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ENERGY CRISIS MANAGEMENT USING SOLAR PHOTOVOLTAIC SYSTEM IN KERALA

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Abstract

10000 rooftop power plants programme in Kerala was a pioneering programme for decentralized stand alone rooftop solar power generation as part of the Jawaharlal Nehru National Solar Mission was implemented by ANERT during the year 2012-13. 1kW Solar power plants on 10,000 rooftops totaling a capacity of 10MW is going to be installed. This has been a novel programme for green energy generation. By using grid tie system we can make the system cheaper at least by Rs 50,000 compared to the present off grid system. Also the latest guidelines state that installation of net-metering system at the site will connect it to grid via distribution companies. In the new scenario those who have set up a solar system with a capacity of 1KW to 1MW on a rooftop space would be able to sell it back to the KSEB.

Keywords:

ANERT=Agency for Non-Conventional Energy and Rural Technology
MNRE=Ministry of New and Renewable Energy
KSEB=Kerala State Electricity Board
JNNSM = Jawaharlal Nehru National Solar Mission

INTRODUCTION

The Jawaharlal Nehru National Solar Mission was launched on the 11th January, 2010 by the Prime Minister. The Mission has set the ambitious target of deploying 20,000 MW of grid connected solar power by 2022 is aimed at reducing the cost of solar power generation in the country through (i) long term policy; (ii) large scale deployment goals; (iii) aggressive R&D; and (iv) domestic production of critical raw materials, components and products, as a result to

achieve grid tariff parity by 2022. Mission will create an enabling policy framework to achieve this objective and make India a global leader in solar energy.

STATEMENT OF THE PROBLEM

The basic problem identified was that the present condition solar power system has been costly. Hence the present study analyses the possibility of reducing the cost by adopting grid tie technology.

OBJECTIVE OF THE STUDY

- To analyse factors depending on cost of a solar power system
- To analyse how to make a solar power system financially viable
- To increase the financial viability of solar power system by analysing the effectiveness of grid tied solar power system and off-grid solar power system.

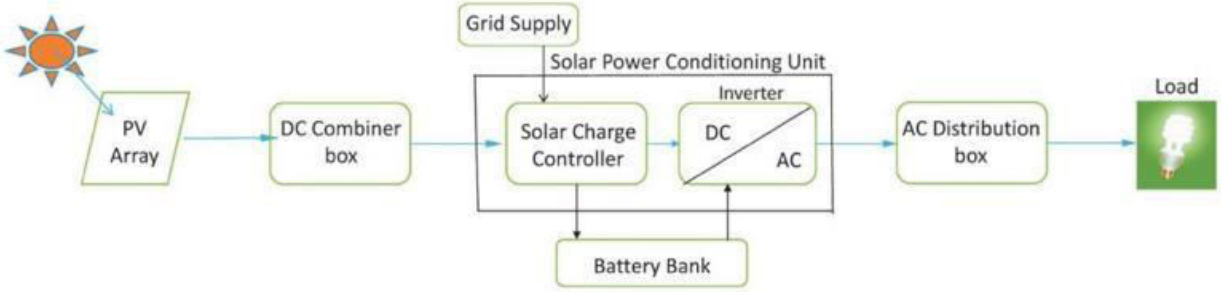
NEED FOR THE STUDY

Kerala depends almost wholly on hydro-electricity. In the present scenerio Kerala will have to buy power from outside at exorbitant rates. Electricity Act 2003 promotes absorption of renewable energy and mandates for specified consumption from renewable sources in the area of every distribution utility. Accordingly Renewable Purchase Obligation (RPO) and more specifically solar purchase obligations have become mandatory recently. This at present is fixed at 3% of the total consumption for RPO and out of which 0.25% shall be from the solar sources alone, with annual escalation at 10% till the quantum from renewable reaches 10% of total purchase.

RESEARCH METHODOLOGY

Descriptive research method has been used for data analysis.

ANALYSIS OF THE OFF-GRID SOLAR POWER SYSTEM



SOLAR POWER SYSTEM COMPONENTS

PHOTOVOLTAICS

A solar cell, or photovoltaic cell (PV), is a device that converts light into electric current using the photoelectric effect. The first solar cell was constructed by Charles Fritts in the 1880s. The German industrialist Ernst Werner von Siemens was among those who recognized the importance of this discovery. In 1931, the German engineer Bruno Lange developed a photo cell using silver selenide in place of copper oxide, although the prototype selenium cells converted less than 1% of incident light into electricity. Following the work of Russell Ohl in the 1940s, researchers Gerald Pearson, Calvin Fuller and Daryl Chapin created the silicon solar cell in 1954. These early solar cells cost 286 USD/watt and reached efficiencies of 4.5–6%.

PHOTOVOLTAIC POWER SYSTEMS

Solar cells produce direct current (DC) power which fluctuates with the sunlight's intensity. For practical use this usually requires conversion to certain desired voltages or alternating current (AC), through the use of inverters. Multiple solar cells are connected inside modules. Modules are wired together to form arrays, then tied to an inverter, which produces power at the desired voltage, and for AC, the desired frequency phase.

