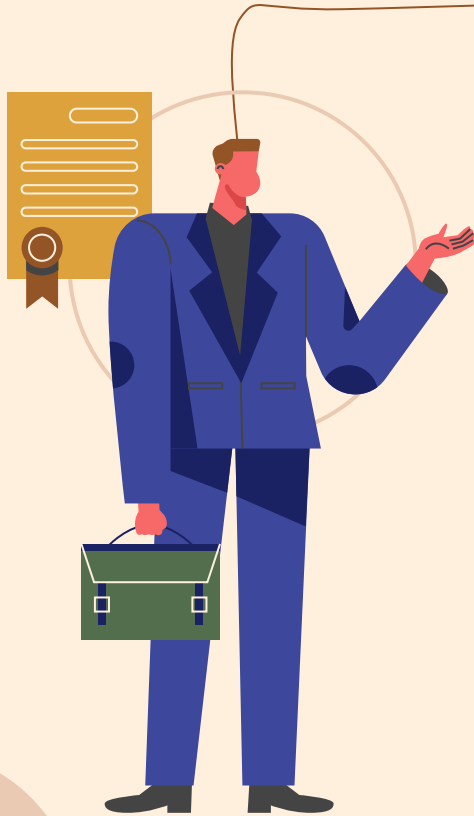




IIT Gandhinagar



Cost Optimization of Solar Energy for Household

Sustainability is the key !

Table of Contents



01

Aim

02

Ideation

03

Project proceedings

04

Final Product

01

Aim

“Aim high! The future you see is the person you be ”
-Jim Cathcart

Aim of the project

- ❑ To optimise the cost of installation of solar panels.
- ❑ To predict and reduce the duration in which solar project will be self-sustainable and start giving out profit.
- ❑ To study different models of battery system and solar panel utilisation.



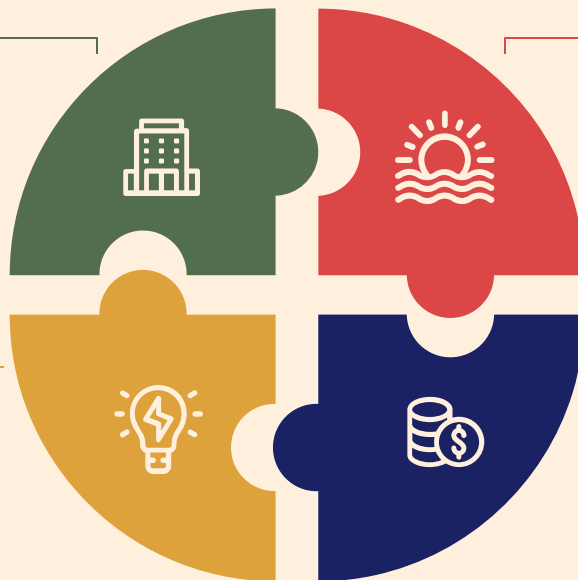
Our Purpose

Feasible Solar Technology

To make solar energy easily available to every household.

Smart Investments

Worry less about big energy bills.



Solar Potential

To bring out the solar potential of our country.

Cost Minimisation

Minimum cost to get maximum profit.



02

Ideation

“ Everything begins with an Idea”
-Earl Nightingale”

How did we solve the problem?

We analysed the factors like :

- Weather patterns of the area
- Minimum area for solar panels to fulfill the need
- Electricity consumption data of customers
- Study of time cost of money after solar installation

