Terms of Reference (TOR)

ENERGY FOR HEALTH – SIKKIM

Agency for Quality & Safety Check of Solar Installation at the Public Health Facilities at state of Sikkim

Title	Request for proposals (RFP) from the Solar agencies/consultants for the quality & safety check of installed Solar DRE systems in public health facilities in state of Sikkim.
Timeline	**3 Months** (Nov 2024 – Jan 2025)
Expected area of expertise	Solar agencies/consultants for the quality check
Apply Link	https://forms.gle/owCe3mctnMLLGQgh8
Email and website	procurement@selcofoundation.org , http://www.selcofoundation.org/)

About SELCO Foundation:

SELCO Foundation's mission is to create a platform of solutions that uses sustainable energy as a catalyst to bridge environmental sustainability and poverty alleviation. With holistic development as the primary focus, the organization strives to create equitable societies, where services are accessed by all communities. The interventions of SELCO lead to a sustainable delivery model of essential services like livelihoods, education, and health till the last mile. (Read more about SELCO here: http://www.selcofoundation.org/)

1. Summary of the project:

As a part of its "Energy for Health" program, SELCO Foundation aims to strengthen health services delivery through the deployment of decentralized sustainable energy solutions for health centres in state of Sikkim.

The SELCO Foundation plans to have a quality and safety check of installed Solar DRE systems in public health facilities in Sikkim. The process should be, by visiting the health facilities physically and filling prerequisite check list and recording all other issues/suggestions/feedback taken from the health facility staff along with observations made.

Proposals (Technical & Financial) from eligible Solar agencies/ consultants are invited to conduct Quality check at the public health facilities as mentioned in the TOR.

2. Goals and Objectives

S.No.	Objective	Methodology
1.	Quality of installations	• Visual/physical inspection for compliance of the installation with reference to the approved SLD/Design/BOM/Other specified instructions as laid down in the agreement/Work order and associated Documents which are signed of between SELCO Foundation and the Vendor. Complete the inspections following the check list provided in Annexure 1.

		• Recording of the plant electrical performance should be a part of the monitoring process. • Verifying the load connectivity with the solar system in comparison with the load details with the sheet. • Verifying the working of connected loads and sockets
2.	Capacity and Awareness of Healthcare staff	Evaluation of the health staff on below given points: - • Knowledge of basic system functioning, it's limitations and purpose • Knowledge of best practices (cleaning, battery maintenance, safety) • Knowledge of disconnect switches. • Information and process of reporting complaints • Challenges (if any) • Any unmet energy needs. • Training programs (if any)
3.	Servicing and Maintenance	• System and equipment warranties
4.	Safety Assurance	Verify that all electrical connections and components meet safety standards to prevent hazards such as electrical shocks, fires, and system failures.
5.	Detection of Unauthorized Modifications	Quality checks should reveal any unauthorized changes or tampering made to the system, in reference to the original design and installation practice.

3. Scope of Work

The scope of work for the quality check of an installed solar system involves a comprehensive evaluation to ensure that the system meets all design specifications, safety standards, and performance expectations. The quality check should cover various aspects including visual inspections, electrical measurements, performance tests, and documentation review.

- The team is required to visit the 137 Health facilities in state of Sikkim as outlined in Annexure No. 2.
- The inspection report needs to be thoroughly completed, to ensure all checkpoints are filled.
- Completing the checklist involves accurately recording the available information acquired through physical visits to the health facility and in close coordination with the staff.
- To ensure thorough inspection, it is imperative to meticulously review and assess each component of the solar system by referring to the documents outlined in Annexure 1 chart. Also, Annexure 1 Chart A & B documents should be duly filled, in references made with Annexure 1 chart documents: 1C, 1D, 1E, 1F, 1G.

