



Impact Assessment of Installation of Solar Plant at Hanumant Seva Medicare Trust Hospital

Submitted by
March 2024



INDIA'S INSTALLED SOLAR ENERGY CAPACITY HAS EXPERIENCED A REMARKABLE 30-FOLD INCREASE OVER THE PAST NINE YEARS, REACHING 74.30 GW AS OF JANUARY 2024. ACCORDING TO A REPORT BY THE NATIONAL INSTITUTE OF SOLAR ENERGY (NISE),



TABLE OF CONTENTS

Executive Summary	4
1. Introduction	5
1.1. Background	5
1.2. Project Description	6
<hr/>	
2. Research Methodology	7
2.1 Research Objectives	7
2.2 Research Framework	7
2.3 Sampling	8
2.4 Data Collection	8
<hr/>	
3. Findings & Analysis	9
3.1 Economic Impact of the Solar Plant Installation	9
3.2 Environmental Impact of Solar Plant Installation	10
3.3 Social Impact of Solar Plant Installation	12
3.4 Analysis	13
<hr/>	
4. Recommendations	15
<hr/>	
5. Conclusion	16

EXECUTIVE SUMMARY

Over the past decades, India has made substantial strides in lifting millions out of poverty. However, this progress has also generated greater energy demand, necessitating additional sources amidst sustainable development challenges. Despite the notable achievement of renewable energy constituting 43% of India's total installed power capacity in 2022-23, the nation continues to rely on coal and oil as its primary energy sources. The commitment made at COP26 underscores India's ambitious plan for a 30-fold increase in solar energy capacity since 2015, resulting in a transformative 74.30 GW capacity in 2024. The solar revolution in India holds immense potential for rural healthcare, providing a pathway to reduce costs, mitigate pollution, and ensure uninterrupted services. Healthcare facilities in rural areas, particularly those dependent on grants, are often constrained in their abilities to invest in modern infrastructure for sustainable energy solutions. This further intensifies their struggle to provide quality medical services to underprivileged communities, perpetuating the existing disparities in access to medical care.

In response to these challenges, Pidilite initiated the 'Health Initiative' to provide operational support to healthcare facilities across India. Through strategic collaboration with non-profit organizations, the initiative focuses on enhancing access to affordable healthcare services for underserved populations by providing cost-effective green energy solutions. Pidilite, in partnership with Hanumant Seva Medicare Trust, implemented the crucial project – the installation of a 250 KW rooftop solar plant in the charitable healthcare facility, Hanumant Hospital, located in Mahuva, Bhavnagar District, Gujarat.

The initiative had far-reaching impacts, including a substantial reduction in the hospital's electricity expenditure and enhanced operational efficiency. This economic benefit directly translated into the hospital's increased capacity to cater to marginalized communities by offering affordable healthcare treatments. Beyond medical assistance, the project also equipped community stakeholders (patients, hospital staff, students, teachers, etc.) with skills, knowledge, and behaviors related to green energy solutions and practices. It was necessary to cultivate a sense of sustainability within the broader community, spreading awareness about the growing need for environmental preservation and combating climate change.

By implementing cost-effective clean energy solutions and fostering community participation, Pidilite's intervention has demonstrated its commitment to supporting India in addressing sustainability challenges.

1. INTRODUCTION

1.1. Background :

As the world's most populous country, with around 1.4 billion people, India has witnessed remarkable economic growth over the past two decades, lifting millions out of poverty. However, this robust economic expansion has led to a surge in the country's energy demand, highlighting the need to identify additional energy sources. Concurrently, India grapples with the challenge of sustainable development due to population growth and environmental degradation.

Renewable Energy in India :

According to the International Renewable Energy Agency (IRENA), a quarter of India's energy demand can be fulfilled through renewable sources. Over the last decade, India has made substantial advancements in the green energy sector, with renewable power accounting for 43% of the total installed power capacity in 2022-23, up from 31% in 2014-15¹. Simultaneously, the share of coal-based power plants has gradually been decreasing, from 51.1% in 2023 to 49.3% in 2022, according to a report by The Energy and Resources Institute (TERI)². Globally, India holds the fourth position in Renewable Energy Installed Capacity (including Large Hydro), Wind Power capacity, and Solar Power capacity, as reported by the REN21 Renewables 2022 Global Status Report.

