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The Success of Solar Diesel Minigrids in Bangladesh: A Case Study of Sandwip Island

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Abstract

Set-up in 2009, the solar diesel hybrid minigrid in Enam Nahar market in Sandwip Island is the oldest running minigrid of its kind in Bangladesh. Several similar minigrids are under construction in different parts of Bangladesh and the experience from this pioneer minigrid should serve as a valuable source of information for up-coming entrepreneurs as well as for financing organizations and government regulators alike. This minigrid has been considerably successful in terms of customer satisfaction. However, there have also been a multitude of problems with respect to competition from the extension of grid systems by national utility to the same site, as well as in terms of technical matters related to logistics and maintenance in this remote costal environment. These factors are critically reflected within this work and conclusions are drawn for the planning of further minigrids in the country.

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1. Introduction

In Bangladesh, the first solar-diesel hybrid minigrid was introduced in Sandwip Island, by the project sponsor Purobi Green Energy Limited (PGEL). It is a 100kWp project, and has been running for five years now. This is the longest running project of its kind in Bangladesh, and can give us valuable insights into the commercial and technological viability of such grids in Bangladesh.

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This project started in September 2010, where a 220V minigrd of 100kW solar PV coupled to a 40kW Diesel backup system was commissioned to meet partial demand of electricity for the people of Enam Nahar Market of Sandwip island. In this study, we have tried to assess the level of success and the future prospects of solar diesel hybrid minigrds in Bangladesh. This research is based on a sampling of fifty customers in Sandwip. We surveyed the customers about their energy usage from the minigrds and their level of satisfaction and also interviews of the minigrd entrepreneur. The specific villages in Sandwip surveyed are Musapur, Haramia, Eanam Nahar, Haramia, Pondither Haat, Musapur and Enam Nahar Bazaar.

2. Background

The Solar Home System dissemination project in the off-grid areas of Bangladesh is considered the most successful in the world although having limitations [1], in terms of the number of households served, and the financial viability. These solar home systems are increasingly competitive in costs with conventional fossil fuels (in the off-grid areas), and increasingly independent of subsidies and grants. The next phase in the use of renewable energy to serve an off grid market is the mushrooming of solar diesel hybrid minigrds in off-grid locations. Several such projects have been initiated in Bangladesh, where the capacity of each minigrd is 100 to 250kWp. These minigrds will serve remote off-grid populations that are unlikely to be served by the national grid in the foreseeable future. The use of solar energy in the form of solar home systems and solar diesel hybrid minigrds in Bangladesh is a bottom-up endeavour, involving some financing and technical assistance from donor agencies and the Bangladesh government, but also through the initiative of local small and large enterprises and the end user communities. An embedded option in these minigrd ventures is that they do not depend on the outdated technologies of the existing grid, but make use of the latest renewable energy technologies available, usually by starting at a small scale, with the option to expand capacity in the future. Furthermore, they reach the relatively energy poor and create the most impact for their socioeconomic development and improvement in the quality of life. [2] An initial survey was conducted of 200 potential customers in Enam Nahar market of Sandwip by the minigrd sponsor. The survey revealed that some government offices and some business organizations used diesel generators for a few hours a day and households were not electrified, unless they used individual solar home systems. It took one year for the observing inhabitants to gain enough confidence in the minigrd to disconnect from their previous systems and connect to the minigrd. 58% of the customers are small and medium enterprises. This results in two peak loads, one in the middle of the day when offices are in full swing and another in the evenings from the domestic customers. [2] Deshmukh, Carvallo and Gambhir [2013] have identified the important elements of sustainability for renewable energy minigrds as follows:

1. Economic: financial Viability over the long term and affordable tariffs
2. Equity: parity with central grid customers, universal access
3. Environmental: minimal environmental footprint
4. Scalability: Potential for growth
5. Social: community involvement, local context
6. Technical: long term operation and minimal downtime. [4]

3. Findings from the field surveys

3.1 Customer Survey

The customers of Sandwip have been using the minigrd for several years, and their level of satisfaction with some aspects of the minigrd's service was assessed. These factors were rated on a scale of satisfaction from very dissatisfied, dissatisfied, neutral, satisfied and very satisfied. For the purpose of analysis, we have assigned weights to each type of response in Table 2 (Appendix A). The following results are also reflected in the figures of Appendix B. The responses from Sandwip customers were summed up and a weighted average was calculated. Factors that were rated very dissatisfied or

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