

Comparison Analysis of Fuzzy Logic Controller Based PV-Pumped Hydro and PV-Battery Storage Systems

Authors : Seada Hussen, Frie Ayalew

Abstract : Integrating different energy resources, like solar PV and hydro, is used to ensure reliable power to rural communities like Hara village in Ethiopia. Hybrid power system offers power supply for rural villages by providing an alternative supply for the intermittent nature of renewable energy resources. The intermittent nature of renewable energy resources is a challenge to electrifying rural communities in a sustainable manner with solar resources. Major rural villages in Ethiopia are suffering from a lack of electrification, that cause our people to suffer deforestation, travel for long distance to fetch water, and lack good services like clinic and school sufficiently. The main objective of this project is to provide a balanced, stable, reliable supply for Hara village, Ethiopia using solar power with a pumped hydro energy storage system. The design of this project starts by collecting data from villages and taking solar irradiance data from NASA. In addition to this, geographical arrangement and location are also taken into consideration. After collecting this, all data analysis and cost estimation or optimal sizing of the system and comparison of solar with pumped hydro and solar with battery storage system is done using Homer Software. And since solar power only works in the daytime and pumped hydro works at night time and also at night and morning, both load will share to cover the load demand; this need controller designed to control multiple switch and scheduling in this project fuzzy logic controller is used to control this scenario. The result of the simulation shows that solar with pumped hydro energy storage system achieves good results than with a battery storage system since the comparison is done considering storage reliability, cost, storage capacity, life span, and efficiency.

Keywords : pumped hydro storage, solar energy, solar PV, battery energy storage, fuzzy logic controller

Conference Title : ICSPSMT 2023 : International Conference on Solar Power Systems and Modern Technology

Conference Location : Vancouver, Canada

Conference Dates : August 03-04, 2023