The Energize Initiative

A Community Solar Project

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'The Energize Initiative' is a project initiated and executed by the Author to implement solar solutions in rural learning centers (Anganwadis) in Maharashtra, India in collaboration with The SELCO Foundation, India.

Introduction

THE ENERGIZE INITIATIVE' is a project I spearheaded that is extremely close to my heart which merges my passion for Engineering, Business and Community Service. It is my collaborative effort with The SELCO Foundation in Bangalore, India, for the installation of solar systems in rural learning centers (Anganwadis) in the villages adopted by The Vatsalya Foundation, Mumbai, India.

I was inspired by Mr Harish Hande, a winner of the Zayed Future Energy award whose organization, The SELCO Foundation, works on providing sustainable and renewable energy solutions to the underprivileged. The SELCO Foundation had recently launched a 'Smart Anganwadi Pilot Programme' which provided sustainable energy access to rural learning centers through the introduction of solar powered fans, lights and educational tablets. I was very keen to be a part of this Programme, and hence applied for an internship to The SELCO Foundation during the summer of 2018.

Interning with The SELCO Foundation in summer, I learnt the basics of solar panels, conducted a needs assessment and designed a solar system solution for a Learning Center (Anganwadi) for children in an impoverished rural area in Karnataka. . Initially, I began by learning the basics, types and workings of solar panels and their components which lay a foundation for conducting a needs assessment and designing a solar system solution for a Learning Center (Anganwadi) for the children in an impoverished rural area. Putting my learning to test, I implemented the project on ground with support from the staff; and further supported the Financial Inclusion Team in the creation of an Ecosystem framework to assess the role and importance of co-operative banks in financing for decentralized energy access. Field visits and co-ordination with different team members provided perspective to understand and execute the process. Referring back to the original 'Smart Anganwadi Pilot Programme', I looked at solutions to potentially improve it for the future. A few examples included implementing a solar powered pump with UV light to kill the bacteria in order to provide clean drinking water for the children and the workers; and a solar powered projector to show the children educational videos and encourage a more engaging and interactive environment. Returning to Dubai, I was excited to convert what I learned and execute a similar project.

I have been associated with The Vatsalya Foundation, a home for street children in Mumbai, India since 2012. I am their Ambassador in Dubai and have a Facebook page called 'Friends of the Vatsalya Foundation'. (https://www.facebook.com/Friends-of-The-Vatsalya-Foundation-530423290435324). Over the years, I have been actively involved with the children and have fundraised for their educational needs. As The Foundation is close to my heart, the Trustees frequently update me on recent happenings and their progress. It was recently brought to my attention that Vatsalya had adopted 20 impoverished villages in Maharashtra which lacked electricity and basic educational facilities. (www.thevatsalyafoundation.org)

The Vatsalya Foundation's struggle to provide the villages access to electricity was synchronous with the plight of the rural communities that The SELCO Foundation's 'Smart Anganwadi Pilot Programme' addressed. In order to proactively address this issue; I fundraised, devised a business model with The SELCO Foundation and provided need-based solar solutions to the learning centers (Anganwadis) associated with The Vatsalya Foundation in Maharashtra, India. Thus began 'The Energize Initiative.' (www.fb.me/theenergizeinitiative)

Methodology:

To implement a solar system; specifications and dimensions must be given in order to design a panel system first. In order to execute this, I began by contacting The Vatsalya Foundation to gain information about the rural villages, such as their population and the needs of their rural learning centers. I was informed that there were currently 20 villages that The Vatsalya Foundation had adopted, each with an average of 50 households, and approximately 30 children in the community; but it could largely vary from 11 to 63. The present requirement for the learning centers (Anganwadis) was a system comprised of 2 lights and 1 fan.