Solar Energy in India :

Despite these advancements, India's energy composition remains predominantly reliant on thermal sources such as coal and oil. At the 2021 COP26 climate summit in Glasgow, Prime Minister Narendra Modi articulated India's commitment to furthering renewable energy, outlining ambitious plans for an additional 500 GW renewable energy capacity by 2030. The primary focus to achieve this target is substantial expansion in nationwide wind and solar installations.

India's installed solar energy capacity has experienced a remarkable 30-fold increase over the past nine years, reaching 74.30 GW as of January 2024. According to a report by the National Institute of Solar Energy (NISE), India's cumulative installed solar capacity in 2021 stood at 55 GW, with grid-connected utility-scale projects contributing 77%, grid-connected rooftop solar contributing 20%, and mini or micro-off-grid projects contributing 3%. NISE also highlights that India's solar energy has the potential to achieve 748 GWp³.

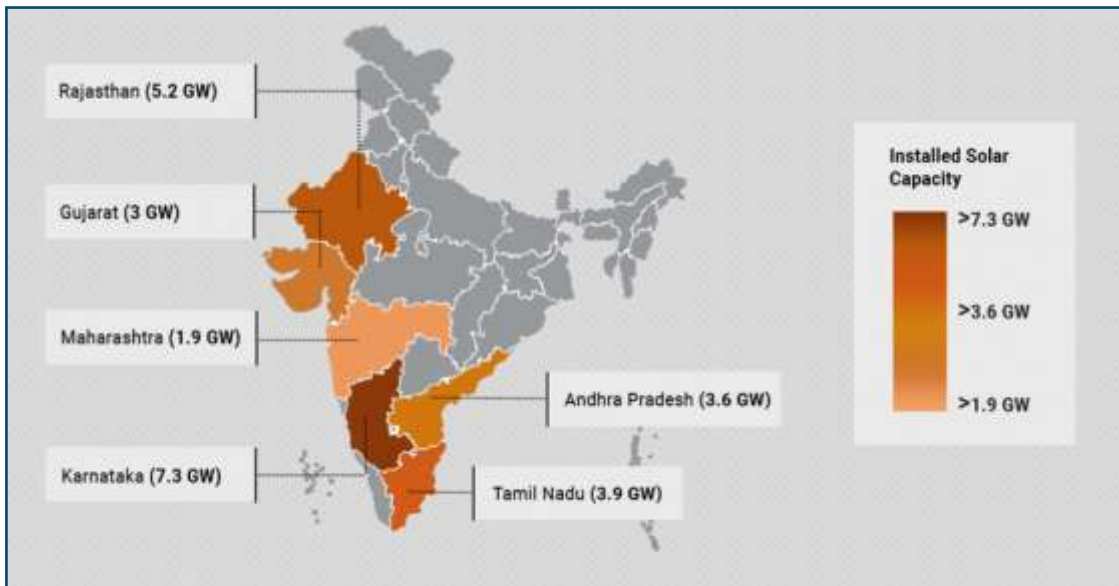
Solar power presents an innovative model that can revolutionize healthcare services in India's rural and remote areas. It serves as a viable energy alternative for the healthcare system, reducing energy costs and pollution from previously unavoidable diesel generators. This transition enhances financial

¹<https://www.financialexpress.com/business/industry-indias-green-energy-capacity-up-138-between-fy14-and-fy23-3377229/>

²<https://www.hindustantimes.com/india-news/indias-renewable-energy-supply-on-the-rise-report-101706122032208.html>

³<https://www.investindia.gov.in/sector/renewable-energy#:~:text=India's%20installed%20non%2Dfossil%20fuel,additions%20of%209.83%25%20in%202022.>

Installed Solar Capacity



efficiency by reallocating resources towards improving healthcare infrastructure and services, ultimately improving the quality and accessibility of care for underserved communities. With consistent access to electricity, hospitals can operate essential medical equipment, emergency surgeries, and patient care round-the-clock. This is crucial in rural areas where limited resources and frequent power outages present significant challenges to healthcare delivery. Although numerous public healthcare facilities have embraced renewable energy solutions, significant gaps persist in fully harnessing the potential of renewable energy across the country. Addressing these gaps requires concerted efforts from government bodies, private stakeholders, and community organizations to overcome funding constraints, technical challenges, and policy limitations.

