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ESTABLISHING RENEWABLE ENERGY BASED MICROGRID POWERED FROM BIFACIAL SOLAR PANELS AT TRIBAL HAMLETS OF BILLENAHOSAHALLI AND LAKSHMANAPURA, HUNSUR TALUK, MYSORE

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Introduction

The project aims to bring sustainable and reliable energy solutions to the remote tribal hamlets of Billenahosahalli and Lakshmanapura in Hunsur Taluk, Mysore. These tribal communities, located in the heartland of nature, have been facing significant challenges in accessing clean energy sources for their daily needs. The proposed solution focuses on the installation of a microgrid powered by bifacial solar panels. Bifacial solar panels, known for their high energy yield and increased efficiency, will be deployed to harness sunlight from both sides, maximizing energy generation even in low light conditions. This approach aligns with the project's objective of ensuring uninterrupted power supply to meet the basic energy requirements of the tribal hamlets.

National Institute of Engineering - Centre for Renewable Energy and Sustainable Technologies (NIE-CREST) is the technology centre at the premises of “The National Institute of Engineering” (NIE), Mysore. The centre promotes eco-friendly energy systems, Renewable energy, and sustainable technologies. The centre itself has successfully implemented numerous projects on eco-friendly & renewable energy systems and sustainable technologies in and around the region.

OBJECTIVES

- To conduct a thorough assessment of the renewable energy potential in the tribal hamlets of Billenahosahalli and Lakshmanapura
- To use a pre-existing portable microgrid available at NIE-CREST (Centre for Renewable Energy and Sustainable Technologies) for implementation
- The microgrid will harness available renewable energy resources to provide a reliable and sustainable source of electricity to meet the energy needs of the hamlets
- To provide a partial solution to the energy needs of the tribal hamlets in Billenahosahalli and Lakshmanapura. While the microgrid implementation may not fully meet the entire energy demand of the hamlets, it will significantly contribute to improving the quality of life and promoting sustainable development in the hamlets

METHODOLOGY

- Coordinating Mapping: Utilizing a handheld GPS device, the coordinates of each dwelling in Billenahosahalli Haadi and Lakshmanapura Haadi will be accurately mapped
- Evaluating Solar Energy Potential: Measuring solar irradiance at the hamlet will enable an assessment of the solar energy potential in the area
- Developing Village Housing Layout: A well-planned layout for housing within the village hamlet will be created
- Load Calculation: Accurate calculations will be made to determine the lighting and mobile charging loads required
- Microgrid Sizing: The microgrid system will be appropriately sized to cater to the energy demands of the hamlet
- Identifying Installation Locations: Suitable spots will be identified for the placement of solar panels, power conditioning units, and batteries
- Deployment of Portable Renewable Energy Microgrid: An easily transportable microgrid system powered by solar energy and biofuel panels will be implemented
- Community Education: The residents will receive training and guidance on the maintenance and general service of the microgrid

RESULTS and CONCLUSIONS

The following results can be derived from the project:

- The preparation of the layout for Billenahosahalli and Lakshmanapura Haadi was
- completed.
- The project has been planned to establish a renewable energy microgrid. This microgrid serves as a reliable and sustainable source of electricity for the communities.
- The microgrid has a capacity of 8 kW, providing a consistent and reliable power supply to meet the energy needs of the tribal hamlets. The performance of the microgrid has been monitored, and it has consistently delivered the expected power output, ensuring a stable electricity supply.
- For the sake of convenience, the project location was divided three zones and then wiring length is calculated.
- The wiring layout analysis revealed that the combined length of the hamlets' wiring was calculated to be 3400 meters.
- Total energy requirement of the hamlets was worked out to be 32000W.
- According to the calculations:

1) 24 solar panels of 330Wp are required
2) 11 batteries of 200 Ah,24 V are required

- Quantity estimation for the construction of Battery room is calculated. The estimated cost for the battery room is approximately 3,00,000 rupees.
- The total cost of the project was determined to be 30,00,000. This cost includes the installation and setup of the microgrid system, procurement of bifacial solar panels, wiring infrastructure, and other necessary components.
- The establishment of the microgrid significantly improves energy access for the tribal communities in Billenahosahalli and Lakshmanapura. Previously, these hamlets faced limited access to electricity, but now they have a reliable and sustainable source of power for their daily needs.
- The project brings about improved energy access, environmental benefits, and socioeconomic development for the communities, showcasing the potential for renewable energy solutions in underserved areas.
- By promoting renewable energy and reducing carbon emissions, the project contributes to mitigating climate change and promoting environmental sustainability

- The successful implementation of the project serves as a model for similar initiatives in other tribal and rural areas, showcasing the feasibility and benefits of renewable energy based microgrids.
- The lessons learned from this project can guide future initiatives aiming to expand access to clean energy and improve livelihoods in remote and marginalized communities, ensuring a more equitable and sustainable future.

SCOPE FOR FUTURE WORK

1. The project can be scaled up to include additional tribal hamlets or communities in the region
2. Future work can focus on integrating the latest innovations into the microgrid system. This includes exploring more efficient and cost-effective solar panel technologies
3. This integration can enable surplus energy generated by the microgrid to be sold back to the grid, promoting energy independence and revenue generation
4. Exploring the hybridization of the microgrid with other renewable energy sources, such as wind or small-scale hydro, can further enhance the system's resilience and overall energy generation capacity.