Harnessing Waterbodies in Dhaka: Exploring the Feasibility of Floating Solar PV to Alleviate the Energy Crisis in Bangladesh

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***Abstract*— Addressing the energy crisis in the 21st century is pivotal for sustainable development. In recent years, Bangladesh has had a significant energy crisis due to the scarcity of fossil fuels as an indirect effect of the economic downturn after the COVID-19 epidemic and the ongoing conflict between Ukraine and Russia. The persistent power outages have detrimentally impacted both economic output and investor confidence. The implementation of floating solar photovoltaic (FSPV) plants has emerged as a feasible solution to address the energy crisis in Bangladesh and alleviate the lack of energy resources. This article thoroughly examined the feasibility of FSPV systems regarding technical, economic, and ecological considerations by conducting PVsyst simulations in several appropriate lakes in the Dhaka Metropolitan region. The study found that by harnessing 5% and 10% of the surface area of the selected lakes, it is possible to achieve a DC capacity of 27.5 MW and 55 MW, resulting in an annual power generation of about 48,282.736 MWh and 93,749.817 MWh respectively. The article investigated the economic viability using the levelized cost of energy metric, revealing an average LCOE of $0.17/kWh. Additionally, the study highlights the potential of FSPV systems to reduce yearly CO_2 emissions by 29,355.90349 and 56,999.88874 tons by utilizing 5% and 10% resources respectively. This substantial decrease in emissions significantly contributes to the carbon reduction targets of the country. Overall, the research provides valuable insights into bridging the energy gap and emphasizes the viability of FSPV technology as a practical solution to the energy crisis of Bangladesh in line with SDGs.**

Keywords*— *Feasibility, Floating Solar PV, Mitigation, Energy Crisis, PVsyst, LCOE

I. Introduction

In the 21st century, an adequate and secure energy supply is crucial for developing a sustainable society [1]. Although it has been acknowledged that one of the Sustainable Development Goals (SDGs) of the United Nations (UN) is to provide affordable and clean energy for all people, there are still over 1.2 billion people from the least-developed countries who are deprived of electricity [2]. Fig. 1 addresses the causes of the energy crisis, which include factors such as excessive population growth, inadequate infrastructure, excessive consumption of fuel, energy waste, delays in plant commissioning, poor distribution of power, underutilized renewable energy, natural disasters, lack of fuel storage, etc.

Bangladesh is facing challenges in meeting its increasing energy demands as a developing nation, mostly attributed to factors such as population expansion, rapid industrialization, and a rising quality of life. A large percentage of the population has limited access to energy because of recurrent power disruptions, load-shedding, and insufficient electrical infrastructure to meet the growing demand. According to the projections made by the Bangladesh Bureau of Statistics (BBS), it is anticipated that the energy consumption in Bangladesh would reach a value of 50,000 MW by the year 2041 [3]. Nevertheless, the present state of the energy sector of the country is more unfavourable compared to previous occurrences. Consequently, the effects of the energy crisis on the economy and growth of the country have been significant and broad. The downturn of the economy may be directly attributed to the power shortage. Industrial production, commercial activities, and professional services are all disrupted by frequent power outages and an unpredictable electrical supply, resulting in lost productivity and business difficulties for businesses. Because of this, investors may be put off, and established companies may have trouble growing.

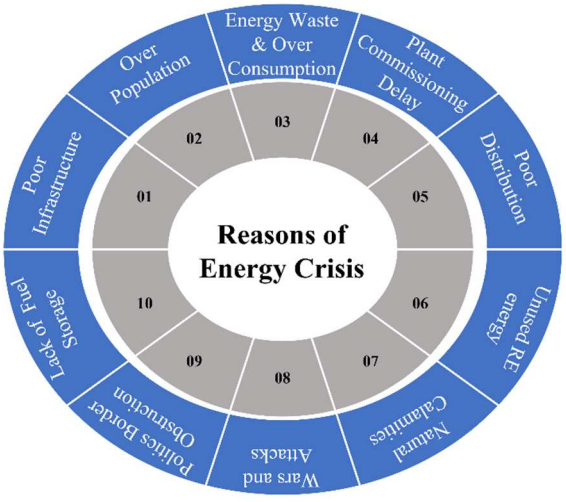

Fig. 1. Several reasons for the energy crisis

Based on an examination of official statistics, Reuters reported in June 2023 that Bangladesh was experiencing its greatest power crisis since 2013. This is caused by extreme weather and the inability of the country to pay fuel imports owing to dwindling foreign exchange reserves and a

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