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ANALYSIS OF SOURA PLAN BY KSEBL: COMPARISON BETWEEN THE THREE MODELS IN THE PERSPECTIVE OF AN EDUCATIONAL INSTITUTION

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ABSTRACT The most popular renewable energy technology is solar energy source because the system is reliable and complimentary in nature. Inline with the renewable energy policy of Kerala Government, KSEBL in association with ANERT targets an addition of 1000MW solar power generation capacity to the present capacity of around 110MW. Three models of roof top solar projects are planned as a part of Soura for achieving 500MW solar capacity in addition. This paper presents the analysis of the three models of the Soura project in an education institution and also suggest the best among the three models.

KEYWORDS : Soura

INTRODUCTION

Kerala has very few fossil fuel resources and much of its large hydro potential is already harnessed. The emissions from coal based or gas based power projects in coastal Kerala may adversely affect both the forests as well as the fragile marine ecosystems of Kerala, as well as the health of the population. Given such myriad constraints, Kerala faces a future threat to its energy security. It is acknowledged that most renewable energy technologies have low environmental impacts; hence a planned transition to 100 per cent renewable energy for Kerala would be desirable for the future sustainable development and energy security of Kerala.

The spread of various renewable energy technologies has been aided by a variety of policies and support measures by Government. Major policy initiatives have been taken to encourage private/foreign direct investment to tap energy from renewable sources including provision of fiscal and financial incentives. This policy is directed towards a greater thrust on overall development and promotion of renewable energy technologies and applications. This will facilitate excellent opportunities for increased investment in this sector, technology up-gradation, induction of new technology market development and export promotion.

The conventional sources of energy in Kerala are fuel wood, petroleum products and electricity. Till recently Kerala has been depending solely on hydro-power for electricity, availability of which is limited due to lack of technically favorable sites and unfavorable ecological impacts. Nuclear power and fossil fuel-fired thermal stations are the other conventional sources. Owing to widespread popular opposition, because of high population density and fragile ecology, nuclear stations could not be installed in Kerala. The only other alternative was fossil-fueled thermal stations like Brahmapuram or Kayamkulam.

It is widely accepted that fossil fuels are limited, that its price will go on increasing, that they do not offer a long term solution, that they contribute to global warming and that alternative sources are to be identified. To cater to ever-increasing demand of power, Government of Kerala has decided to give encouragement to power generation from Non-conventional Energy Sources. It is proposed to generate energy from municipal waste, agro waste, industrial waste and sewage and other biomass, small-hydel units, solar photo voltaic, wind, tide, wave, geothermal etc. These technologies are environment friendly. The use of Municipal Solid Waste for power generation, besides generating power, will eliminate the problem of pollution and disposal of urban waste. Private investment will be attracted in all these sectors.

The efficiency of solar varies from 13–22%. It is the production of energy which uses pure energy from the sun thus the system drives clean energy. Installing a solar panel on your house will help you in combat the emission of greenhouse gas and helps in reducing the dependence on fossil fuels for energy production.

On per the second basis, the sun is able to send around 42 trillion kilocalories of sunlight energy to our planet. if we are able to convert the entire 100% of this energy than we can produce one year's worth of electricity for our entire planet with just one hour of energy conversion. It is the most powerful form of renewable energy resource.

The Soura project of KSEB aims to generate 500MW electricity by installing rooftop panels atop the building owned by consumers across the state. Inline with the renewable energy policy of Kerala Government, KSEBL target an addition of 1000MW solar power generation capacity to the present capacity of around 110MW. Figure (1) shows the foreseen projects of KSEBL.

The Soura project offers three different schemes to the consumer. Under the first scheme, KSEB will bear the cost of installation as well as maintenance of the plants. The scheme offers 10% of total electricity produced to the consumer for free.

In the second scheme also the cost would be borne by KSEB and any quantity of electricity produced from the project can be drawn by the consumer at a fixed rate. As per the third scheme, the consumer will bear the cost of the project. Then, he/she will have the right to use the whole energy generated at his roof top or can sell the energy completely or partially to the KSEB.

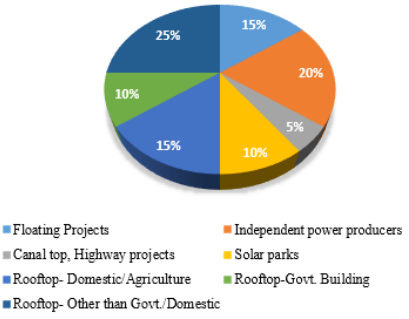

FIGURE 1 : ***Different Solar Projects of KSEBL***

KSEB will also have to work out the financial aspects involved with the project, including the rate for giving electricity to the consumer as well as purchasing power from them.

We conducted the analysis at College of Engineering Kidangoor, Kottayam. The college has an unshaded area of 4425.72 m². The electricity supply to the institution is from KSEBL Kidangoor, Pala. The institution is billed under HT II (B) GENERAL.

TABLE – 1: ***Baseline Data***

Electricity Provider	KSEBL
Tariff	HT II (B) GENERAL
Substation feeder	11 kV, HT
Contract Demand (kVA)	100
Connected Load (kW)	246
Average Maximum Demand (kVA)	45
Average monthly consumption (kWh)	6000
Average monthly electricity cost (Rs)	73,962
Per Unit Cost (Rs)	6.2

The college works from 9am to 5pm. The institution has a connected load of 246 kW. Taking the above details into consideration energy saving can be accounted on zone 1 only. Zone 1 is billed at a rate of Rs. 6.2 per unit of energy consumed.

