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RESIDENTIAL PEACE in KERALA BY USE OF SOLAR PANELS

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Abstract

The advent of concrete buildings in the tropical state of Kerala in India, from the last 100 years have predominantly resulted in an increase of atmospheric temperature inside residences. The ancient housing in the state would have leaf roofing which would disintegrate the heat because of the large surface area each leaf has, and it would also prevent water leakage. However concrete households and Mysore tile roofing also to an extend did increase the interior temperature far from the optimal temperature requirement of 24 c, to as high as 42 degree Celsius, in the summer. This journal will discuss how the optimal temperature can be attained by use of solar panels and how it will help the average monthly budget of each house owner.

Keywords:

House Budgeting, Solar panel, Electricity Bill , Return on investment ,Air conditioning

IDEA OF HOUSING WITH OPTIMAL TEMPERATURE AIMED

AT RESIDENTIAL PEACE in KERALA BY USE OF SOLAR PANELS

Introduction

A Home is a place where all living creatures aim to reside, spend their happy times and take rest. Human beings, as species with high intelligence and everlasting quest for improvement in lifestyle, and innovation, also tend to create places of stay, weather commercial or residential aimed at facilitating stay of its occupants, for work or rest. Their for, investment or budget is the opening factor of any buildings, and it's from then that various factors about the facilities are discussed by the owners of the property, and cash flow arrangement for the budget are discussed to ensure these amenities and features are met upon completion of these projects.

Priorities are different for each individual owner, however, there are certain facilities which are mandatory, like for instance electricity and water supply, drainage requirements, bathing and toilet requirements, sleeping and cooking requirements etc. These are the first come first items which comes to everybody's mind while planning a home. Each of these essential items are listed and budget is allocated and its studied as on which can be included and which can be excluded , or if there is still left over budget, what additional facilities can be added to suit ones requirement. This planning and budgeting helps each owners in accomplishing their dream in timely manner

It is there for very important that each home owner or property owner plan things in advance what are their priorities and where their money should go. Kerala Home owners generally tend to meet their primary requirements and spend a lot of money on dead investments like exterior decoration , ceiling decorations, stair extra Vicenza , wooden decorations and beautification furnishing, and many times forget or avoid to consider the most important factor required to facilitate a stay in a home peacefully- optimal temperature.

Human body respond to the exterior temperature, the normal human body temperature is around 36 to 37degree Celsius, and it's widely understood that an external temperature of 24 degree c is best suited for the health of occupants in tropical climate of India. Residential characteristics have widely changed in Kerala over the last century which has resulted in an higher inside temperature for buildings which normally falls above 30 degree c and even reach up to 40 or more in summer, which has their for will make the homes as hot as hell and unsuitable for residing unless the temperature is controlled to reach an optimal range

The purpose of this journal is to discuss the financial viability and budgeting of reaching an optimal temperature and how it can be attained.

Kerala Weather, and temperature under roofs

Kerala is a tiny strip of land at the southernmost corner of India, and has a varied geography with midlands, ocean and mountains all together in one state. The climate in Kerala is maritime tropical climate, with heavy rainfall during the monsoon season .The average temperature varies between 28 degree c and 32 degree c, however in the summer, the temperature goes up to 37 degree c on average except in the hilly areas.

Kerala records a cooler climate in the morning, with the blazing sun resulting in an increased temperature by the time it sets. The transformation of the housing to concrete buildings as opposed to the leaf roofing which prevailed in ancient times, resulted in high interior temperature for households. For instance, when the atmospheric temperature is 33 degree c, the average Kerala household interior temperature will be around 39 degree to 42 degree c, which is far from the optimal temperature suitable for comfortable stay (24degree c) because of the heat absorbed by the concrete and other roofing's on Kerala homes.

A rise in sea temperature because of global warming in turn increases the humidity, which results in higher than average maximum temperature during the summer time, between Januarys to mid may. It has been reported that the higher temperature has even crossed 40 degree c in Palakkad district, with similar higher temperature throughout Kerala on dry weather durations.