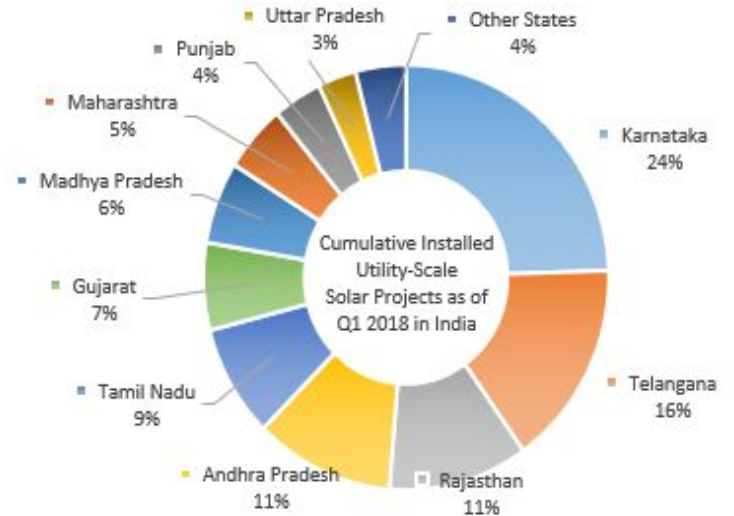
We strived for a better model of cost minimization.

Data Required

Collected the data on:

- Area required to plant solar beds
- Weather pattern data in the area
- Electricity consumption of household
- Area available
- Different types of Solar Panels, their cost and specifications

India: Top 10 Solar States with Cumulative Installations

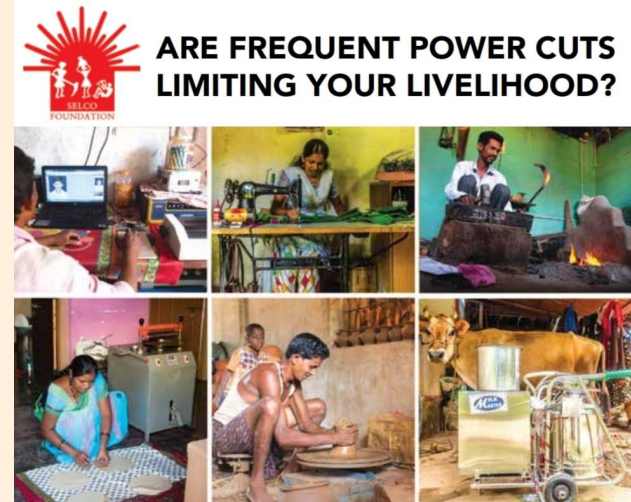


Our Domain

- We studied the weather pattern and other details for a house in rural settlement of Rajasthan.
- We planned to apply our idea to small scale industries in semi-urban and rural development.
- With a few minor changes our project will be applicable anywhere in india.

Beneficial for whom

- ❖ People of both rural and urban areas
- ❖ Country's economy
- ❖ Environment
- ❖ Micro and Small Business



Challenges faced by the users

Ashish Kumar Vidyarthi - September 25, 2019

Hi I m ashish from hyderabad. I would like to know more about the solar panels system and price. I would like to know about how much watt required for 2 and 4 Bhk and how many solar cells will be required with price. Kindly let me know if you will provide some guidance.

With Regards Ashish

Jaibir Singh - May 31, 2019

Dear Sir I am interested to install Solar panel at my house ,average consumption of my home is appx 25 unit per day please suggest me for better one.

v.k.chum - August 9, 2019

need a solar panel unit at roof top,daily consumption 15 units,connected load 6kw,pl. advice on brand & cost of panels & accessories,viability of unit etc.,complete tech.advice,suppliers in jaipur.

Workflow

Difficulty faced

In selecting solar panels



Analysed

The details of house



Go to Calculator

To get idea about the requirements



Input

The required information



Finalised Output

Obtain the perfect plan



03

Project

Proceedings

“Perfection has to do with the end product, but excellence has to do with the process”

