INTEGRATION OF SOLAR AND MICRO HYDRO SYSTEMS TO MICROGRID FOR HARNESSING THE RENEWABLE ENERGY SOURCES

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Introduction:

Over 759 million of the world population lack access to electricity even today. Many villages and tribal communities in India are not electrified due to various reasons and lead their lives in darkness. In rural communities the lack of electricity has been linked to disparities in regional development within countries and increased rural to urban migration, thus putting further stress on already strained urban infrastructure systems.

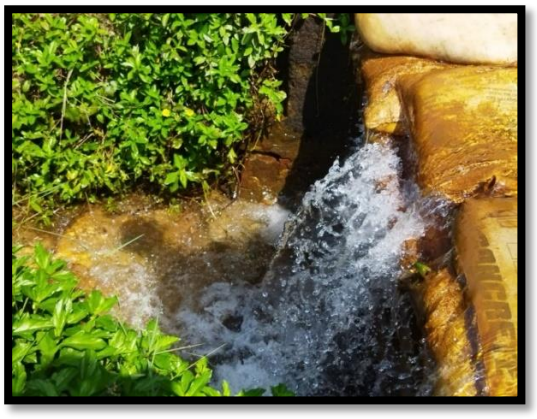
Based on studies conducted, 60-70 percent of business people across the world opine that lack of electricity is the prime factor stunting their growth. Heggala village in Virajpet Taluk of Coorg District, Karnataka is prone to heavy and continuous high intensity rainfall throughout the year, resulting in frequent power cuts/ load shedding. This region is also remotely located. Majority of the population in this region are daily wage laborers occupied in the coffee plantation and depend on the power supply from the main grid. On the other hand, the region is equipped with numerous natural streams (with consistent flow and discharge of 5-6 liters/sec) and abundance of sunlight (annual solar irradiation of around 56.5 kW/m^2) i.e., hydro and solar power, which is a potential source of renewable energy. Alternatively, the power supply can be achieved by the installation of Renewable Energy based eco-friendly Micro-grid system.
The works carried out include promotion and dissemination of Micro-grid system with major content of renewable energy for rural electrification.

Objectives:

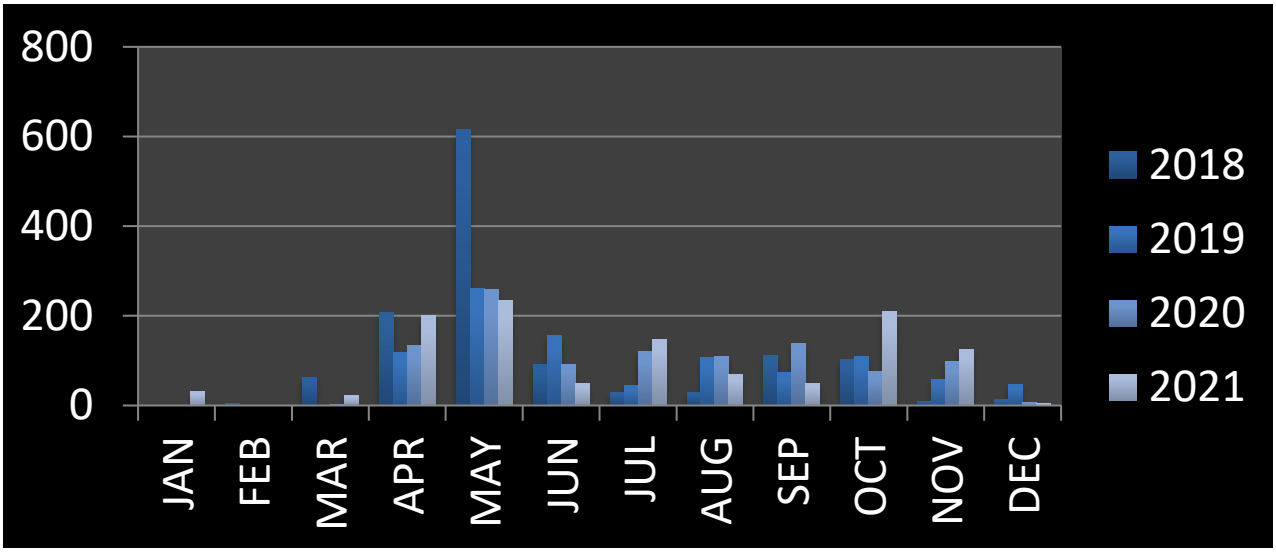
- To harness the Renewable Energy resources for generation of electricity
- To implement the Solar-Micro hydro powered lighting systems to cluster of houses in Heggala Village, Coorg District

METHODOLOGY:

1. **Identification of Natural stream for hydropower**
2. **Sizing of Micro-grid**
3. **Village layout for electrification**
4. **Calculating of loads for lighting**
5. **Compensating with solar energy**



Pictures showing the study area



Rainfall Data 2018-2021

Details of work carried out:

- Reconnaissance Survey
- Discharge measurement (**Bucket method**) and determining the head of stream (10 m)
- Mapping the Layout of the study area and Catchment area – Determination of the co-ordinates of the stream outlet and computing catchment using **QGIS** software (0.24 km^2)
- Analysis of hydrological data to check the feasibility of the stream for installation of turbine (maximum rainfall of 260 mm)
- Design/select the components of hybrid system that includes forebay, penstock, turbine, number of batteries, and solar panels

Results and Conclusions:

- One among the visited sites in the study area has favorable hydrological characteristics and is suitable for implementation of the system
- Cross flow turbine is chosen for the site due to the higher gradient (10 m) and necessary discharge (5-6 liters/sec)
- The components of micro hydro system like penstock, forebay and solar panels are designed based on the terrain conditions, flow and power demand
- Solar panel of 500W (1 No.) capacity is used to overcome the energy deficit which was not fulfilled by hydro power
- The payback period of the system is 8 years
- The design can be implemented in other similar and feasible locations

- Dependency on grid can be reduced

Scope for future works:

- A **prototype** can be developed for installation in other similar and feasible locations
- Enhance the size and capacity of the system according to the requirements
- Introduce a startup where the microgrids can be commercialized, and more installations can be taken up
- Integrate other available Renewable Energy resources like biodiesel, available in the vicinity