Average Temperature during Winter in Kerala:	Maximum: 28°C Minimum : 18°C
Average Rainfall during the season :	25 mm

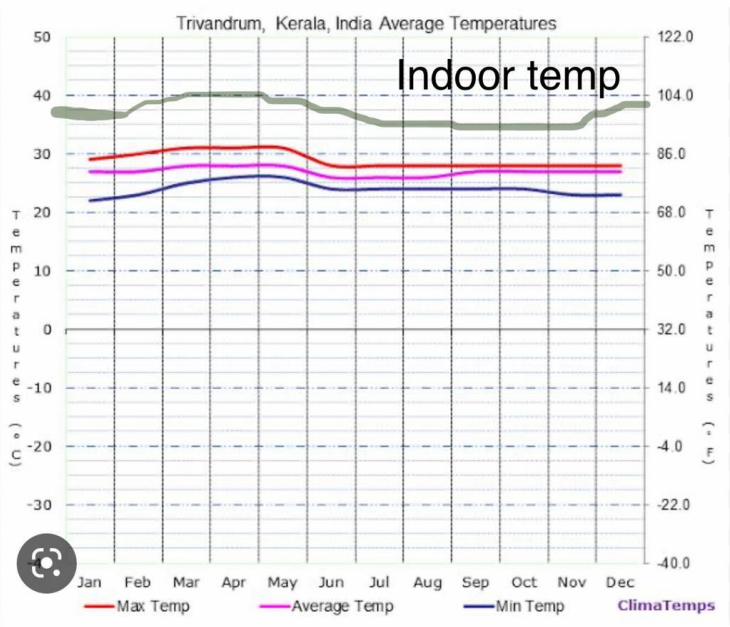
Average Temperature during Summer in Kerala:	Maximum : 36°C Minimum : 32°C
Average Rainfall during the season :	135 mm

*Based on ENVIS data

The highest recorded temperature of the year was reported at Vellanikkara in Thrissur, which was 42.9 degrees Celsius, as on 14 April 2023. There were many small pocket places with temperature above 40 degree c

This means that the average indoor temperature below the concrete roofs will further increase by another 8 to 10 degrees, which will make it impossible unless required measures are taken to reduce the heat

The easiest and most reliable solution to this heat problem is to install air conditioning systems inside the house and optimize the temperature. However this means that the home owner will have to spend a huge amount of money on electricity bill on monthly basis, which will affect the home budget.



Monthly recurring expenditures are considered to be burden by most Keralies, while onetime expense, even if huge is given a go. For instance, while constructing a home, if at all the optimal indoor temperature is even considered as a requirement, many dead investments like exterior beautification works which costs a fortune can be less prioritized than the requirement for comfortable temperature inside home, which is very important for peace of mind of the residents. That's the reason why it is important to have a look at what are the avoidable requirements for a home, which can be replaced for the sake of indoor comfort

Objectives of the Study

1- To apply for Lower income class home construction budget.
2- To use for Middle class home construction budget,

3- To live with peace mind through the installation of solar panels and

4-To get high net worth home construction budget.

In all these four categories, amazingly even in category 4, it can be observed that indoor temperature comfort is not given almost importance. This can be understood from the fact that 90% of home users in Kerala use electricity less than 150 units a month, which won't be enough to run air conditioners.

Methodology

The reason for this is the fancy ideas each home owner has regarding their home. The exterior and interior view- and certain amenities – are given importance and not the comfort factor. For instance in category 1, the lower income class home budget expectations mostly revolve around concrete roof housing plans- while a leaf roofing solution, well implemented with leak proof solution and burglar proof steel roof can be done in more beautiful, ecofriendly and less expensive execution, and this would ensure a much comfortable indoor temperatures ranging up to 32 degree c even at peak summers. However, seldom it's the case. For category 2, and 3, the middle class and higher middle class, it can be observed that majority of the home owners focus on the exterior elevation and beautification, and spends lot of money as dead investment to give a better look for home, and as well spend on stair cases beautification, real wood decoration expenses etc. which consumes a considerable amount of expense. Home owners do go for air conditioning installation, however, because solar power generation is not implemented, the usage of these machines will be limited in their home because of the concerns of monthly electricity bills. Even in high net worth individuals, its observed that more than 50% of home owners don't go for a on grid solar plant enough to give optimal temperature for their indoors, even while they spend fortunes on Italian marble flooring, ceiling decoration, stair and other area decoration and external beautification.

