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Economic Evaluation of Degradation by Corrosion of an On-Grid Battery Energy Storage System: A Case Study in Algeria Territory

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Abstract : Economic planning models, which are used to build microgrids and distributed energy resources, are the current norm for expressing such confidence (DER). These models often decide both short-term DER dispatch and long-term DER investments. This research investigates the most cost-effective hybrid (photovoltaic-diesel) renewable energy system (HRES) based on Total Net Present Cost (TNPC) in an Algerian Saharan area, which has a high potential for solar irradiation and has a production capacity of 1GW/h. Lead-acid batteries have been around much longer and are easier to understand, but have limited storage capacity. Lithium-ion batteries last longer, are lighter, but generally more expensive. By combining the advantages of each chemistry, we produce cost-effective high-capacity battery banks that operate solely on AC coupling. The financial implications of this research describe the corrosion process that occurs at the interface between the active material and grid material of the positive plate of a lead-acid battery. The best cost study for the HRES is completed with the assistance of the HOMER Pro MATLAB Link. Additionally, during the course of the project's 20 years, the system is simulated for each time step. In this model, which takes into consideration decline in solar efficiency, changes in battery storage levels over time, and rises in fuel prices above the rate of inflation. The trade-off is that the model is more accurate, but it took longer to compute. As a consequence, the model is more precise, but the computation takes longer. We initially utilized the Optimizer to run the model without MultiYear in order to discover the best system architecture. The optimal system for the single-year scenario is the Danvest generator, which has 760 kW, 200 kWh of the necessary quantity of lead-acid storage, and a somewhat lower COE of $0.309/kWh. Different scenarios that account for fluctuations in the gasified biomass generator's production of electricity have been simulated, and various strategies to guarantee the balance between generation and consumption have been investigated. The technological optimization of the same system has been finished and is being reviewed in a recent paper study.

Keywords : battery, corrosion, diesel, economic planning optimization, hybrid energy system, lead-acid battery, multi-year planning, microgrid, price forecast, PV, total net present cost
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