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THE CANAL TOP SOLAR POWER GENERATION PROJECT

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ABSTRACT

Negative environmental impact of fossil fuel consumption highlights the role of renewable energy sources and give them a unique opportunity to grow and improve. Among renewable energy sources solar energy attract more attention and many studies have focused on using solar energy for electricity generation. Here, in this study, solar energy technologies are reviewed to find out the best option for electricity generation. Using solar energy to generate electricity can be done either directly and indirectly. In the direct method, PV modules are utilized to convert solar irradiation into electricity. In the indirect method, thermal energy is harnessed employing concentrated solar power (CSP) plants such as Linear Fresnel collectors and parabolic trough collectors. In this project electricity generation in Gujarat from solar energy by providing solar panels on top of canal is discussed. And we prepare model for the project in Gujarat. We also discussed about the developments in Gujarat due to this solar power project and how the electricity is distributed in Gujarat and how the canal water is used for agricultural purposes. This solar power generation from the top surface of canal project has several benefits such as 16.2 million units of power generated annually, 90 million liters of water is conserved annually, 25 acres of land conserved, less algae growth in the canal water, minimize evaporation from canal, produce eco-friendly power using solar panels as a cover and save land.

INTRODUCTION

Due to the increase in world population, development in industrial activities, and enhancement in living standards, the human demand for electricity will grow in the future years. Traditional fossil fuels such as oil and coal cause carbon dioxide emissions and global warming. Thus, it is necessary to explore appropriate alternatives sources for electricity generation which are environmentally benign and sustainable. Solar energy is one of the most attractive sources of energy for electricity generation. Typically, solar energy harnessed in the daytime needs to be stored (thermally or electrically) for utilization in the night. Utilizing energy storage units typically result in increased investment and maintenance costs and hence an increase in the leveled cost of generated electricity. Recent advances in solar energy research and development have helped make solar energy systems more affordable for commercial utilization. Research continues in order to decrease the constraints (which are mainly technical) and cost of those systems which are typically employed in solar power plants. Based on a recent International Energy Agency (IEA) report, the share of fossil fuels in the global energy consumption is equal to 82%, however, it is anticipated that this share will be reduced down to 75% by 2035 by developing new renewable energy sources or adding improvements to the present renewable energy systems. The energy received by the earth from the sun in 1 day can provide the whole world's energy requirement for more than 20 years since this the rate of the solar energy which fell to the earth's surface is 120 × 105 watts. Development in solar energy infrastructures can enhance the level of energy security since it is an import- independent energy source. In addition, using solar energy results in minimal environmental impacts.

Renewable energy sources are environmentally friendly (Herez et al., 2018), one of which is by increasing power generation by using distributed charging stations based on renewable energy sources (Torreglosa et al., 2016). With increasing public awareness of environmental protection and strengthening continued government support, more and more home users have installed small scale distributed renewable energy power generation systems such as solar power and wind energy (Zatsarinnaya et al., 2020) (Sun et al., 2020). Therefore, it is highly expected that future markets will see high growth of this technology with different types of distributed generation (Wang et al., 2020). Moreover, the generation of electricity from renewable energy sources integrated into a smart grid system can be one of the best choices for future energy security. Smart network system overcomes resource breakdown and modern information technology for communication and 3 improves power distribution efficiency.

However, this renewable energy is likely to be produced not only at the industrial level (for example, on a large-scale state or private company) but also at the household or individual level (Strielkowski et al., 2019). Human activities contribute to climate change and consequently, environmentally friendly energy generation is needed. For this, finally, we explore the possibility of utilizing solar energy (Strušnik et al., 2020), because it can be used