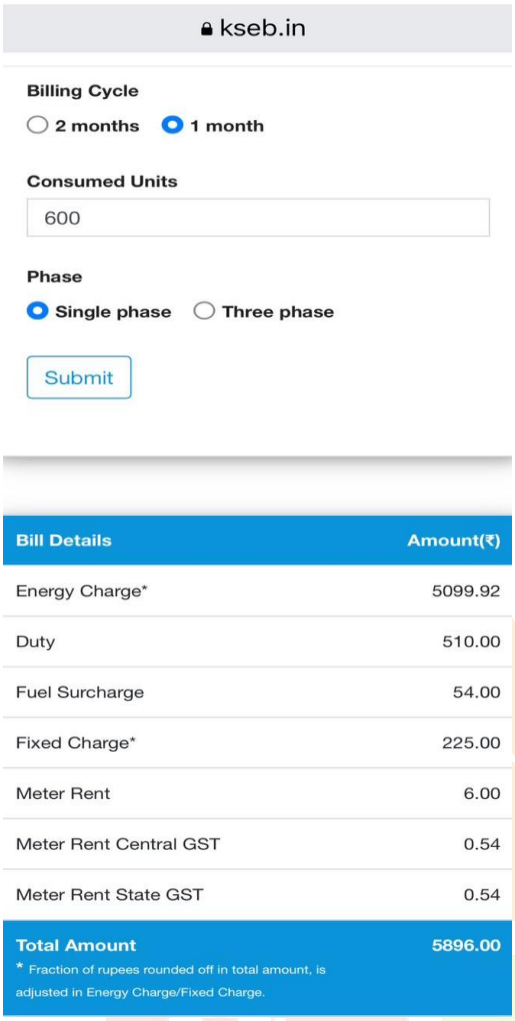
All of this happens because of the social stigma around home construction in Kerala which is more focused on the look, or the view and not on the comfort. Every home is unique and all home owners have a concept on how the home should look like and it should look beautiful, but not at the cost of comfortable living which is the core reason why a home is made.

Electricity Bills in Kerala

85% of electricity users in Kerala consume less than 250 units which is equal to 2500 watt of energy, which means that air conditioning is not used as a potential optimizer to ensure optimum temperature. Less than 10% of users consume more than 500 units of energy, amongst which less than 1% of users are using solar power to generate electricity to meet their power requirement.

There is around 93 Lacks of houses connected by KSEB in Kerala, and the total houses connected with solar on grid connection still remains less than 40,000/.

At least 10% of these houses which comes to around 9 Lacks houses are using more than 500 units of power on monthly basis. It can be understood that any household which can afford to use 500 units is not the lower income group, and their total load will be more than 5K W, which makes it evident that these houses if aware about the benefits can have the cash flow to install on grid solar panels.



Capacity (kWp)	Average Solar Units Generated/Bimonthly	Price of Solar Power Plant (Price Per kWp, Without Subsidy)
2 kWp	360 to 480 units	Rs.70,000 – Rs.90,000
3 kWp	270 to 360 units	Rs.65,000 – Rs.80,000
5 kWp	450 to 600 units	Rs.60,000 – Rs.80,000
9 kWp	810 to 1080 units	Rs.55,000 – Rs.70,000

*Calculation derived from KSEB website for 600 units of electricity

The above mentioned calculation makes it evident that each household with a daily consumption more than 20 units of power, will generate an average bill of around INR 6000/- per month which will make it a total of 72000/- INR in a year. Multiply that by 10 years, and you get a fortune of 7 Lacks 20000 INR, which will be the lowest tariff the owner is going to spend in 10 years. Most likely every 3 years KSEB revises the bill and increases the tariff, hence the total bill may even reach one million INR in a span of a decade.

This is the reason why every house hold has to install a required solar on grid plant to ensure that the optimal temperature required for wellbeing of in mates can be met

Secondary data

EXPENSE FOR SOLAR ON GRID System

On-grid solar power system is a solar power generation system where it is connected to the utility grid. The electricity produced by the system is routed to the grid from where it is used to run the various appliances. The installation of the same is also fuss-free and easy to maintain

The arrangement of solar modules absorbs the sunlight on them and convert them into electricity. The current generated here is Direct Current (DC). The solar inverter then converts the DC to Alternating Current (AC), thus making it power the electrical items. This electricity is then routed to the grid where it is supplied for day to day use. An important feature is a net meter. It is a device that records the energy supplied to the grid and the energy consumed. At the end of each month, the outstanding is recorded and the consumer is provided with a bill.

