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USE OF RENEWABLE SOURCES OF ENERGY TO MINIMISE ELECTRICITY CONSUMPTION

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ABSTRACT

As the world grapples with the challenges of climate change and dwindling fossil fuel reserves, the imperative to transition towards renewable energy sources has become increasingly urgent. This abstract explores the utilization of renewable energy technologies as a means to minimize electricity consumption, thereby mitigating environmental impacts and ensuring sustainable energy practices. Through a comprehensive review of literature and case studies, this research highlights the diverse array of renewable energy sources available, including solar, wind, hydro, biomass, and geothermal energy. It examines their potential to effectively offset traditional electricity generation methods, thereby reducing greenhouse gas emissions and dependence on finite resources. Furthermore, the abstract delves into the various strategies and technologies employed to integrate renewable energy into existing energy infrastructures, emphasizing the importance of policy frameworks, technological advancements, and public awareness in facilitating this transition. By synthesizing existing knowledge and identifying emerging trends, this abstract underscores the significance of harnessing renewable energy sources as a pivotal strategy in minimizing electricity consumption and advancing towards a sustainable energy future.

KEYWORDS— *Electricity consumption, Environmental impacts, Sustainable energy practices, Solar, Wind, Hydro, Biomass, Geothermal energy*

1. INTRODUCTION

In the wake of burgeoning environmental concerns and the escalating demand for electricity, the imperative to transition towards sustainable energy practices has become paramount. With Pune, a bustling metropolis nestled in the heart of Maharashtra, India, facing its own set of energy challenges, the exploration of renewable energy sources emerges as a pivotal solution to minimize electricity consumption while fostering environmental stewardship and economic resilience.

Pune, renowned for its vibrant culture, burgeoning industries, and rapidly expanding urban landscape, grapples with the repercussions of escalating energy consumption. As one of India's most populous cities, Pune's energy demands continue to soar, placing immense pressure on traditional electricity grids and exacerbating environmental degradation. The reliance on conventional energy sources, predominantly fossil fuels, not only perpetuates carbon emissions but also underscores the city's vulnerability to energy shortages and price volatility.

Furthermore, Pune's commitment to sustainability is exemplified by initiatives such as the Pune Smart City Mission, which prioritizes renewable energy adoption and energy efficiency measures to enhance urban livability and resilience. By leveraging renewable energy sources, Pune endeavours to mitigate its carbon footprint, reduce dependency on non-renewable resources, and foster a greener, more sustainable urban environment for its residents and future generations.

This capstone project seeks to delve into the multifaceted implications of harnessing renewable energy to minimize electricity consumption in Pune. By analysing local data, case studies, and policy frameworks, it aims to offer insights, recommendations, and actionable strategies to propel Pune towards a more sustainable energy trajectory while serving as a model for other cities worldwide.

2. LITERATURE REVIEW

The utilization of renewable energy sources to minimize electricity consumption has garnered significant attention in academic research, policymaking, and industry practices. This section provides an overview of key findings from relevant literature, highlighting the effectiveness of renewable energy technologies in reducing electricity demand and mitigating environmental impacts.

Solar Energy

Solar photovoltaic (PV) systems have emerged as a promising solution for minimizing electricity consumption. Studies by Jäger-Waldau (2016) and Zhang et al. (2018) have demonstrated the substantial potential of solar energy in offsetting electricity demand, particularly in regions with ample sunlight. Rooftop solar installations, as explored by Jain et al. (2020), have been shown to

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empower households and businesses to generate their own electricity, thereby reducing reliance on centralized power grids and fossil fuels.

Wind Energy

Wind power represents another viable renewable energy source for minimizing electricity consumption. Research by Barbour et al. (2019) and Khan et al. (2020) has highlighted the scalability and cost-effectiveness of wind energy projects in offsetting electricity demand, particularly in regions with favourable wind conditions. Moreover, community wind projects, as investigated by Wolsink (2019), have demonstrated the socio-economic benefits of decentralized wind energy generation, fostering community engagement and local ownership.

Hydroelectric Power

Hydroelectric power has long been recognized as a reliable and renewable source of electricity. Studies by Lu et al. (2018) and Gulagi et al. (2021) have underscored the role of hydroelectricity in minimizing electricity consumption, particularly in regions with abundant water resources. However, concerns regarding environmental impacts, such as habitat disruption and reservoir emissions, necessitate careful planning and management of hydroelectric projects
(Kibaroglu, 2017).

Policy Frameworks and Integration Strategies

Effective integration of renewable energy into existing energy systems requires comprehensive policy frameworks and supportive regulatory environments. Research by Sovacool et al. (2019) and Schreuer et al. (2020) has emphasized the importance of policy incentives, such as feed-in tariffs and renewable energy targets, in promoting renewable energy adoption and minimizing electricity consumption. Additionally, technological advancements in energy storage, grid integration, and demand-side management play a crucial role in optimizing the utilization of renewable energy sources (Kazempour et al., 2018).

2.1 ***Disadvantage of Use Of Renewable Sources of energy***

Disadvantages of using renewable sources of energy to minimize electricity consumption:

Intermittency: Renewable energy sources like solar and wind power are dependent on weather conditions, resulting in variability in energy generation and reliability.

