ENERGY STORAGE ESTIMATION AND FEASIBILITY ANALYSIS FOR SOLAR POWER GENERATION

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Abstract - Energy storage is the capture of energy produced at one time for use at a later time. It is considered that storage integrated renewable energy can support all the steady state loads. This will maximize the use of renewable energy. Proper sized renewable energy resources with proper sized storage is essential for best utilization of renewable energy in a cost effective way. Solar PV is unable provide electricity during night and cloudy days. Moreover,the PV application is not able to follow the load demand when these renewable energy generators are just in the stage to start generating energy and when these renewable energy are in highest mode of generating stage while load demand falls to the lowest level. Therefore, it is said that renewable energy is unable to generate energy by following the load demand which is a major limitation in energy management. The storage playsa critical role of proper energy management, improves the power quality and helps in reducing the intermittent nature of renewable energy. The solar is themajor source of renewable energy. Morobe province of Papua New Guinea is one of best places for this source. Therefore, the Makham district of Morobe provinceof this country is selectedas the study area where residential load and solar radiation data of this location is considered for detailed analysis. The proper sized solar energy resources with proper sized storage is essential for best utilization of renewable energy in a cost effective way. The energy storage adds flexibility in renewable energy and improves energy management. The ability to store large amount of energy allows electrical utilities to have greater workability in their operation. This paper describes estimations procedures of required storage for solar energyand feasibility of storage to support a residential load. This paper also explains the feasibility analysis of storage by comparing the economical and environmental indexes. Overall electricity demand is very high in the evening and also in the morning for the residential load.However, PV generates electricity mostly during the day time therefore residents need to purchase costly electricity during peak demand in the evening and night times. Therefore properly estimated storage needs to be integrated to overcome this situation. This paper explores the need of storage systems to maximize the use of renewable energy. Furthermore,it estimates the required capacity of storage to meet the daily demand which will gradually eliminate the dependency on conventional energy sources. It describes the sizing guidelines for standalone system to estimate the required storage for solar energy applications.

Keywords - Energy Storage Estimation, Solar Power, Photo Voltaic (PV) Systems, Renewable Enegrgy, Energy Generation, Feasibilty Analysis.