Sl. No	**Annexure 1 Chart**	
1	Annexure-1 A	Solar Installation Monitoring Checklist
2	Annexure-1 B	Monitoring Observation Report
3	Annexure-1 C	SLD/Concept sheet of solar system
4	Annexure-1 D	SLD/Concept sheet of load wiring
5	Annexure-1 E	Bill Of Materials of solar system, Luminaries & fans
6	Annexure-1 F	Bill Of Materials of load wiring
8	Annexure-1 G	Load details sheet

- Record detailed recommendations, feedback, suggestions, and issues in the provided format for comprehensive follow-up and develop a corrective action plan for identified issues.
- The team or person visited should be easily accessible to provide explanations for any clarifications needed regarding the checklist or provided information.
- The visiting team is advised to maintain respectful and attentive interactions with health staff.
- The monitoring should be done without disturbing the medical services and without disturbing the patients.
- The monitoring should be done without damaging the physical infrastructure of the health facility, and if so, the agency is liable for repair of the same
- The individual must inform the SELCO Foundation immediately if any urgent or major rectification is required.
- The final payment will be initiated only after the complete closure of the project (I.e., all the inputs required by Selco foundation are fully furnished and validated. Incorrect and incomplete inputs will be considered invalid)
- The team should be available for online meeting discussions as and when called for.
- If staff are unaware of the basic system functioning, it would be the responsibility of the agency to provide basic orientation to staff on the points mentioned above and document to same.
- Prior coordination/appointment with staff of respective health facility should be compulsorily made; in order to avoid revisits to the same site (Revisits to health centers and the expenses incurred for the same will be the taken care by the vendor/monitoring team and it will not be in the scope of SELCO Foundation to entertain such requests)

4. Requirement:

- The team is expected to provide the checklist, preferably in MS Excel format, along with Photos and its respective comments made. Raw data sheets along with the final digitized formats would be required.
- After every visit, district-wise subfolders containing all the relevant information should be uploaded into the specified folder created by SELCO Foundation.
- To ensure the task is completed within the given timeframe, adequate team members must be available and must look after their own transport, food, and lodging arrangements.
- The Team members should be over 18+ years of age.
- The team members should possess qualifications such as ITI, Diploma, BE, etc., and preferably should have experience in solar installation and maintenance activities. The biodatas of the assigned personnel are to be shared with SELCO Foundation prior to work initiation.
- The details of the tour plan and the information about the team members are to be shared with SELCO Foundation as per the agreed-upon timeline. Day wise updates (Travel plan, Task completion) should be compulsorily shared with SELCO Foundation on a regular basis.

5. Timelines:

26th November 2024 to 31st January 2025

6. Selection Criteria:

- The agency/consultant should have at least 3 - 5 years of proven experience in solar installation, Monitoring, design.
- Demonstrated experience of rectification in various sized solar plants
- Experience in preferably working with public health facilities.
- This assignment would require travel to project sites in state of Sikkim.

7. Payment Terms:

30%	After signing the contract
40%	After Completion of 70% of Site against submission of deliverables listed above
30%	After submitting the final balance deliverables

8. To apply

Interested consultants / organizations, with relevant experience (please include samples and/or references of the previous similar work as proof of experience) and based out of India are requested to reach out with a detailed proposal giving a brief on the methodology and the process they will uptake for this project, including budgets (with break-ups and explanation), timelines and milestones and submit the same to google form https://forms.gle/owCe3mctnMLLGQgh8 on before 20th November 2024.

Any further queries please write to procurement@selcofoundation.org with a subject line: **"Agency for Quality & Safety Check of Solar Installation at the Public Health Facilities at state of Sikkim"**

Refer Terms and Condition:

1. **Sub-contracting:** In the event that the Consultant requires the services of subcontractors to perform any obligations under the Contract, the Consultant shall obtain the prior written approval of the Foundation. Any rejection or non-performance of the subcontractor shall not, in and of itself, entitle the Consultant to claim any delays in the performance, or to assert any excuses for the non-performance, of any of its obligations under the Contract, and the Consultant shall be solely responsible for all services, obligations and deliverables performed by its subcontractors.

2. **Quality Assurance**
   The data submitted to SELCO Foundation should be accurate, complete, reliable, and relevant. Consulting agencies shall establish additional layers for data cleaning and submission.

