



CLEAN ENERGY FOR POOR - A CHANGING SCENARIO

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Abstract:

The energy is omnipresent and it can neither be created nor be destroyed. The energy can be changed from one form to another form. Some forms of the energy is used by the human being for his daily needs. One such form is the electrical energy. Man depends on the traditional methods to generate electricity like Thermal energy, hydro electricity, atomic energy etc. The availability of such form of electrical energy is very much possible in the cities where population is more concentrated. The power supply companies under the control of the government/private sector is responsible for the energy production. The distribution of this electrical energy is done by the department like KPTCL in Karnataka which is under the control of the state government. This department finds it easy to distribute the energy to cities where population is more for a given area. But the people living in the rural places are finding it difficult to get the benefit of such facility because the department is either not showing interest in providing the service at rural places or the cost incurred in providing such facility is more than the return out of it. This leads to a lot of problems to the people living in the villages in getting the service from such companies. An alternative arrangement for such people is the use of clean and green energy by using the freely available solar energy. In this paper a small village called Mala is taken as a sample village. This paper gives the geographical structure of Mala, the various waste products that can be reused to maintain clean environment. This paper also gives a cost difference in using traditional energy system and renewable energy system and time required to recover the investment done for installing renewable energy sources.

Index Terms: Clean Energy, Green Energy, Rural, Traditional Methods & Energy Service

1. Introduction:

Electrical energy is one of the basic needs of a human being. Today the demand and supply ratio of electrical energy is not 1:1.^[1] The system is struggling to fulfill the demand. The main resources of electrical energy to meet the demand are thermal energy, hydroelectricity, and atomic energy system.^[2] These are called traditional conventional energy system. There are a lot of challenges in getting electricity from these traditional methods. The main challenge is the geographical changes from time to time. The thermal electricity depends upon coal. The availability of the coal is decreasing day by day. The thermal electricity is also polluting the air as well as the water causing the environmental pollution.^[3] The clean electricity in traditional methods is the hydro electricity which depends upon the rain water. The rain in India is not regular and we cannot predict the amount of water getting stored in the dam to produce the electricity from the rain. The electricity from the atomic energy depends upon the uranium which is once again dangerous if preventive measures are not taken during production. In order to get electricity from the traditional method in Mega Watts of power, the government installs the plant in a remote area where there is a large amount of land is available. The main target of the government is the villages where there will be a large space available for setting up the projects. In return, the villagers lose their cultivating land and they get the poisonous environment because of the project.

The people in the rural area are finding difficulty in getting the traditional commercial energy due to several factors. They have to depend on electricity for domestic purpose and agriculture. The present Government policies target rural people in balancing the production and demand ratio by means of power cut to the rural area for more than 4 to 6 hours a day. The people in the rural area who depend on electricity for agriculture will have to suffer a lot resulting in a loss from the agriculture.

2. Alternate Arrangement for Rural People:

The major requirements where the rural people depend on electricity are agriculture pump for watering, cooking, light and other domestic appliances.^[4] Instead of depending on the conventional electricity from the commercial organizations it is always better to generate electricity (decentralized) by using alternative electricity production method by using the available resources and use the same to that area without thinking of mass production and distribution. Some of the alternative energy resources that can be used to generate electricity within the area are

- ✓ Solar Electricity
- ✓ Biomass gas
- ✓ Electricity from the waste
- ✓ Electricity from Microbial Fuel.^[5]

Solar energy is the best alternative to the traditional system. The people in the rural area can definitely adopt solar energy for their lighting system to cater the need of Lights, Fans, and TVs. Due to the present government

of India policy in supporting the renewable energy system is not costly in adopting the solar energy in the rural areas.^[6]

Rural area has a good collection of cow dung and other manure to produce the biogas. Using this method people can generate energy for the cooking purpose. The left out material can be used for agricultural land as fertilizers.

It is very easy to collect the waste products in the rural area. The amount of waste from the household equipment may not be sufficient to generate the electricity but one can get a huge collection of dry leaves which can also be treated as waste products.

3. Objective of this Paper:

The objective is to study and propose the clean energy using renewable energy resources to the rural area. Here the village called Mala which is in Karkala Taluk, Udupi District, Karnataka is considered as a sample rural area. The objective includes study of

- ✓ Geological structure of the village.
- ✓ Study of sunlight available in the area.
- ✓ The main agricultural activity.
- ✓ Available waste material that can be used for alternative energy production.