-Jerry Moran

Integrated Solar Calculator



Input

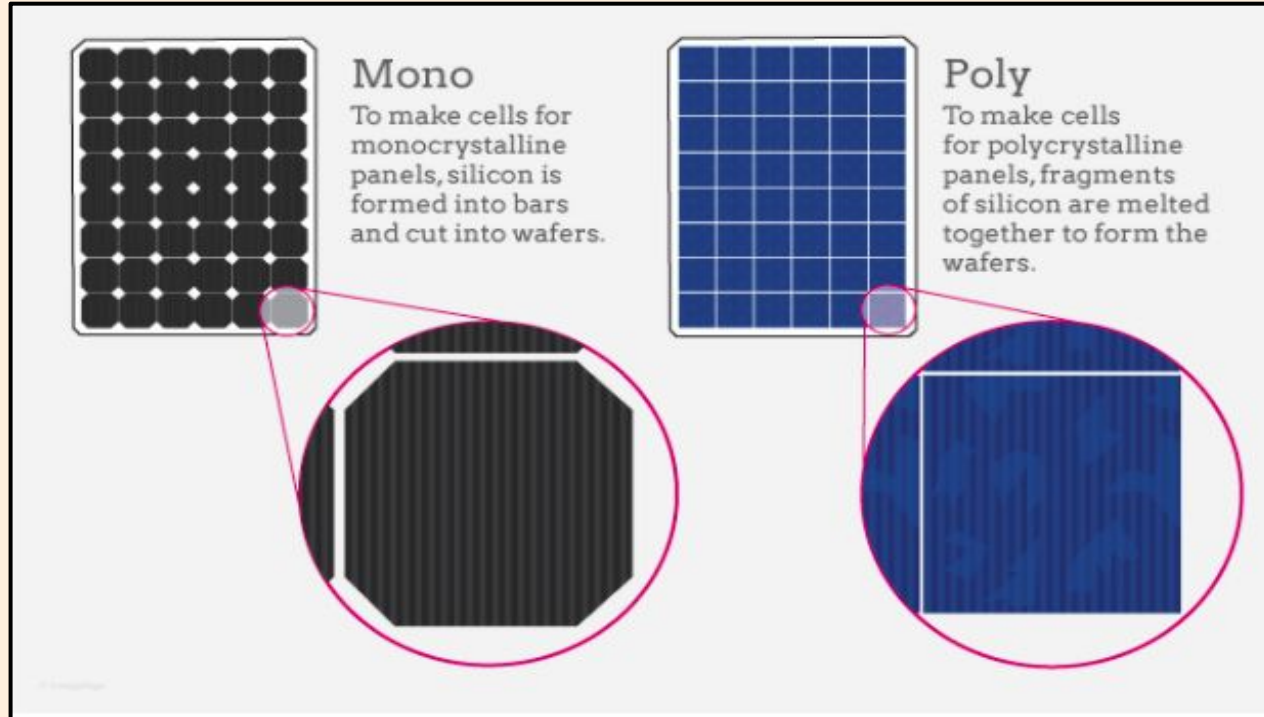
- Location of the house
- Surface Area of the roof
- Maximum Electricity consumption of the house (monthly)
- Budget available



Output

- Number and type of solar panels required
- Time in which the solar panels will recover the initial cost and would start giving out profit
- Optimal cost of installation

● Monocrystalline vs Polycrystalline Solar Panels



Details of Solar Panels

	Monocrystalline solar panels	Polycrystalline solar panels	Thin Film
Cost	More expensive	Less expensive	Least Expensive
Efficiency	More efficient	Less efficient	Least efficient
Sustainability	Not environmental friendly, produces lot of waste	Environmental friendly	Most environmentally Friendly
Longevity	25+ years	25+ years	10+ years

We chose to go with Polycrystalline Solar Panels because they are:

- ❑ Efficient
- ❑ Cheaper
- ❑ Environmentally friendly
- ❑ Durable.

Data Collection

- Electricity Rate = ₹ 7.5 per kWh
- Total units consumed per month (in kWh) = 629.6
- Average area of the rooftop with 100% sunlight = 1200 sq ft
- Number of Sunshine hours (daily) = 6 hrs
- Most Conventional Solar panel = 330 Watt
- Area of 330 Watt Solar panel = 2 sq.m.
- Cost of 330 Watt Solar Panel = ₹ 28 per W