1.2. Project Description:

To address these challenges in India's healthcare system, Pidilite, through its Health Initiative, aimed to provide cost-effective, clean energy solutions by facilitating the installation of a 250 kW solar power plant at Hanumant Hospital, located in Mahuva, Bhavnagar District, Gujarat. For successful implementation, the company has collaborated with the non-profit organization, Hanumant Seva Medicare Trust.

As a pioneer in adhesive technology in India, Pidilite manufactures and distributes adhesives, industrial and construction chemicals, and art materials. Committed to creating positive societal change, the company actively engages in CSR initiatives nationwide. Aligned with its mission to promote public welfare, Pidilite has allocated resources to support green energy interventions, aimed at reducing energy costs and improving access to healthcare services among marginalized populations, particularly in remote areas.

2. RESEARCH METHODOLOGY

To evaluate the project's impact and understand the objectives outlined below, Pidilite has assigned NuSocia, an impact advisory firm, the crucial task of conducting the Impact Assessment of the hospital infrastructure development initiative executed by the non-profit organization, Hanumant Seva Medicare Trust.

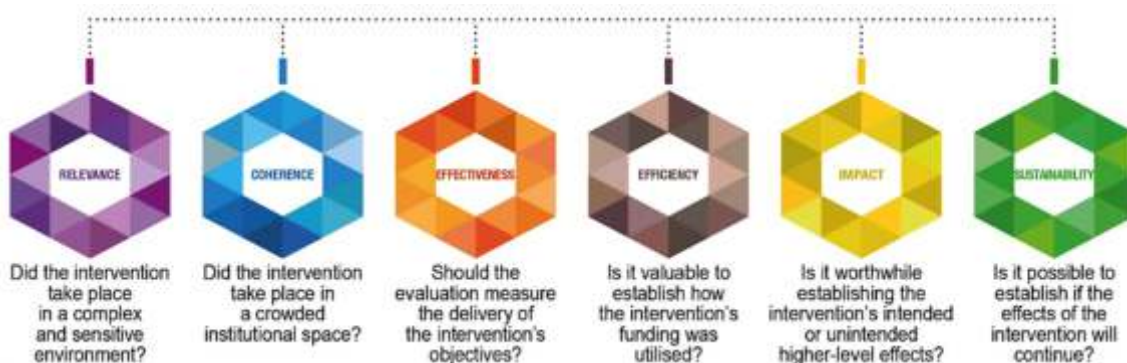
2.1. Research Objectives

- To assess the economic impact by gauging the reduction in hospital's electricity expenses and enhancement of operational efficiency, making healthcare services more affordable and sustainable.
- To assess the environmental impact through the advancement of clean energy, contributing to environmental preservation, and mitigating climate change.
- To assess the social impact in terms of improved healthcare accessibility and community involvement fostered by sustainable practices.

2.2. Research Framework

The evaluation of the impact assessment will utilize various aspects of the REECIS Framework provided by the OECD DAC (The Organisation for Economic Co-operation and Development's Development Assistance Committee). This framework adopts a comprehensive and inclusive approach to impact assessment, encompassing the following elements:

- **Relevance** : Evaluate the project's necessity within the broader contextual framework.
- **Effectiveness** : Scrutinize the achievement of intervention objectives.
- **Efficiency** : Examine the judicious utilization of cost, time, and resources.
- **Coherence** : Ensure that the intervention aligns with and complements similar efforts, fostering consistency.
- **Impact** : Evaluate the potential higher-level effects of the intervention, whether intended or unintended.
- **Sustainability**: Primarily assess the enduring success of the intervention over the long term.



The REECIS Framework offers a thorough perspective for systematically addressing relevance, effectiveness, efficiency, coherence, and sustainability in the impact assessment process.

2.3. Sampling

The project benefited the 150-bed hospital, including nursing students from the training wing. It significantly contributed to cost-reduction efforts through the implementation of clean energy sources - the construction of a solar power plant within the healthcare facility. For in-depth interviews, the study employed convenience sampling to ensure that data collected represented crucial insights from both the beneficiaries and administration.