4. Methodology:

This paper is a study of a village called Mala which is in Karkala Taluk of Udupi district. The study begins with the following data collection

Geological Structure of the Village:

The village Mala is located towards east of Karkala city at a distance of 15kms. The total area of the village is 4700 Hectares^[7]. The population of Mala is almost 6000. The number of houses in Mala is 1338. The reason why Mala is identified for the study is it is the village which is not very much facilitated by the commercial electricity supply. The main agricultural crop is coconut, arcanut and paddy fields. The electricity for the agricultural pump is highly dependent on the traditional electricity which is highly irregular due to power cut for more than 6 to 7 hours per day.

Study of Sunlight Available in the Area: More than 60% of the village is exposed to sun light in the form of paddy fields.^[8] Rest of the 40% land is having the shade from the sun in the form of coconut and arcanut plantations.

The Main Agricultural Activity: The village is spread over 4700 Hectares. The main agricultural activity is the paddy field. In addition to the paddy field the people have coconut and arcanut plantations. The agricultural products are paddy, coconut and arcanut. The main byproducts are coconut jute, arcanut shell can be used for renewable energy.

Available Waste Material that Can be Used for Alternative Energy Production:

The daily waste products are

- ✓ Vegetable waste,
- ✓ Waste from the cow hut
- ✓ Waste from the green grass from the paddy fields
- ✓ Jute from coconut, arcanut shell, and dry grass.

5. Suggestion for the implementation of Renewable Energy in Mala:

Use of Solar Energy: The geographical area of Mala clearly shows that more than 60% of the land is directly exposed to the sun. Solar Energy is suggested for domestic lighting and agriculture pump. The solar pump submersible under water draws around 500W-600W power.^[9] This can be achieved by installing 3 solar panels of 24V and 250W. The above setup in an agricultural land can get water supply to the paddy fields as well as coconut and arcanut plants every day without depending upon the traditional commercial electricity. The total cost of the project may be around Rs 70,000. The agriculturists will get subsidy for the above installation from the government. The estimated lifespan of this solar water pump is about 25 years (panel life) The water pump can be repaired whenever there is a problem in the pump. The solar electricity can also be used for the domestic purpose for the lighting system and other Light electrical equipment.

Uses of Waste Products: The major waste products are the jute from coconut, arcanut shell and cow dung. The jute and arcanut shell can be used for water heater. The cow dung can be used as bio gas for kitchen work. In addition to the cow dung the vegetable waste also can be utilized. A bio gas can be generated by fermenting the green grass which is another waste product from the agricultural land.

Use of Hydrogen gas as Alternate Energy Resource: In addition to the use of renewable clean energy resources it is also strongly recommended to have hydrogen gas as an energy resource which can be used for kitchen, agricultural pump set, electric generator set etc. The place Mala is rich in water resource. This water is used to generate the hydrogen gas and this gas is then collected in a cylinder under pressure. This hydrogen gas inside a cylinder can be used as energy resource. The block diagram of the hydrogen gas plant is shown below. As shown in the figure 1 the salt water is collected inside a tank. This tank is connected by the positive and negative electrodes. The electricity to these electrodes is given from the solar panel through the control circuits.

Due to the electrolysis process the water eliminates hydrogen gas. This gas is collected in another chamber. This gas which is collected inside a chamber will be having low pressure. Using a proper compressor this hydrogen gas thus collected will be transferred to the regular cylinder with pressure. After collecting in a cylinder under pressure the gas can be used for kitchen work, agricultural pump sets, electric generators etc.

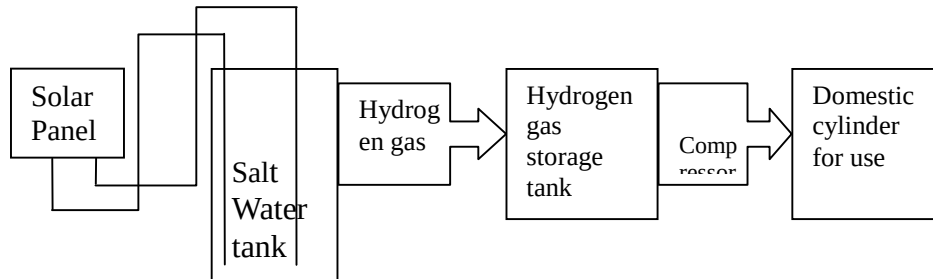


Figure 1: Hydrogen Gas Plant

The table 1 shows the electrical energy consumption in the village Mala using traditional commercial electrical energy system and implementing renewable energy using above methods, the cost in implementing the same.