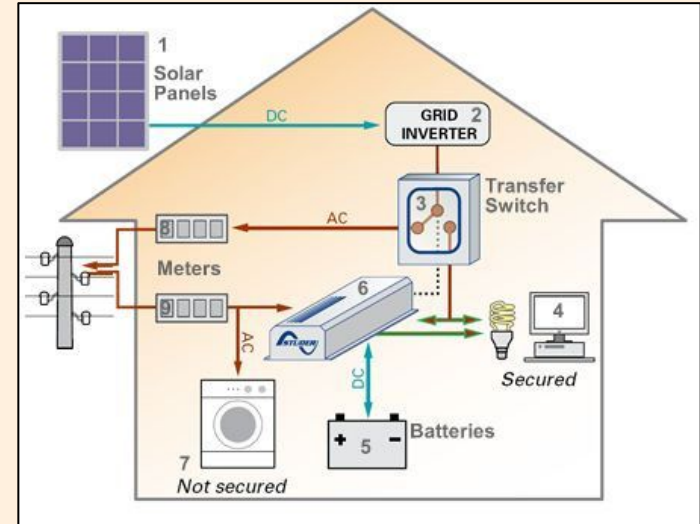
Components of Solar Power System

Core Components:-

- Solar Panels
- Inverters
- DC/AC Disconnects
- Meters
- Wiring
- Racking and Mounting

Additional Components:-

- Charge Controllers
- Batteries
- Monitoring Equipments
- Additional Balance of Systems items :
 - Junction Boxes
 - Combiner Boxes
 - Circuit Breakers
 - Fuses
 - Load Centers
 - Rapid Shutdowns
 - Surge Devices



Solar Grid Options

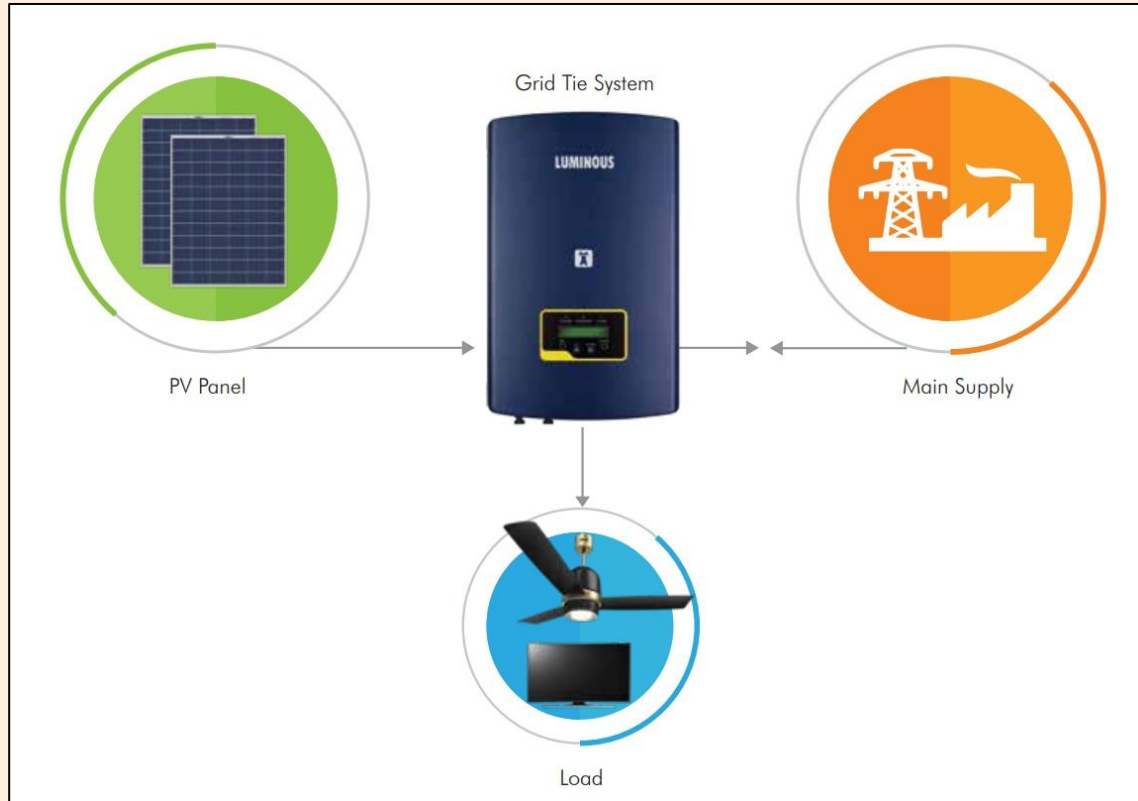
Grid Tie System

A Grid-Tie Solar System, is an electrical producing power module which is connected to a 'power grid', i.e., (your local utilities company)

Off- Grid System

An **Off-Grid System** is not connected to a power utility. Off-grid systems are generally utilized when you are at remote locations which do not have access to a power grid.

