable Electricity Systems in The Grid of Ethiopia

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Abstract : Ethiopia's Climate- Resilient Green Economy (ECRGE) strategy focuses mainly on generating and proper utilization of renewable energy (RE). Nonetheless, the current electricity generation of the country is dominated by hydropower. The data collected in 2016 by Ethiopian Electric Power (EEP) indicates that the intermittent RE sources from solar and wind energy were only 8 %. On the other hand, the EEP electricity generation plan in 2030 indicates that 36.1 % of the energy generation share will be covered by solar and wind sources. Thus, a case study was initiated to model and compute the balance and consumption of electricity in three different scenarios: 2016, 2025, and 2030 using the EnergyPLAN Model (EPM). Initially, the model was validated using the 2016 annual power-generated data to conduct the EnergyPLAN (EP) analysis for two predictive scenarios. The EP simulation analysis using EPM for 2016 showed that there was no significant excess power generated. Thus, the EPM was applied to analyze the role of energy storage in RE in Ethiopian grid systems. The results of the EP simulation analysis showed there will be excess production of 402 /7963 MW average and maximum, respectively, in 2025. The excess power was in the three rainy months of the year (June, July, and August). The outcome of the model also showed that in the dry seasons of the year, there would be excess power production in the country. Consequently, based on the validated outcomes of EP indicates, there is a good reason to think about other alternatives for the utilization of excess energy and storage of RE. Thus, from the scenarios and model results obtained, it is realistic to infer that if the excess power is utilized with a storage system, it can stabilize the grid system and be exported to support the economy. Therefore, researchers must continue to upgrade the current and upcoming storage system to synchronize with potentials that can be generated from renewable energy.

Keywords : renewable energy, power, storage, wind, energy plan

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