Table 1: Comparison between Traditional electricity and renewable energy system

Particulars	Traditional Electricity System	Use of Renewable energy System
Domestic Electricity set up	Nominal registration charges Rs 4,000/-	Nearly 1,00,000 using solar energy
Daily consumption of Electricity for domestic use	5 Units	5 Units
Daily consumption of Electricity for agricultural use	3 units	3 units
Cost of Agricultural Pump setup	Nearly Rs 30,000/-	Nearly Rs 75,000/-
Total Monthly consumption	240 Units	240 Units
Total Monthly Charges	Nearly Rs 1500/month	-
Hot water for domestic use	2 units	Use water heater from jute and aracanut waste costing Rs 10,000/-
Monthly consumption	60 units	-
Monthly Cost	Around Rs 300/month	-
Kitchen appliances	3 units	Use bio gas or Hydrogen gas plant costing Rs 15,000
Monthly Consumptions	90 Units	-
Monthly Cost	Rs 450/ month	-
Total monthly electric Cost	Rs 2250/month	-

The table indicates the initial establishment charges and monthly charges of the traditional electric energy and the renewable energy

The expected cost of using renewable energy is around Rs 2,00,000/- per house.

The charges of traditional electricity for one month /house is around Rs 2250/month.

The time required to recover the initial investments for renewable energy is 100 months

6. ABCD Analysis:

Here the analysis of the above proposed model is done for different stake holders like

- ✓ Government
- ✓ Business
- ✓ End users

Government: The central Government has reached nearly 43 GW of power generation from renewable energy resources during 2016. It is investing nearly 1 billion on renewable energy source for the past three years. But the investments and promotions of renewable energy is not concentrating on rural part and the villagers are not getting the benefits of such energy. Government sector should seriously think in implementing the above model

as it is contributing to the clean environment. The Government is very much keen in promoting environmental friendly renewable energy. The target location is really ideal location for such promotion. Presently the government is concentrating on major projects involving Mega watts of power production using renewable energy. But the actual promotion is not taking place due to policy matter which does not entertain decentralized energy production and lack of interest in the local MLA or MP s in promoting these technology in villages.

Business: The industries are attracted by the government in establishing the renewable energy plants. The companies have invested around 14 billion rupees on establishing the plants in India for the past three years. But they fail in reaching the rural area because the companies are investing for large scale production which is centralized and they do not think of decentralized power production concentrating the rural part of India. This model is very much suitable for business organizations to implement clean energy at the decentralized manner concentrating on individual house. The village like Mala gives ample opportunities to start the medium scale business in promoting clean energy solutions.

End Users: The end users being the villagers should show more and more interest in implementing the clean and green energy. Basically the villagers in Mala are more agriculture oriented rather than technology. They have to be given good raining in implementing these technologies in the village.

Advantages of the Above Model:

Using of the above mentioned renewable energy resources have the following advantages.

- ✓ Maximum use of the by products from the village for renewable energy system.
- ✓ Reuse of waste products for alternative energy.
- ✓ Reduced dependency on traditional energy.
- ✓ Clean environment.
- ✓ Uninterrupted power supply

Benefits of Using the Model:

People get multiple benefits from the above suggestions.

- ✓ The dependency on the current traditional energy system is reduced.
- ✓ The waste from the village is reused and waste management is well done.
- ✓ The agricultural land can get water during the day time.
- ✓ Instead if commercial gas for the domestic applications villagers can use bio gas.
- ✓ Villagers can also use hydrogen gas if hydrogen bunker is established.

Constraints of Using the Above Model:

- ✓ Educating the people about the renewable energy resource.
- ✓ Making the people understand the above suggestions.
- ✓ Varying environmental conditions.
- ✓ Improper rain for setting up hydrogen bunk

Drawbacks of the Model:

- ✓ Investment for setting up solar plants for agriculture and domestic electricity.
- ✓ Amount of waste product collected for the energy source is insufficient.
- ✓ Collection of waste product from each house for the renewable energy source.
- ✓ Manpower for bio gas plants.

7. Conclusions:

By looking into the geographical structure of Mala it is strongly remanded to use the clean energy using the above mentioned renewable energy resources. The table 1 clearly shows the various advantages of using the renewable energy resources and time required to recover the initial investment for the renewable energy resources. It is also suggested to have a centralized hydrogen gas production plant where the villagers can go and fill their empty cylinders.

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