After procuring this information, I contacted Mr Harish Hande, co-founder of The SELCO Foundation for providing me with the assistance and expertise of his team to execute this project; as they had expertly dealt with, and implemented similar solar systems in many rural areas earlier. First, the system had to be designed for each learning center (Anganwadi). Since each one of them was identical, the design would remain the same for each village learning center. In order to go about designing the system, I had to

address my learnings at SELCO foundation, particularly the calculations for system design.

The formulae for the system design are shown in Figure 1. These formulae were used to determine the solar module, the battery and the charge controller size. Calculations were not done for an inverter because we were working with a DC system, which does not require one. Figure 2, 3, 4, and 5 show my calculations on my excel sheet for the each component, which were then determined to be a 60Wp panel, 60Ah battery, and 10A charge regulator.

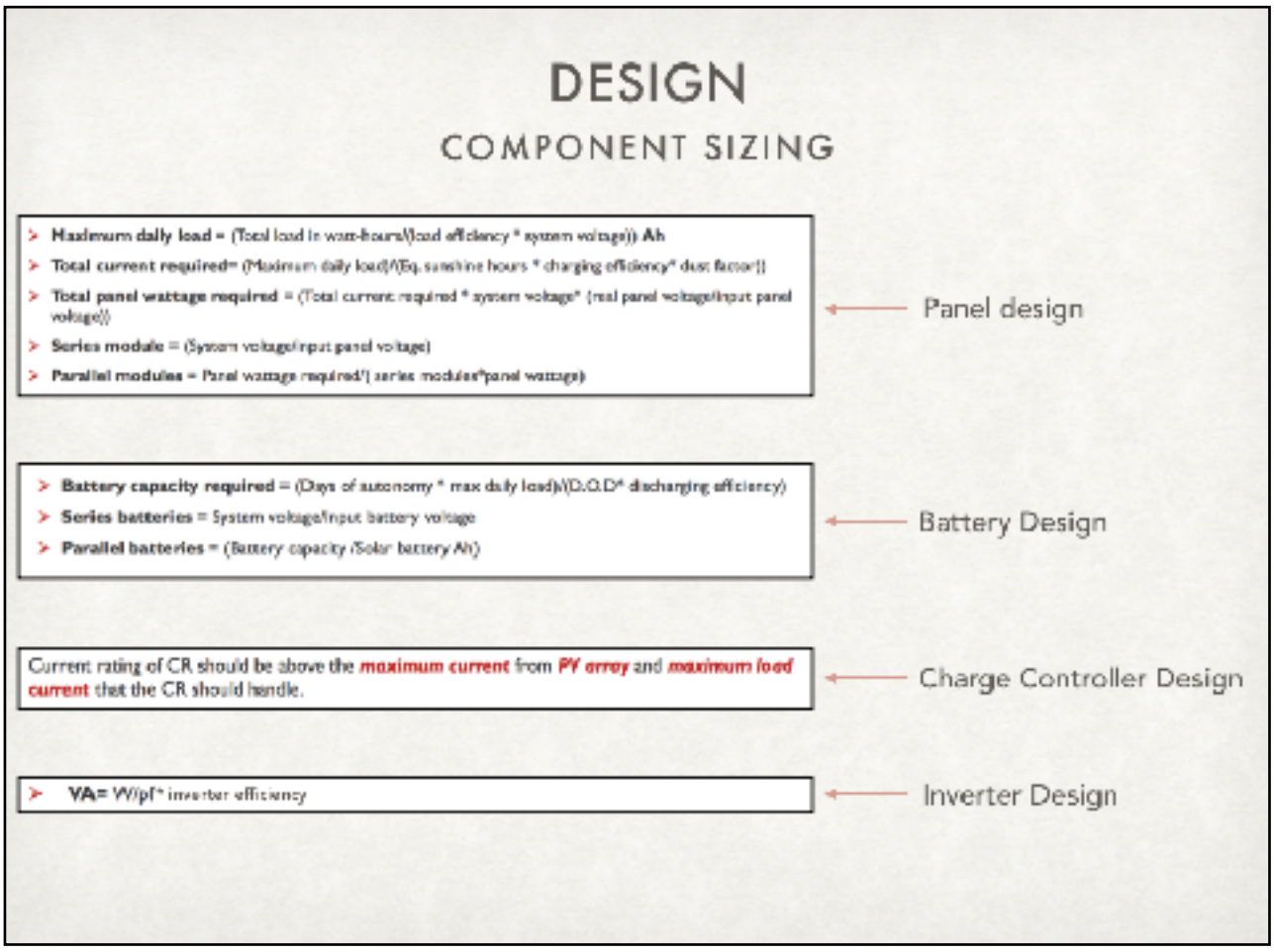

Figure 1: Component Sizing sheet created by me during my internship at SELCO.

Load details for Anganwadi Center

Type of appliance	Wattage (W)	Amount of appliance	Amount of hours the appliance runs for (h)	Load (Wh)
LED tubelight	5	1	4	20
Light	10	1	4	40
Fan	14	1	4	56
Total load				116
Total wattage	29			

Figure 2: Load details for Vatsalya Anganwadis

Panel Designing

Total load (Wh)	116	
Load efficiency	0.8	
System voltage (V)	12	
Maximum daily load (Ah)	12.083333333333	
Sunshine hours (h)	5	
Charging efficiency	0.9	
Duet factor	0.9	
Total current required (A)	2.9398309465021	
System voltage (V)	12	
Real panel voltage (V)	18	
Total panel wattage required (Wp)	53.703703703703	
Input voltage (V)	12	