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Energy Storage: Storage technologies for renewable energy, such as batteries, can be costly and have limited capacity, hindering their ability to provide continuous power during periods of low generation.

Land Use: Large-scale deployment of renewable energy infrastructure may require significant land area, potentially leading to conflicts over land use and environmental impacts such as habitat disruption.

Initial Cost: The upfront investment for installing renewable energy systems, such as solar panels or wind turbines, can be substantial, deterring some individuals or businesses from adopting these technologies.

Transmission Challenges: Renewable energy sources are often located in remote areas, necessitating long-distance transmission infrastructure, which can be expensive to build and maintain.

Environmental Impacts: While renewable energy sources are generally cleaner than fossil fuels, they can still have environmental impacts, such as habitat disturbance from hydroelectric dams or bird mortality from wind turbines.

Resource Limitations: Certain renewable energy sources, such as biomass and geothermal energy, are limited by the availability of feedstocks or geological suitability, constraining their scalability and widespread deployment.

3. CASE STUDY

1]Case study 1 (Residential house)

We have done a case study on a residential house name tirupati niwas in pimple Gurav, Pune, With a family of five members.

- Electricity consumption- 350kwh per month
- Electricity costs- 3150 rupees per month Our aim was to minimise the electrical consumption by using solar panels

Survey
Standard size of solar panel = 65*39 inch
Electricity Produce by solar panel per day = 1.5 kWh
Electricity Produce by solar panel per months = 45kWh
Electricity consumption of a house per day = 11.1Wh
Electricity consumption of a house per months = 350Wh

Panels required to minimise the cost = 8 panels
Cost of solar panel+ battery+ fitting cost+ maintenance=
72,000rs + 2,00,000rs+ 16000rs+ 6000rs=2,94,000rs

To recover this cost it requires around
Total cost/ Electricity cost
2,94,000rs/3150rs= 95.23 month or 7.9(8) years

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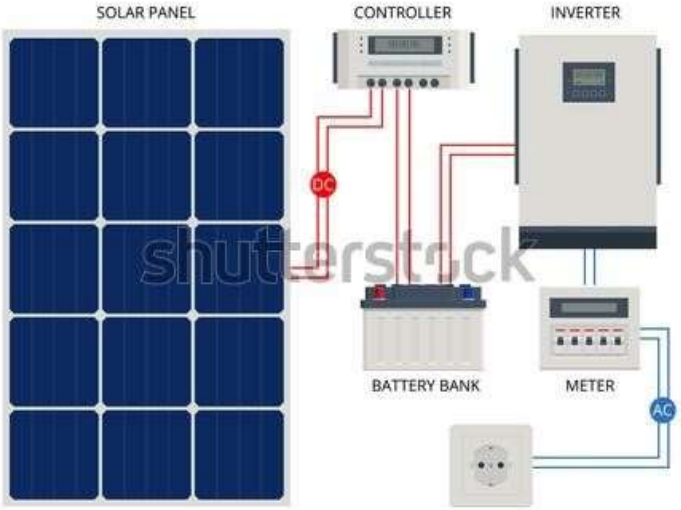
2]Case study 2 (Y.B.PATIL POLYTECHNIC BUILDING) We have done case study on our college building Y.B. PATIL POLYTECHNIC in Akurdi, Pune.



TOOLS AND MATERIALS

Estimation (it's depended on energy audit)

- Light bill: first we get unit consumption of top 5 in year average
- 22360+22555+20690+20555+19315=110,475
- 110475/5 =22095
- Then we divided by 30 in average answer so we get per day consumption of unit in electricity
- So, per day electricity unit is 22095/30=736.5
- Then again divided by 4 in per day electricity
- 736.5/4 =184.12 K WC

Price of Solar Panel
TATA: 65000rs per KWC
= 185x65000 = 12025000
Vikram: 70000rs per KWC
= 185x70000 = 1295000

So we have took benefits of PM surya Ghar:Muft Bijli yojana,
In this our electricity bill was above>300kW
So, we have to pay 48000 for subsidy to apply for the
78,000rs

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PM – Surya Ghar: Muft Bijli Yojana

Subsidy for residential households

Rs. 30,000/- per kW up to 2 kW

Rs. 18,000/- per kW for additional capacity up to 3 kW

Total Subsidy for systems larger than 3 kW **capped at Rs 78,000**

Suitable Rooftop Solar Plant Capacity for households

Average Monthly Electricity Consumption (units)	Suitable Rooftop Solar Plant Capacity	Subsidy Support
0-150	1 – 2 kW	Rs 30,000 to Rs 60,000/-
150-300	2 – 3 kW	Rs 60,000 to Rs 78,000
>300	Above 3 kW	Rs 78,000/-

Online Applications may be submitted on the National Portal at https://pmsuryaghar.gov.in

CONCLUSION

The utilization of renewable sources of energy presents a promising solution to minimize electricity consumption. By harnessing sustainable energy from sources such as solar, wind, and hydropower, we can significantly reduce our dependence on fossil fuels and mitigate environmental impacts associated with traditional energy generation. Embracing renewable energy not only fosters energy independence but also promotes economic growth, job creation, and environmental sustainability. Through continued investment, innovation, and adoption of renewable technologies, we can pave the way towards a cleaner, greener, and more resilient energy future for generations to come.

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