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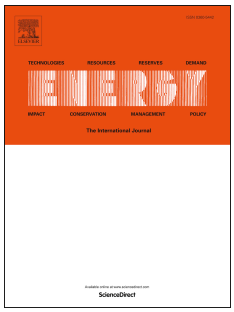

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Demand Side Management Approach to Rural Electrification of Different Climate Zones in Indian State of Tamil Nadu

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Abstract

This paper involves the hybrid power potential implementation in view of six climatic zones in Indian state of Tamil Nadu. An intertwined techno-economic feasible study and energy management analysis of Hybrid Renewable Energy System (HRES) has been proposed to cater to need of the electrical energy requirement in un-electrified village hamlets of Tamil Nadu. The HRES feasibility, size optimization, cost and sensitivity analyses are performed to satisfy the electrical energy requirements of the considered area. A combination of Demand Side Management (DSM) and optimum tilt solar panel approach has also been analyzed through HOMER Energy® simulation. The selection of HRES configuration is based on real-time data collected from six different climatic zones. The optimization results of the considered system are presented and compared with and without DSM strategy. The optimum planning of HRES is based on ranking scheme which includes technical and ecological aspects for sustainable development. In addition, to evaluate the most feasible consideration of the system, sensitivity analysis has been performed upon the load variation, biomass and diesel price too. The simulation results of the proposed HRES configuration can improve the renewable fraction and offer more employment opportunities to the local people, compared to the existing PV-DG-Battery HRES.

Key words: Hybrid renewable energy system (HRES), Demand side management (DSM), Net present cost (NPC), Renewable fraction (RF), Employment.

1. Introduction

In recent years, avoiding the grid power utility has become an interesting option for residential applications even in suburban locations, due to continuity and reliability of electric supply [1]. As per Indian Government statistics, the Tamil Nadu state has 100% power supplies to all regions including rural areas and there is no power shortage in all the sectors [2]. However, the