Grid Tie System



Off Grid System



Determination of Solar System Size



Solar System Size is the amount of energy your solar panels need to produce every hour. (aim is to recover monthly electricity consumption)

$$\text{Solar System Size} = \frac{\text{Monthly Energy Consumption} * 1.2}{30 * \text{Number of Sunshine Hours}}$$

Selection of Best Solar Panel

- We explored different brands and various models of solar panels
- We looked for following qualities in the selection of solar panel:-
 - The solar panel should be efficient.
 - It should be economical
 - Easily Available for Indian public
 - Suitable for Indian conditions

Considering the above factors, we chose to go with **330 W Tata Solar Panel**

Number of Solar Panels

Number of Solar Panels of 330 Watt user need to install can be given as,

$$\text{Number of Solar Panels} = \frac{\text{Solar System Size} * 1000}{330}$$

Minimum Area Requirement

The minimum area required (**A'**) is the area required to install the solar panels which can only recover the monthly electricity bill of the user.

Minimum Area Required = Area of One Solar Panel * Number of Solar Panels

Area Analysis

- If ($A' > A$):
 - Solar panel with higher efficiency if user can afford it
 - Lower efficiency solar panel if budget restricted, but won't recover monthly electricity bill
- If ($A' = A$):
 - Optimal solar panel
- If ($A' < A$):
 - Solar panel with lower efficiency, if the user wants to generate more electricity than his/her monthly consumption.
 - On-grid model
 - Battery

Cost Analysis



1. **Cost of Solar Panels = Price per Watt * 330 * Number of Solar Panels**
2. **Monthly Earnings = Monthly Electricity Consumption * 7.5**
3. **Daily Earnings = $\frac{\text{Monthly Earnings}}{30}$**
4. **Annual Earnings = Monthly Earnings * 12**

Environmental Footprint Analysis

1. CO2 Emission Mitigated =

$$\frac{0.82 * \text{Monthly Electricity Consumption} * \text{Lifetime of Solar Panels} * 12}{1000}$$

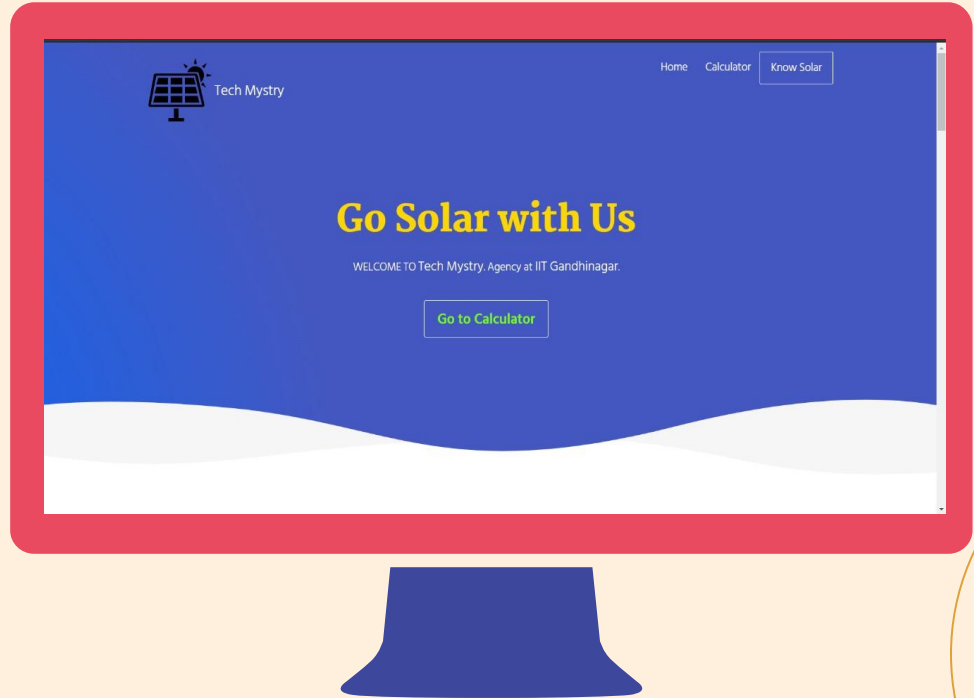
2. Number of Teak Trees You will plant =