2.4. Data Collection

The data collection for this project involved the use of the following methods :

- **Key Informant Interviews (KIIs):** In-depth interviews were conducted with the assistance of a survey questionnaire containing open-ended questions. Beneficiaries, including hospital management staff and the administration team, were contacted either in person or over the phone to comprehensively understand the project's effectiveness.
- **Desk Research:** Desk research was conducted by utilizing relevant materials such as annual project reports, assessment reports, and other documents provided by implementation partners and the donor. Additionally, secondary information available on the internet was also incorporated.

3. FINDINGS & ANALYSIS

3.1. Economic Impact of the Solar Plant Installation

Hanumat Hospital stands as the sole multi-specialty facility within a 90 km radius in Mahuva, Bhavnagar District, Gujarat. Situated near a highway, the hospital serves as the primary medical care point for patients from neighboring areas. As a charitable trust, the primary challenge faced by Hanumant Hospital was the significant costs incurred due to high electricity consumption. This was mainly due to the frequent use of energy-intensive medical equipment and the essential need for 24/7 air conditioning. The persistently high demand heavily impacted the hospital's overall electricity expenditure, averaging around 53,000 units per month, equivalent to approximately Rs. 3.60 lakhs per month. This high expenditure posed a considerable threat to the hospital's viability, highlighting the urgent need for resource optimization.

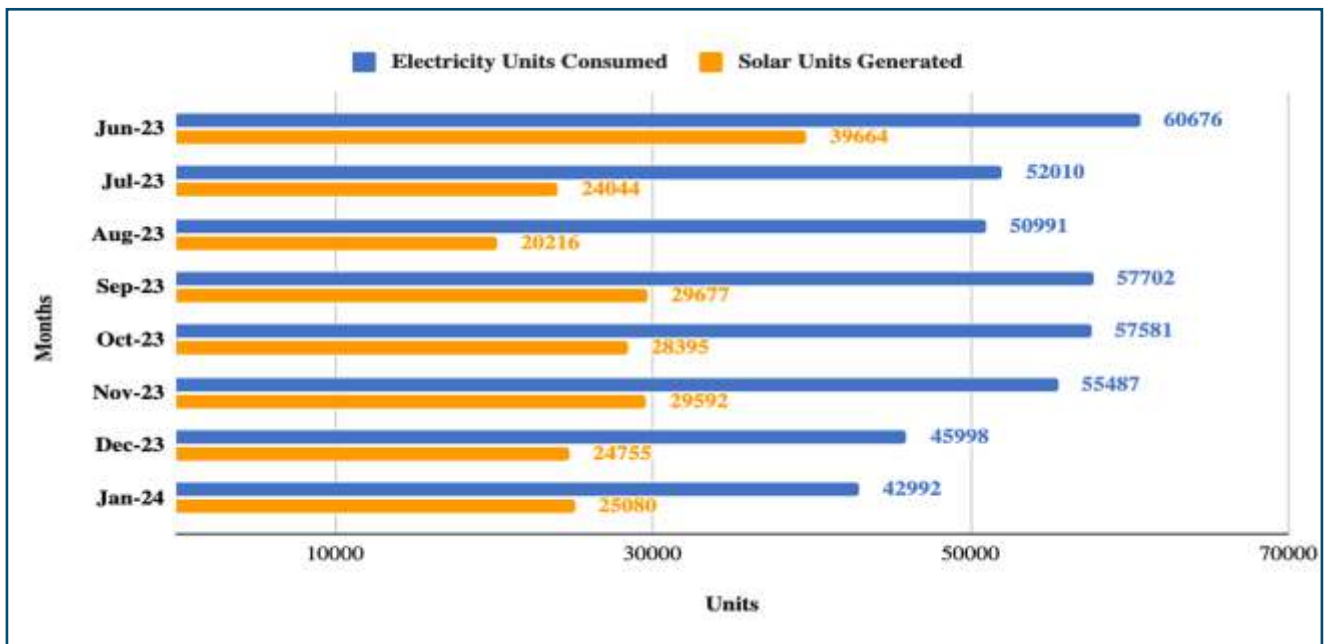
In response to this critical issue, Pidilite, in collaboration with the implementation partner, facilitated the installation of a 250-kW solar power plant at the hospital and its residential premises. The primary objective of this intervention was to reduce the hospital's electricity expenses by transitioning to green energy. The total budget allocated for this project amounted to Rs. 1.43 crore.