An off grid system has disadvantage of batteries which is costly and require high maintenance. Hence it's always good to opt for on grid system

The average expense of a solar on grid system in Kerala is as described in the chart

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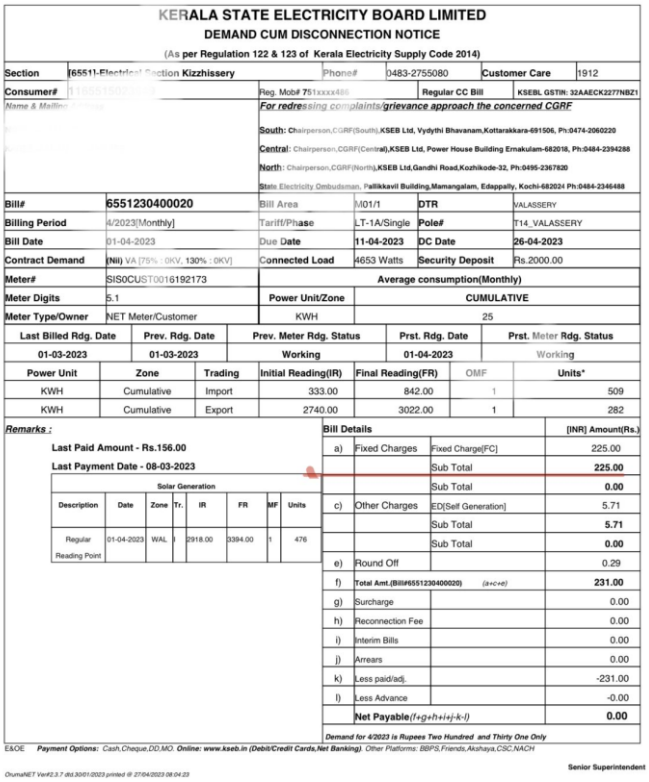
An average house with three air conditioners, inclusive of all the normal amities like lighting, refrigerator, water pump, washing machines , switches and sockets, can be run on 3 air condition with 5 star rating, with average use of 18 hours a day, and even still the monthly unit will be around 600 units. This will help to keep the optimal temperature of the house between 24 to 27 degree Celsius which is a very healthy and comfortable indoor temperature. A 5 KW solar power station on grid will cost between 3 lacks to 4 lacks, and it can fetch approximately 600 units of power, which will help to maintain the optimal temperature indoors.



KERALA STATE ELECTRICITY BOARD LIMITED

DEMAND CUM DISCONNECTION NOTICE

(As per Regulation 122 & 123 of Kerala Electricity Supply Code 2014)

Section [65511-Electrical Section Kizhissery] Phone# 0483-2755080 Customer Care 1912

Consumer# [illegible] Reg. Mob# 751xxxx486 Regular CC Bill KSEBL GSTIN: 32AAECK2277NBZ1

Name & Mailing [illegible]

For redressing complaints/grievance approach the concerned CGRF

South: Chairperson,CGRF(South),KSEB Ltd, Vydythi Bhavanam,Kottarakkara-691506, Ph:0474-2060220

Central: Chairperson,CGRF(Central),KSEB Ltd, Power House Building Ernakulam-682018, Ph:0484-2394288

North: Chairperson,CGRF(North),KSEB Ltd,Gandhi Road,Kozhikode-32, Ph:0495-2367820

State Electricity Ombudsman, Pallikkavil Building,Mamangalam, Edappally, Kochi-682024 Ph:0484-2346488

Bill#	6551230400020	Bill Area	M01/1	DTR	VALASSERY
Billing Period	4/2023[Monthly]	Tariff/Phase	LT-1A/Single	Pole#	T14_VALASSERY
Bill Date	01-04-2023	Due Date	11-04-2023	DC Date	26-04-2023
Contract Demand	(Nil) VA [75% : 0KV, 130% : 0KV]	Connected Load	4653 Watts	Security Deposit	Rs.2000.00
Meter#	SIS0CUST0016192173	Average consumption(Monthly)			
Meter Digits	5.1	Power Unit/Zone	CUMULATIVE		
Meter Type/Owner	NET Meter/Customer	KWH	25		