$$\text{CO2 Emission Mitigated} * 1.6$$

A photograph of three business professionals (two women and one man) standing in front of a modern glass building. The woman on the left is holding a rolled-up document. The man in the center has his arms crossed. The woman on the right is smiling. The background features a blue glass building and a palm tree. The image is decorated with orange abstract shapes in the top-left and bottom-right corners.

Final Product

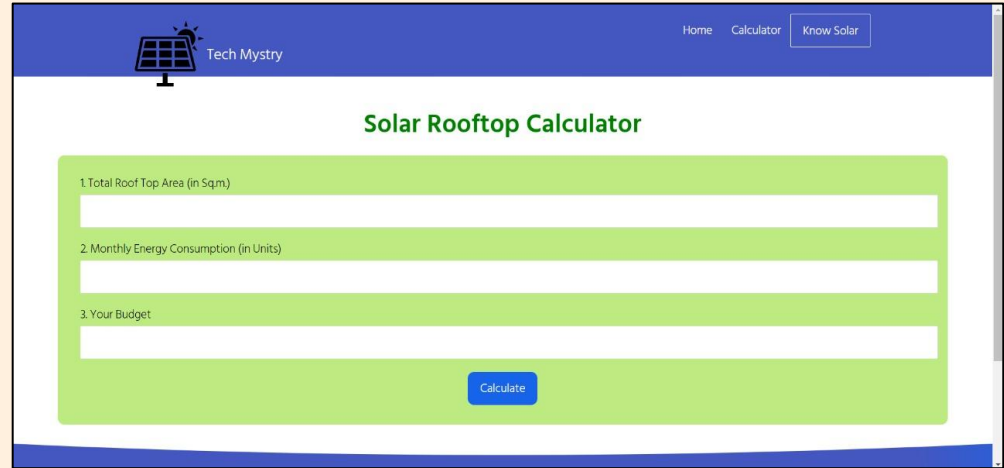
Desktop Website



Solar Rooftop Calculator

User Input:

- Area in sq.m. (**A**)
- Monthly Energy Consumption
- Budget Available



The screenshot displays a web application titled "Solar Rooftop Calculator" by "Tech Mystry". The interface features a blue header with navigation links for "Home", "Calculator", and "Know Solar". The main content area has a green background and contains three input fields for user data: "1. Total Roof Top Area (in Sqm.)", "2. Monthly Energy Consumption (in Units)", and "3. Your Budget". A blue "Calculate" button is positioned at the bottom right of the input section.

Project Contribution



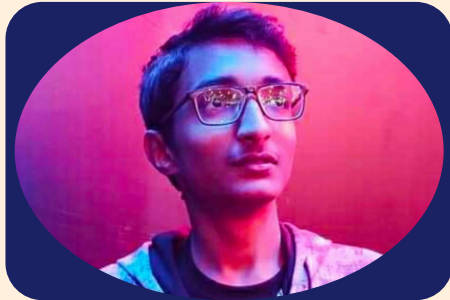
Prof. Udit Bhatia
Mentor



Mr. Shashwat Parashar
Technical Lead



Mr. Harsh Vinayak
Rappature/Documentation Head



Mr. Abhishek Yawalkar
Data Collection Head
Website Developer



Mr. Hemant Poonia
Presentation Lead



Mr. Shashwat Jain
Data Analyst

TECH MYSTRY



techmysteryhelp@gmail.com

techmystery.co.in

1800 620 621 838



Thanks!

Do you have any
questions?