Many residential systems are connected to the grid wherever available, especially in developed countries with large markets. In these grid-connected PV systems, use of energy storage is optional. In certain applications such as satellites, lighthouses, or in developing countries, batteries or additional power generators are often added as back-ups. Such stand-alone power systems permit operations at night and at other times of limited sunlight.

What Does "Off-Grid" Mean?

"Off-grid" means you are on your own: there is no connection to the power company. The only way to accomplish this in a setting where you want electricity even when the sun is not shining, is to incorporate batteries into your system. Thus off-grid homes have no power poles running to them, and draw the power they need from deep cycle battery banks.

Price list of Empanelled Agencies

Bidder Name	Rate(Rs)	Rate after deducting subsidy (Rs.)
Su-Kam Power Systems Ltd	1,93,760	1,01,498
Tata Power Solar Systems	1,97,500	1,05,238
Ammini Solar Pvt. Ltd	1,97,500	1,05,238
Waaree Energies Pvt. Ltd	2,05,500	1,13,238
Luminous Power Technologies Pvt. Ltd	1,93,500	1,01,238
Bosch Limited	2,02,535	1,10,273
Solar integration India Pvt. Ltd	1,92,000	99,738

Subsidy

Financial support from MNRE (Government of India) and Government of Kerala is available for the programme as detailed below

MNRE = Rs.53262, State Government = Rs.39000, Total subsidy = Rs.92262

SYSTEM CONFIGUIRATION

System Component	Capacity	Minimum Technical Compliance
Solar panel	1000 Wp	IEC 61215 / IS14286, IEC 61730 Part 1 & II
Battery	7200Whr ± 4%	IS1651/IS13369 /IEC 61427/IS15549
Power conditioning Unit	1kW	IEC 61683 / IS 61683 IEC 60068-2 (1, 2, 14, 30) / Equivalent BIS Std Efficiency 85% and above
Cables		IEC 60227 / IS 694 IEC 60502 / IS 1554 (Pt. I & II
Switches/ Circuit Breakers/ Connectors		IEC 60947 part I,II, III / IS 60947 Part I,II,III EN 50521
Junction Boxes /Enclosures for Inverters/ Charge Controllers		IP 54 (for outdoor)/ IP 21(for indoor) as per IEC 529

Warranty

5 years warranty for the entire system should be provided by the supplier as per the conditions of the contract.

PV modules used in solar power plants systems must be warranted for their outputpeak watt capacity, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years.

GRID-TIED: THE ALTERNATIVE

"Grid-tied," by contrast, means that your house is connected to the grid, and you are still set up to buy your power from the power company when you need it. But, when your solar array is producing power, you can either sell that power straight to the grid with the goal of financially offsetting the cost of the power you have purchased, or you use that power yourself first, and sell any extra to the grid. You may not be using the actual electrons you have produced yourself, but you are still contributing green power to everyone's benefit.

MAJOR FINDINGS AND IMPLICATIONS

The advantages of one system over the other come down to cost, comfort and independence. A grid-tied system will cost less because it does not require batteries, which form a significant portion of the cost of an off-grid system. A grid-tied system for a net-zero home will also cost less because fewer solar panels are needed: When you are not trying to store your own energy in batteries for later use, you do not need to produce quite as much energy in order to offset your yearly energy use.

A grid-tied system is also more flexible, both from a day-to-day use standpoint, and from a down-the-road standpoint. Since you still buy any excess power from the grid, you won't suddenly find yourself without electricity if you accidentally leave the lights on all night—although you will have to pay the electric bill for such a mistake. And since you aren't tied in to producing all of your own power yourself, you can use a grid-tied system to install as much solar as your budget allows, adding to it down the road as you are able. Although you can add to an off-grid array down the road as well, if you don't install enough to meet all of your power needs to begin with, you can't wait on installing more capacity if you want to have enough power.

Installing the grid-tied array allowed the homeowners to put in as much solar as their budget allowed. However, for safety reasons, grid-tied systems cannot function when grid power goes down (a live load on the line would present a danger to utility workers coming in to fix power outages), and to many independence-seeking homeowners, that is the biggest drawback of grid-tied systems. There may be very practical reasons to go off-grid as well, such as a high cost of installing traditional power poles to a remote jobsite or a concern about local grid reliability.

An off-grid system could also be argued to have a lesser environmental footprint than a grid-tied system. For one thing, it forces you to adopt a more energy-conscious lifestyle, for every decision about electrical usage has consequences for how your system performs. Additionally, an off-grid system produces its energy on the site where that energy will be used, eliminating the inefficiencies of distribution. An off-grid system represents a complete removal of your home from the environmental externalities associated with conventional power production—for some, this is by far the biggest attraction of renewable energy.

CONCLUSION

In the present scenario the component which can be tweaked has been identified as solar battery. The cost of the system can be reduced by adopting grid tie system. The recurring cost of battery and the problem of dumping large number of batteries can also be avoided. Batteries, specifically deep-cycle, lead-acid batteries contain lead and sulfuric acid, which are both highly toxic, especially to marine creatures. Lead present in batteries has been found to cause a number of impairments in children, including developmental disabilities. So this change can become a financially feasible and eco-friendly option.

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