"As an implementation partner, the main motive of Hanumat Seva Medicare behind this collaboration with Pidilite was to set up the solar plant for two main reasons: assessing the financial impact on electricity expenses and promoting solar clean energy in the hospital and nearby communities." - Hospital Management Staff



Picture 1 : Solar Panels installed at the Hanumat hospital

The solar power plant commenced operations in June 2023, following its successful installation in May. It generated an average of approximately 27,500 units per month, with output varying based on weather conditions. The chart below illustrates that the solar units generated during June 2023 were 39,664 units due to sunny weather, subsequently declining to 24,044 units and 20,216 units in July and August 2023, respectively, owing to monsoon climatic conditions. Overall, the solar power plant played an important role in reducing electricity costs while promoting clean energy.



Over the past eight months, the solar power plant has produced approximately 2.21 lakh units, enabling the hospital to save around Rs. 14.91 lakhs on electricity expenses since the project’s inception. If the solar plant continues this trend in the upcoming years, it is anticipated to recoup its installation cost in approximately 6.4 years through the generation of electricity valued at Rs. 22.37 lakhs per year. This cost also includes a warranty for 5 years on the inverter and 10-25 years on the solar panels, provided by the vendor.

When asked about the cost-effectiveness of the solar plant, the hospital management staff explained that this one-time initial investment will generate electricity at a cost lower than grid prices for the long term, while keeping operational and maintenance costs low, thereby influencing a positive environmental impact.

"Solar plants can enhance the overall operational efficiency of hospitals in many ways, including cost savings on electricity expenses (at Rs. 1.5/unit lower than usual), generating energy in the long term, facilitating no disruption in power supply, and increasing trust and goodwill among patients, staff, and community members." - Engineer at Hanumant Hospital.

3.2. Environmental Impact of Solar Plant Installation

In this initiative, the most significant environmental impact of the solar plant installation is the hospital's reduced dependency on conventional energy sources to meet its energy demand. Previously reliant

solely on non-renewable sources such as coal and gas, Hanumant Hospital fulfilled its electricity demands through the government entity, Paschim Gujarat Vij Company Ltd. (PGVCL). Since the establishment of solar infrastructure, the hospital has made noteworthy progress toward self-reliance by transitioning to clean energy solutions and contributing to environmental preservation.

"The hospital is ensuring the use of energy-effective equipment and shifting its focus to green energy." - Hospital Management Staff.



Picture 2 : Solar Inverter at Hanumat Hospital

Moreover, comprehensive capacity-building and training sessions were conducted for the hospital, nursing, and administrative staff, fostering expertise in solar plant operation and maintenance. Workshops and hands-on training equipped them with the necessary skills and confidence to run power plant operations smoothly.

"The administration provided an orientation session to the staff about the usage of the solar infrastructure and informed us that they are moving towards energy-saving methods." - Hospital Management Staff.

To ensure the power plant's efficient functioning and long-term sustainability, strategic plans were implemented. Choosing the hospital's rooftop for safety, security, and maximum sunlight exposure,

along with a comprehensive maintenance schedule for regular cleanliness, ensured uninterrupted energy generation. These measures facilitated a smooth transition and seamless integration of the solar infrastructure into the daily workflow. The administration also expressed plans to expand the solar plant to 500-600 MW, further promoting the clean energy initiative.

"The implementation of solar plants has impacted the community, and many stakeholders and institutions are coming forward to replicate this model in their institutions and villages accordingly." - Engineer at Hanumant Hospital.

3.3. Social Impact of Solar Plant Installation

As the sole multi-specialty facility in the region, Hanumant Hospital is dedicated to providing affordable healthcare services, particularly for marginalized communities. Operating under a charitable trust, the hospital often bears the medical costs for underprivileged patients, facing the challenge of limited resources. To address this issue, a 250-kW solar power plant was installed at the hospital and its residential premises, alleviating its electricity expenses. This enables optimal utilization of resources towards offering high-quality medical treatment at reasonable rates.