Series module	1	Sc = 1 panel in series
Watt peak of panel required (Wp)	60	
Parallel module	0.895061728395062	Sc = 1 panel in parallel

Figure 3: Panel design for Vatsalya Anganwadis - 60Wp panel chosen

Battery sizing

Maximum daily load (Ah)	12.083333333333	
Days of autonomy	3	
Depth of discharge	0.8	
Discharging efficiency	0.85	
Battery capacity required	53.308823529411B	
System voltage (V)	12	
Input voltage (V)	12	
Series module	1	So = 1 battery in series
Ampere hour of batter required (Ah)	60	
Parallel module	0.8884803921568B3	So = 1 battery in parallel

Figure 4: Battery design for Vatsalya Anganwadis - 60Ah battery chosen

Charge regulator sizing

Panel used	60Wp	
Rated current for panel used (A) (Ip = current from panel to charge controller)	5.35	
	1.25	(25% tolerance)
Rated current for panel used (A) (Ip = current from panel to charge controller) with allowance	6.6875	
Total wattage	29	
System voltage	12	
Current (from charge controller to load)	2.41666666666667	
Current (from charge controller to load) with allowance	3.02083333333333	So charge regulator used = 10A 12V

Figure 5: Charge regulator design for Vatsalya Anganwadis - 10A 12V charge regulator chosen

After all the components were designed, I sent my calculations back to The SELCO Foundation for costing and any additional improvements. The specifications and cost estimates were sent back to me and further perused by the officers at The Vatsalya Foundation. This is documented in Figure 6 below.

2 LIGHT 1 FAN SYSTEM

Sl.No.	Products	Capacity	Qty
1	Solar Module	60 Wp, 12 V	1 No.
2	Solar Battery	60 Ah, 12 V	1 No.
3	MMS	60 Wp, 1 M	1 No.
4	CR	10 A, 12 V	1 No.
5	DC LED Light	5 W, 12 V	1 No.
6	DC LED Light	10 W, 12 V	1 No.
7	DC Fan	14 W, 12 V	1 No.
8	Cables	2.5 Sq.mm	30 mt.
9	Consumables		1 Set.