Last Billed Rdg. Date	Prev. Rdg. Date	Prev. Meter Rdg. Status	Prst. Rdg. Date	Prst. Meter Rdg. Status
01-03-2023	01-03-2023	Working	01-04-2023	Working

Power Unit	Zone	Trading	Initial Reading(IR)	Final Reading(FR)	OMF	Units*
KWH	Cumulative	Import	333.00	842.00	1	509
KWH	Cumulative	Export	2740.00	3022.00	1	282

Remarks :

Last Paid Amount - Rs.156.00

Last Payment Date - 08-03-2023

Solar Generation

Description	Date	Zone	Tr.	IR	FR	MF	Units
Regular Reading Point	01-04-2023	WAL	)	2918.00	3394.00	1	476

Bill Details			[INR] Amount(Rs.)
a)	Fixed Charges	Fixed Charge(FC)	225.00
		Sub Total	225.00
		Sub Total	0.00
c)	Other Charges	ED[Self Generation]	5.71
		Sub Total	5.71
		Sub Total	0.00
e)	Round Off		0.29
f)	Total Amt.(Bill#6551230400020) (a+c+e)		231.00
g)	Surcharge		0.00
h)	Reconnection Fee		0.00
i)	Interim Bills		0.00
j)	Arrears		0.00
k)	Less paid/adj.		-231.00
l)	Less Advance		-0.00
	Net Payable(f+g+h+i+j-k-l)		0.00

Demand for 4/2023 is Rupees Two Hundred and Thirty One Only

E&OE Payment Options: Cash,Cheque,DD,MO. Online: www.kseb.in (Debit/Credit Cards,Net Banking). Other Platforms: BBPS,Friends,Akshaya,CSC,NACH

Senior Superintendent

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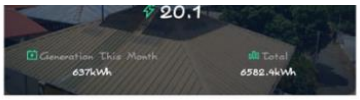

COST VS RETURN FOR 5 KW ON GRID SOLAR STATION

The below mentioned charts will explain the cost vs return of investment for the 5kw solar station

The above mentioned primary data is derived from a 5 KW solar on grid plant based in Malappuram district of Kerala. This plant has generated a total power of 637 kW in a month's duration. Considering an average of 600 units per month this plant can produce a total of 7200 units of power in a year.

The average monthly bill of a unit with more than 600 units is given below, to understand how much effectively the solar grid can take down the bill. The electricity board will be charging only the fixed charges for units above 600 units, which is INR 230/- only

Considering an average cost of 3,50000/-INR for the solar plant, considering monthly utility of a household standing at 600 units, and the solar power generation at 600 units, the below said table explains the investment vs return of investment duration and profitability periods marked in green

YEARS	1	2	3	4	5	6	7	TOTAL
SOLAR POWER GEN IN KW	7200	7200	7200	7200	7200	7200	7200	50400
USAGE IN KW	7200	7200	7200	7200	7200	7200	7200	50400
BILL WITHOUT SOLAR INR	72000	72000	72000	72000	72000	72000	72000	504000
BILL WITH SOLAR INR	2760	2760	2760	2760	2760	2760	2760	19320
REDUCTION OF COST CHART REDUCING YEARLY PROFIT FROM INVESTMENT OF INR 3,50000	315760	246520	177280	108040	38800	30440	99680	168920

This chart explains clearly how much profitable a solar plant can be, and how useful it is to not only help the home owner maintain optimal comfortable temperature at home throughout the year, but also helps the owner to make more than 6000 INR per month as electricity savings, from 6th year to 25 years, which will average the net profit more than 2 million INR, recovering the cost of installation in 5 years.

Conclusion

The Kerala home owners should take advantage of the govt scheme to install solar plants at their homes, which will not only help the govt to get low cost environment friendly electricity from each home, but also help each home owner to optimize the temperature to suit the comfort of each individual who resides in the house

This will help the home owners to enjoy the lifestyle, at the same time ensure return of investment, and help a better healthy living.

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4. www.kerenvis.nic.in