"As part of the trust, the burden of treatment and medical costs sometimes falls on the hospital, leading to financial shortages. To address this, the hospital focused on reducing its electricity expenses through solar panels." - Hospital Management Staff

Furthermore, the initiative extends beyond direct medical care by promoting community engagement for sustainable development. Training and capacity-building sessions, focusing on environment-related topics and energy-saving practices, were implemented. These sessions were conducted to raise awareness among medical professionals, patients, and hospital staff regarding day-to-day environment-friendly habits, such as switching to LED lights and powering down electronics when not in use. The primary goal was to cultivate a culture of sustainability, encouraging active participation within homes, schools, and the broader community. The overarching aim is to create a lasting impact by instilling the necessary skills and knowledge to understand the importance of green energy.

"The solar plant's installation at the hospital has generated indirect positive impacts in the community by promoting awareness of clean energy benefits and sustainable practices." - Engineer at Hanumat Hospital.

3.4. Analysis

Parameters	Description
Relevance	<ul style="list-style-type: none"> • The project's relevance becomes evident in the context of India's dual struggle with surging energy demand and the pressing need to identify additional sources of energy for sustainable development. • By strategically targeting healthcare facilities in rural areas, Pidilite's initiative to install a solar power plant recognizes the intersectionality of energy access and public health. It not only aligns with India's commitment to furthering renewable energy but also takes into account the socio-economic factors that impact Hanumant Hospital in the target region.
Effectiveness	<p>The provided capital support successfully achieved the intervention's objectives, yielding positive outcomes for the hospital staff, patients, students, and the broader community.</p> <ul style="list-style-type: none"> • The installation of a 250-kW solar power plant substantially reduced the hospital's financial burden of incurring high electricity costs. It also enhanced overall efficiency by keeping operational and maintenance costs low, generating energy for the long term, and facilitating lesser disruption in power supply. • Moreover, the intervention played a crucial role in the hospital's transition from conventional, non-renewable energy sources to solar power, promoting green energy solutions to mitigate environmental degradation and climate change. The emphasis on capacity-building and training sessions for the hospital staff and strategic planning for longevity indicates a proactive approach to ensuring the effective operation and sustainability of the solar infrastructure. • The economic benefits of this initiative directly translated into the hospital's increased capacity to deliver affordable healthcare services to underserved populations. Training sessions and capacity-building efforts have not only empowered hospital staff with the necessary skills for solar plant operation but also instilled a culture of sustainability within the institution. By actively involving medical professionals, patients, and the broader community, the project has become a catalyst for positive behavioral changes.
Efficiency	<p>The total cost of the 250-kW solar power plant, including installation, amounted to 143.7 lakh Indian rupees. In the past eight months, the plant has generated approximately 2.21 lakh units, enabling the</p>

	<p>hospital to save around Rs. 14.91 lakhs on electricity expenses. Based on these trends, it is predicted that the solar plant’s operations will recover the installation cost in approximately 6.4 years, including a warranty period, underscoring the judicious utilization of resources. By seamlessly integrating the solar infrastructure into the hospital’s daily workflow, the project has delivered timely and cost-effective results, enhancing the overall operational efficiency of the healthcare facility.</p>
<p>Coherence</p>	<p>This project demonstrates strong coherence by aligning with India's commitment to renewable energy and healthcare improvement. Targeting rural healthcare facilities, it supports national goals, providing a synergistic impact on energy access and healthcare infrastructure. Acknowledging socio-economic factors in the target region brings alignment to the intervention within the larger framework of community needs. It also highlights the challenging intersectionality of healthcare and eco-friendly energy, enhancing its potential for sustainable impact within a broader development context.</p>
<p>Impact</p>	<p>The installation of the 250-kW solar power plant has had visible impacts at multiple levels. Firstly, it has greatly reduced the energy costs of Hanumant Hospital through a one-time investment that will result in energy production over a long time. Secondly, it has encouraged the transition from non-renewable energy sources to green energy solutions, contributing to the efforts of environment preservation and combating climate change. Lastly, this has improved the hospital’s capacity to offer affordable healthcare treatments and facilities to underprivileged communities. Through active collaboration and community engagement, the hospital created a culture of sustainability, influencing behaviors in homes, schools, and the broader community.</p>
<p>Sustainability</p>	<p>On the economic front, the sustainability of the solar plant presents an optimistic outlook, attributed to its high return on investment and minimal maintenance costs, supported by a five-year warranty on the inverter and 25 years for the solar panels. The solar power plant undergoes three preventive maintenance routines every month, ensuring its longevity and continuous functionality.</p> <p>Given the success of this project, numerous stakeholders and institutions are expressing interest in replicating the green energy model in their respective locations. Furthermore, the administration has articulated plans to expand the solar plant to 500-600 MW, actively contributing to the promotion of the clean energy initiative.</p>

