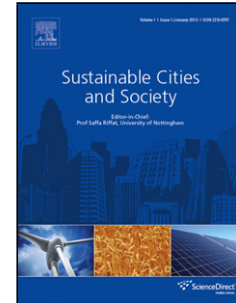


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Author: Md. Shahinur Islam



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A Techno-Economic Feasibility Analysis of Hybrid Renewable Energy Supply Options for a Grid-Connected Large Office Building in Southeastern part of France

Md Shahinur Islam

School of Electrical Engineering, Royal Institute of Technology (KTH), 100 44 Stockholm, Sweden
E-mail: msislam4@kth.se; Tel.: +49 176 301 460 43

Highlights

- The feasibility of grid/HRES combinations are investigated to meet the electric load demand of a large office building
- Three alternative scenarios were developed, and optimization results were compared to select the optimum solution
- Sensitivity analyses have been performed on the optimized HRES in order to observe future performance of the system
- If carbon tax is imposed, then the optimized system far outperform grid only supply system

Abstract. This study gives emphasis to the techno-economic analysis of renovating the energy supply system of a large office building through a Hybrid Renewable Energy System (HRES). The study is focused on how to minimize electricity consumption from the grid by producing as much as possible renewable energy, and in addition to that it integrates green vehicle transportation usage, such as hydrogen cars, electric cars etc. which are indispensable elements of a sustainable city, in the proposed system. The work initiated collecting the sites monthly electrical load data, climate data and associated monetary data with the aim of investigating a renewable energy supply system feasibility study. Three alternative scenarios were developed according to the project needs and these scenarios were modelled by a renewable energy system design tool. The study concludes with a direct comparison of the economic feasibility, renewable energy fraction, and emissions among all systems, looking for the more appropriate and sustainable solution. The study finds that integrating PV curtails more than 43% electricity consumption of the office building from the utility grid. The result also shows that per unit cost of electricity of PV/Grid system to satisfy the load demand is around 10% lower compared to the utility grid tariff and furthermore, it minimizes over 90% emission compared to the total emission in the study site. This study will provide helpful insights to the relevant stakeholders and policy makers in the development of grid connected HRES system.

Keywords: Hybrid Renewable Energy System; Distributed Energy Generation; PV; Hydro; River current; Grid-Connected System; Techno-Economic Analysis

Nomenclature

HRES- Hybrid Renewable Energy System

RES-Renewable Energy Sources

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