Assuming the installation of 10kW solar power plant on the college rooftop which generates 10000 units of energy per year. Then we are analyzing the three different models of Soura Projects of KSEBL.

ANALYSIS OF MODEL 1

In this model, the installation and maintenance is done by KSEBL and zero investment for the customer. 10% of the energy generated can be used by the customers at free of cost. i.e,

1000×6.2 = **6200/year**.

So 6200 rupees can be saved per year by installing model 1 solar power plant.

The model has zero installation cost and thereby no payback period. The problem faced in this model is that only 10% of the generated energy can be used by the consumer which may not meet his energy requirements. The surplus energy must be brought from the KSEB at fixed rate .i.e, Rs 6.2 in case of this institution. This model is profitable to a consumer who has an area to install this project such that the 10% generated can full fill his electrical energy requirements

ANALYSIS OF MODEL 2

In this model, the installation and the maintenance is done by KSEBL and zero investment for the customer. The whole energy generated is sold to the customer at fixed rate i.e. at a rate of Rs 5 per unit

10000 × (6.2-5) = **12000/year**

So 12000 rupees can be saved per year by installing model 2 solar power plant.

Here there is no issues of the payback period as there is no installation charges. Consumer can benefit from this as they have a reduction in their normal Tariff rate by an amount of Rs 1.2 per unit. So the consumer can meet his electrical energy requirements at a lower cost. This adds to his financial savings.

ANALYSIS OF MODEL 3

In this model customer invest and KSEB installs solar panel. It cost approximately Rs 45000 – 60000/kW. For installing a solar power plant of capacity 10 kW the customer need to invest an amount of approximately Rs. 500000. If the consumer takes a loan for the installation the profitable rate of interest can be calculated using Internal Rate of Return (IRR).

$$Net\ Present\ Value = \sum_{t=0}^{n} \frac{R_t}{(1+i)^t}$$

t = Time of the cash flow

i = Discount rate

R□ = Net Cash Flow

$$\text{Net Present Value} = r_a + \frac{NPV_a}{NPV_a - NPV_s}(r_s - r_a)$$

r_s = Higher Discount Rate chosen

r_a = Lower Discount Rate chosen

NPV_a = Net Present Value at r_a

NPV_s = Net Present Value at r_s

The profitable interest rate calculated using the above formula for 10 years is 4%.

TABLE – 2 : Net Present Value

Year	Cash Flow	Present Value
0	-500000	-500000
1	62000	57407.40741
2	62620	53686.55693
3	63246.2	50206.87268
4	63878.662	46952.72353
5	64517.44862	43909.49145
6	65162.62311	41063.50589
7	65814.24934	38401.98236
8	66472.39183	35912.96498
9	67137.11575	33585.27281
10	67808.48691	31408.44957

The table shows the profitable payback amount for 10 years. There was a price hike in the KSEBL Tariff in 2013 where the price increased from Rs 5.59 per unit to Rs 6.2 per unit for zone 1. So in this case there is an expected rise in KSEBL Tariff which will add to the savings in future. Another benefit by installing solar is that there will be a reduction in the demand and thereby we can save Rs 400 per kVA reduced per month. There will be reduction in the efficiency of solar panel after each year. In their first year of operation, panels generally undergo short-term degradation ranging from less than 1% to 3%. After that, solar panel performance declines by an average of 0.8% to 0.9% each year. On the practical side a loan with 4% interest is not available from the bank for this purpose. Taking a loan at 12% rate of interest gives a payback of 25 years and above which is not profitable to the consumer.

COMPARISON BETWEEN THE MODELS

TABLE – 3: ***Comparison of the three Models***

Model 1	Model 2	Model 3
KSEB installs solar panel free of cost	KSEB installs solar panel free of cost	Customer invests and KSEB installs solar panels
Zero investment for the customer	Zero investment for the customer	Approximately Rs. 45000 – 60000/Kw
KSEB will do operation and maintenance	KSEB will do operation and maintenance	KSEB to do operation and maintenance as per customer request
10% energy to be provided free of cost	Energy sold to customer at fixed rate for 25 years	KSEB will by surplus energy

Model 1 has a benefit of having no installation charges and thereby no payback period. The drawback of this project is that only 10% of the

energy produced can be consumed by the consumer free of cost which may not meet their requirements. Here Model 2 is more advantageous compared to the former as the consumer can use the needed energy with a rate of Rs 5 per unit which is lower than the KSEBL Tariff i.e. Rs 6.2 per unit.

On comparing this with Model 3, where the consumer has to bear the cost of installation, again Model 2 seems profitable. The simple payback period of the customer is calculated to be 8 years. This too seems unprofitable.

Hence according to the analysis, Model 2 where the KSEBL in association with ANERT funds the cost of installation and maintenance and sell the energy produced to consumer at a rate of Rs 5 per unit.

CONCLUSIONS

This paper makes an attempt to find out the best among the three models of Soura project in educational institutions. In this paper, the three models of the Soura Project was analyzed. The best model suitable for an educational institution is model 2. In this scheme the installation and maintenance is done by KSEBL and the consumer has to pay only Rs. 5 per unit energy consumed which is profitable to the consumer. Another advantage of installing this project is that this increases the power quality as the power factor of the generated electricity is unity. Solar panels also prevent heat gain inside the building. Moving into renewable energy sources like solar power plant, the consumer can also contribute to the reduction of Carbon emissions.

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