Chapter 13
Optimizing the Benefits of Solar PV-Integrated Infrastructure in Educational Institutes and Organizational Setups in North Eastern India

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ABSTRACT

In typical Indian organisational settings, users usually rely on the traditional electrical grid and costly, environmentally harmful diesel generators to supply electricity for regular, emergency backup, and transient services. In addition to offering a chance to supply electricity to relocated people, integrating solar capacity into the current grid can result in considerable cost and carbon reductions. Utilising computational energy system modelling and the analysis of monitored demand data, we assess the savings made possible by the integration of solar (160 kW) capacity into the current supply grid of Assam Power Distribution Co. Ltd. (APDCL, India) at the Azara campus of Assam Don Bosco University, India. The authors discover that, over a five-year period, the renewable infrastructure significantly lowers costs and CO2 emissions. In order to cut costs and emissions and pave the way for sustainable energy practices, organisations should look into ways to integrate renewable energy sources into their current electrical infrastructure and maximise their performance once installed.

DOI: 10.4018/979-8-3693-2260-4.ch013

1. INTRODUCTION

In the rapidly evolving world of energy, the need for sustainable and efficient solutions has never been more pressing. This chapter delves into the transformative potential of integrating solar capacity into traditional electrical infrastructures. In the conventional Indian organizational settings, the primary sources of electricity are the traditional electrical grid and diesel generators. These methods, while reliable, have two major drawbacks. Firstly, they are often costly due to the fluctuating fuel prices and maintenance costs associated with diesel generators. Secondly, they contribute to environmental degradation through the emission of greenhouse gases. This chapter evaluates the cost-effectiveness of integration of solar capacity into existing systems.

The chapter presents a detailed case study of the Azara campus of Assam Don Bosco University, India. Here, a 160 kW solar capacity was integrated into the existing supply grid of Assam Power Distribution Co. Ltd. (APDCL, India) and used as a power source during power cuts. The chapter meticulously evaluates the savings made possible by this integration, using monitored demand data and computational energy system modelling. Over a five-year period, the renewable infrastructure significantly lowers costs and CO_2 emissions while maintaining the generator's present operating strategy. This is a testament to the economic and environmental benefits of RE (renewable energy) sources. Furthermore, the chapter explores an alternate approach using solar water heating, which results in even greater savings compared to heating provided by the grid.

The chapter concludes with a call to action for organizations, especially educational institutions that offer boarding or hostel and other residential facilities. It suggests that these organizations should explore ways to integrate renewable energy sources into their current electrical infrastructure and maximize their performance once installed. This would not only lead to cost and emission reductions but also pave the way for sustainable energy practices.

1.1 Renewable Energy Scenario in India

India is currently creating waves in the renewable energy industry. India has committed to a sustainable future by pledging to reach a 50% cumulative installed capacity of electricity generated by non-fossil fuel-based energy resources by 2030. The nation will have installed an astounding 167.75 GW of renewable energy capacity (including large hydro) by the end of 2022. Furthermore, 78.75 GW of projects are presently in different phases of execution, while an additional 32.60 GW are undergoing bids (*MNRE Annual Report 2022-23*, 2022). On the global stage, India proudly stands fourth in renewable energy installed capacity, wind power capacity,