The Prospect of Waste Management System for Solar Power Plants in Bangladesh: A Case Study

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2023 5th International Conference on Sustainable Technologies for Industry 5.0 (STI) | 979-8-3503-9431-3/23/$31.00 ©2023 IEEE | DOI: 10.1109/STI59863.2023.10464979

***Abstract*— A possible path towards generating sustainable energy in Bangladesh is the use of solar power facilities. One crucial issue that necessitates attention is the effective handling of waste produced by these solar power facilities. Solar power plants are spreading across the country at an increasing rate as the need for renewable energy rises. While the focus primarily remains on the generation of clean energy, the management of waste, including photovoltaic module disposal must not be overlooked. The inappropriate treatment of waste from solar installations poses environmental and regulatory difficulties, and this article highlights the necessity for an all-encompassing waste management approach and how to recycle glass, aluminum, copper, silicon, and plastic considering the long-term benefits of reduced environmental impact and resource conservation. In this work, the prospect of a waste management system is analyzed for three solar power plants in Bangladesh. The plants are 28 MW Teknaf Solar Park, 73 MW Mymensingh Solar PV Park in Mymensingh, and 200 MW Teesta Solar Limited in Gaibandha. This work focuses on the recycled materials that can be obtained after the end-of-life of the plants. The results show that the amount of recoverable copper is 187.28 tonnes, aluminum is 1926.4 tonnes, silicon is 1018.82 tonnes, plastic is 1589.28 tonnes, and glass is 17744.44 tonnes from the proposed three PV power plants. Bangladesh can maximize the benefits of its solar power initiatives while minimizing environmental harm by confronting waste-related difficulties head-on and putting in place a successful waste management system.**

Keywords*— *waste management, PV power plant, clean energy, environmental impact, recycled materials.

I. INTRODUCTION

A considerable change toward renewable energy sources has occurred as a result of growing global concern over climate change and the depletion of fossil fuels, with solar power emerging as a strong contender. The use of solar energy has gained popularity in Bangladesh, a country with a high population density and a high energy demand [1]. However, as the nation increases its capacity for solar energy, it is critical to take into account any potential environmental difficulties related to the management of solar power plant waste [2], [3]. Due to its extremely low operational greenhouse gas emissions, solar power plants have long been hailed as a clean and environmentally beneficial energy source [4], [5]. These facilities employ photovoltaic panels to harvest energy from the sun. Due to this intrinsic benefit, solar installations have increased dramatically throughout Bangladesh, helping the country meet its lofty goals for renewable energy. However, the quickly developing solar industry has its own unique set of waste management issues that need to be addressed. Fig. 1 shows some important factors causing the degradation of PV modules in PV plants and Module becomes degraded. The recycling process can aid significantly in generating new PV modules which must be economically sustainable and related to the application of industry 5.0 technology.

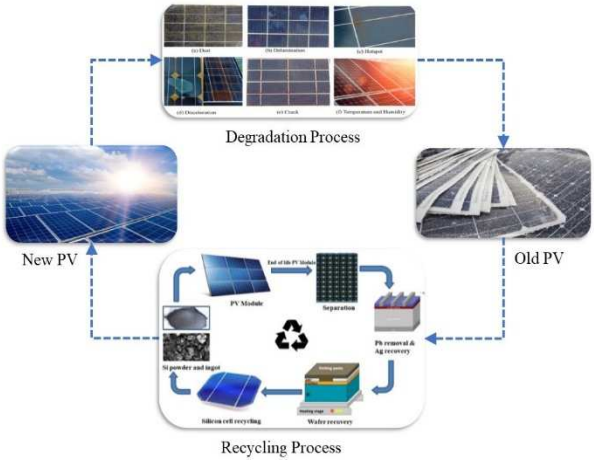

Fig. 1. Solar PV module degradation and recycling process

This essay tries to investigate the likelihood that solar power plants in Bangladesh will develop a successful waste management system. It will investigate the many wastes produced during a solar power plant's lifecycle, which includes the phases of production, installation, use, and decommissioning. Each waste type's issues, including any potential environmental dangers and health risks, as well as the legal frameworks that currently control waste management procedures in the nation, will be assessed. The study will also highlight effective waste management initiatives from other nations that could act as models for Bangladesh's waste management plan. It will stress the value of early intervention and the incorporation of sustainable practices into the design, building, and operation of solar power plants. To emphasize the long-term advantages of a proactive strategy, it will also be investigated whether waste management systems are economically feasible. It is important to consider the waste management element of solar power plants as Bangladesh works to meet its energy needs while reducing its carbon footprint. In [6] an overview of the solar PV degradation process and end-of-life material recycling processes are investigated and calculated in Malaysia. Different recycling processes are analyzed considering the amount of recyclable waste. In [7] Solar cell recycling process is analyzed using different chemical-based

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