4. RECOMMENDATIONS

Pidilite, through its targeted initiative, sought to alleviate the financial burden of energy consumption at Hanumant Hospital and promote eco-friendly energy practices. To achieve this goal, they allocated capital expenditure for the installation of a 250-kW solar power plant in the healthcare facility, offering a more economical alternative for its energy needs. Their dedication to creating positive environmental impacts distinguishes them, especially considering the challenges related to attribution, ownership, and maintenance. Hence, their commitment is noteworthy, and the study encourages their investment in advanced clean energy solutions to enhance healthcare facilities for underserved populations.

Based on the interactions and critical observations conducted in the study, the following recommendations are proposed for the implementation of similar projects in the future.

- **Strengthening Solar Plant Resilience:** The geographical location of Hanumant Hospital, situated in a cyclone-prone area of Gujarat, demands strategic measures to strengthen the solar power plant against potential cyclonic winds. The imperative nature of this recommendation stems from the recognition that extreme weather conditions pose a critical threat to the structural integrity and operational efficiency of the solar infrastructure. Prioritizing cyclone preparedness becomes paramount to ensure the durability and safety of the solar power plant, thereby mitigating potential risks and preserving the long-term success of the green energy initiative.
- **Regular Maintenance and Inspection for Operational Excellence:** To sustain the operational excellence of the solar power plant, the establishment of a systematic maintenance schedule is crucial. Regular cleaning and maintenance of solar panels, inverters, and other critical components are essential to ensure the continued functionality of the solar plant over the long term. These inspections, conducted at regular intervals, allow for the early detection of any signs of deterioration or malfunction. Timely efforts to resolve such issues can prevent them from escalating into more significant problems that could hinder the plant's operational efficiency.
- **Community Outreach and Awareness:** Fostering a culture of sustainability within the community is integral to maximizing the socio-environmental impact of the solar power plant initiative. To achieve this, Pidilite should improve its efforts in community outreach and awareness by encouraging active participation in campaigns, workshops, and educational sessions within the community. Here, the goal is to empower individuals to adopt sustainable practices in their daily lives, contributing to a broader culture of environmental responsibility.

5. CONCLUSION

Pidilite's intervention, 'The Health Initiative,' aimed to reduce operational costs in Indian healthcare facilities by embracing green energy alternatives, thereby making medical services more affordable. Partnering with the non-profit organization Hanumant Seva Medicare Trust, the installation of a 250 kW solar power plant at Hanumant Hospital and its residential premises marks a significant step towards addressing economic, environmental, and social challenges.

Economically, the hospital witnessed a substantial decrease in electricity expenditure, enhancing its financial viability. Additionally, the initial investment is expected to be recouped within 6.4 years, ensuring long-term stability and improved healthcare affordability for marginalized communities. In terms of environmental impact, the initiative promotes clean energy adoption, reducing reliance on non-renewable sources and contributing to environmental preservation. Through training and capacity-building sessions, the project contributes to the efficient operation and maintenance of the solar infrastructure. It also fosters community engagement by promoting sustainable practices and encouraging participation in environmental conservation. By alleviating financial burdens and enhancing healthcare accessibility, particularly for underserved populations, tangible advantages are generated for patients and the community at large.

Moving forward, the success of Pidilite's 'Health Initiative' highlights the importance of strategic collaborations and innovative solutions in addressing crucial developmental challenges. To further amplify the intervention's impact, the study recommends strengthening solar plant resilience against extreme weather conditions, ensuring timely maintenance and inspection of the solar plant for operational efficiency, and raising awareness through community outreach to foster a sense of sustainability.



To address these challenges in India's healthcare system, Pidilite, through its Health Initiative, aimed to provide cost-effective, clean energy solutions by facilitating the installation of a 250 kW solar power plant at Hanumant Hospital, located in Mahuva, Bhavnagar District, Gujarat. For successful implementation, the company has collaborated with the non-profit organization, Hanumant Seva Medicare Trust.



✉ contact@nusocia.com

🌐 www.nusocia.com

🐦 📷 📘 🌐 / @nusocia