to overcome dependence on non-renewable resources (Sahu & Raheman, 2020). Renewable and alternative energy has great potential benefits to replace dependence on fossil fuels, progress bringing it into the mainstream slowly in most developing countries (Vaka et al., 2020). In a study conducted by JX Sun, JN Wang, WX Yu, ZH Wang, and YH Wang shows that the proposed algorithm is applied for household electrical load sorting with solar panels, with high accuracy and reliability (Sun et al., 2020). In general, previous research related to Renewable energy and solar panels has only examined one research topic, such as one country Pantua et al., 2020), one affiliation (Preston et al., 2020), and one field (Ioannidis & Koutsoyiannis, 2020). The creation and management of records by individuals or organizations is growing rapidly, especially the change from print to electronic, and the smallest fraction of records or metadata (Wicaksono & Nurpratama, 2017). Unfortunately, although it displays a broad image map visualized from year to year with details from several published studies on alobal scale, there is not much literature on renewable energy and solar panels. The strong positive relationship regarding affiliation, scholars, and the impact of scientific studies has also not been explicitly discussed by any publication. This study aims to study the position of literature in the field of renewable energy and solar panels by researchers at the global level published internationally indexed by Scopus using bibliometric position. We monitor an increasing number of scientific documents related to renewable energy and solar panels published and indexed by Scopus from 1989 to 2020. Energy is one of the most important factors affecting and shaping our daily life. Basic life necessities such as water and food are \also obtained and transported by energy. Therefore, having high quality and uninterruptible energy is a basic need, for reasons such as rising fuel prices, energy requirements, pollution and greenhouse gases, the use of environmentally friendly renewable energy sources is increasing rapidly. Due to the high potential of renewable energy in our country, renewable energy systems are also increasingly popular (Demiroren & Yilmaz, 2010). Therefore, the use of renewable energy to supply electricity has grown in recent years, especially wind and solar.

Electrical energy has been universally accepted as one of the most important aspects of electrical energy for human development economic growth (Vishnupriyan & Manoharan, 2018). To match the ever-increasing demand for power, the concept of renewable-based power generation is being implemented and a lot of research is being done on the same (Balasubrahmanyam & Gupta, 2020). solar energy is one of the cheapest, pollution free, inexhaustible renewable energy resources. It is used to provide heating, hot water, electricity, and even cooling to residential, commercial, and industrial centres (Zoghi et al., 2017). Solar energy is considered a reliable, promising, and profitable energy source. It has various advantages such as pollution free, long life, low maintenance etc. (Gupta et al., 2016). Solar energy is used in at least 4 different ways in our daily lives, and these range from heating water to generating electricity (Husain et al., 2018)

Problem Statement:

The Canal Top Solar Power Generation Project

With increasing global energy demands, rapid urbanization, and the adverse effects of climate change, there is an urgent need to shift toward sustainable and renewable energy sources. India, being a tropical country, has immense solar energy potential, yet land availability remains a significant constraint in the widespread deployment of large-scale solar power infrastructure.

Simultaneously, water bodies like irrigation canals suffer from substantial evaporation losses, particularly in arid and semi-arid regions. These twin challenges – the demand for clean energy and the need to conserve water – require an integrated and innovative solution.

The Key Problems:

1) Scarcity of Land for Solar Projects:
2) Acquiring large tracts of land for solar farms disrupts agriculture and often leads to displacement or land-use conflict.
3) Land costs form a significant part of overall project expenditure.
4) High Evaporation Losses in Irrigation Canals:
5) Especially in regions like Gujarat, Rajasthan, and Maharashtra, open canals lose large volumes of water to evaporation.
6) This reduces water availability for agriculture and drinking purposes.
7) Energy Access and Sustainability:
8) Many rural and agricultural areas lack reliable access to electricity.
9) There is a pressing need to decarbonize the energy sector and reduce dependency on fossil fuels.

Proposed Integrated Solution:

The Canal Top Solar Power Generation Project proposes to install photovoltaic (PV) solar panels over existing irrigation canals. This approach addresses the dual problems of land scarcity and water evaporation while generating clean, renewable energy.

Benefits:

1) Optimal Land Use: No need to acquire additional land.

2) Water Conservation: Panels provide shade and reduce evaporation.

3) Clean Energy Production: Solar power helps meet energy needs sustainably.

4) Infrastructure Synergy: Dual use of canal infrastructure increases efficiency.

CONCLUSION:

The canal-top solar power project proves to be an innovative and sustainable solution that integrates clean energy generation with water and land conservation. By addressing energy demand while reducing evaporation and land use conflicts, it offers multiple environmental and economic benefits. Such projects can play a vital role in advancing renewable energy adoption and supporting sustainable development goals.

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