Figure 6: Specification sheet

In order to implement the solar systems, funding was required. Living in Dubai, I fundraised by spreading awareness of The Energize Initiative, initially starting through word of mouth, a social event and finally by my facebook page for The Energize Initiative (www.fb.me/theenergizeinitiative). I was able to raise Rs.105,000 which could be used to solarize 5 learning centers (Anganwadis), as each costed around Rs.20,000. The learning centers (Anganwadis) chosen were in the locations Shahapur and Kasara in the state of Maharashtra, India.

Shahapur, a hilly area is also a major supplier of water to Mumbai. The four dams at Tansa , Bhatsa , Vaitarna , and Modak Sagar together supply 2900 megalitres per day. Kasara is next to Shahapur, where the hilly area begins and continues till Igatpuri. The usual problem around the big water dams is the constant relocation of the communities living near the water dam. There are many clusters of villages near these four dams which are adversely affected by the construction of the water dam. As water is an essential component of life, these communities have chosen to live near water bodies since generations. Villages which are near to the ground level receive the electricity supply from the Government, but villages located on hill side, still face the lack or shortage of electricity supply. Furthermore, the continuity, service and quality of power are always the issues in such hilly areas.

The specific villages for the solar implementation included Bersingipada, Sekatpada, Bondarpada, Kolipada and Telampada. In these villages, none of the le arning centers (Anganwadis) had a legal electricity connection. Two learning centers (Anganwadis) had taken the electricity connection from a nearby household and rest were totally non-electrified. This was informed to The SELCO Foundation , and the final quotation was sent back to me as seen in Figure 7. The solar system was completely off grid designed in DC source of electricity based on electricity requirement of the Anganwadi.

Load Profile	
Concurrent Loads	DC LED Tube Light – 1 No. of 5 W DC LED Tube Light – 1 No. of 10 W DC Pedestal Fan – 1 No. of 14 W
Usage Hours	4 hours
Days of Autonomy	3 Days

Sr. No.	Product	Capacity	Quantity
1	Solar Module	60 Wp, 12 V	1
2	Solar Battery	60 Ah, 12 V	1
3	MMS	60 Wp, 1 M	1
4	Charge Controller	10 Amp	1
5	Cables Red + Black	2.5 sq. mm.	30
6	DC LED Tube Light	5 W	1
7	DC LED Tube Light	10 W	1
8	DC Pedestal Fan	14 W	1
9	Consumables	1 Set	1
	System Cost		**Rs. 20,000/-**
	Number of System		**5**
	Total Cost		**Rs. 1,00,000/-**
	Transportation Cost		**Rs. 3,000/-**
	Total Project Cost		**Rs. 1,03,000/-**

Figure 6: Technical and costing details for Vatsalya Anganwadis

Implementation

Implementation of the solar systems by the staff of The SELCO Foundation was successfully completed in all five locations mentioned above by mid-October. Each learning center (Anganwadi) has been fitted with two tube-lights (5W + 10W) and one fan.

The process of the implementation was recorded via pictures and is shown in the figures below.

Implementation of the solar panel:



Implementation of the DC pedestal and fan:


Implementation of the DC LED Tube Light:

Conclusion

I am conducting an optimistic second round of fundraising in November to solarize the remaining fifteen learning Centers (Anganwadis) adopted by The vatsalya Foundation. I am currently also working on a business model to incorporate each family's need and look forward to sequentially solarizing houses in the villages.

To improvise on 'The Energize Initiative', I referred back to the 'Smart Anganwadi Pilot Program' of The Selco Foundation. The programme is similar to 'The Energize Initiative' in that it implements the solar systems in rural learning centers; however, not only does The SELCO Foundation deliver a solar unit to the centers, but they also provide tablets to educate the children in various subjects including sustainability and its importance. This encourages the children and parents to adopt sustainable changes for their future, increasing awareness and thus promoting economy. Personally, I would like to further incorporate tablets for the children under The Vatsalya Foundation's umbrella as change is definite, education is the right of every child and lessons in sustainability create a generation of the future.