3. **Financials & Reporting**
   TDS will be deducted on the fixed amount as per Income Tax Act and Rate of Percentage. In accordance with the Central Board of Direct Taxes circular No. 7 of 2022 dated 30th March, 2022 in relation to the clarifications with respect to Section 114AAA of the Income-tax Rules, 1962, failure to link Aadhar number to the PAN card and/or failure by any person, who falls within the income tax bracket or otherwise, to file tax returns in relation to payment of TDS for any service (in accordance with Section 206AB and 206AA) and/or an inoperative PAN card will result in a 20% tax deduction.

4. **Indemnification**
   Both parties shall indemnify and hold its Trustees, Directors and representative officers, employees, agents harmless from and against any and all claims, demands, actions, losses, liabilities, charges, damages, costs and expenses (including but not limited to reasonable attorney's fees) arising out of or resulting from (1) any claims arising in connection with activities undertaken by both parties in connection with the project or (2) Consultant's gross negligence or willful misconduct or breach of any undertaking, covenant, representation or warranty contained in this agreement and/ or the actual infringement of any patent, trademark, copyrights, trade secret or any other intellectual property right of the third party.

5. **Patent, Copyright and other Proprietary Rights**
   (i) Except as is otherwise expressly provided in writing in the Contract, the Foundation shall be entitled to all intellectual property and other proprietary rights including, but not limited to, patents, copyrights, and trademarks, with regard to products, processes, inventions, ideas, know-how, or documents and other materials which the Consultant has developed for the Foundation under the Contract and which bear a direct relation to or are produced or prepared or collected in consequence of, or during the course of, the performance of the Contract. The Contractor acknowledges and agrees that such products, documents and other materials constitute works made for hire for the Foundation.
   (ii) Subject to the foregoing provisions, all documents, reports, recommendations, documents, and all other data compiled by or received by the Consultant under the Contract shall be the property of the Foundation, shall be made available for use or inspection by the Foundation at reasonable times and in reasonable places, shall be treated as confidential, and shall be delivered only to the Foundation's authorized officials on completion of work under the Contract
   (iii) The Consultant will treat all information given to him/her as information of proprietary value and will not disclose the same to competitors or any outsiders. The Consultant will not at any time, except under legal process, divulge any trade or business secret relating to the Foundation or any customer or agent of the Foundation, which may become known to him by virtue of his position as consultant, save in so far as such

disclosure shall be necessary in the interest and for the benefit of the said Foundation and will be true and faithful to the Foundation in all dealings and transactions whatsoever relating to the said Foundation.

(iv) Reports or other data that are developed specifically for the performance of this Contract shall be the property of the Foundation and the Consultant shall deliver reports and data to the Foundation as per the milestones. Dissemination of the reports and any information from the said contracts shall be done with written approval from the Foundation.

6. **Publicity, use of name & Logo of the Foundation:** The Consultant shall not advertise or otherwise make public for purposes of commercial advantage or goodwill that it has a contractual relationship with the Foundation, nor shall the Consultant, in any manner whatsoever use the name, emblem, logo or official seal of the Foundation or that of SELCO in connection with its business or otherwise without the written permission of the Foundation.

7. **Observance of Law:**

(i) The Consultant shall comply with all laws, ordinances, rules, and regulations bearing upon the performance of its obligations under the Contract.

(ii) The Consultant represents and warrants that neither it, its parent entities, partners or subcontractors nor any of its subsidiary or affiliated entities (if any) is engaged in any practice inconsistent with the rights set forth in the *Child Labour (Prohibition and Regulation) Act of 1986*, which, *inter alia*, requires that a child shall be protected from performing any work that is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development.

(iii) The Consultant represents and warrants that it shall adhere to the mandates prescribed under the *Sexual Harassment of Women (Prevention, Prohibition & Redressal) Act, 2013*, which requires all workplaces to have a Policy and Internal Committee to address complaints of sexual harassment that women may face at the workplace

8. **Termination:**

Either party may terminate this contract by giving a notice in writing to the other party stating their intention to terminate the same on the expiration of Seven (7) days from the date of such notice. In addition, the Foundation may also terminate this contract forthwith in the event of any fraud, misconduct or neglect of duties on the part of the Consultant. Any notice to be given hereunder shall be sufficiently given to the Consultant if forwarded by registered post or by Courier Service to the last known postal address of the Consultant and shall be sufficiently given to the Foundation if similarly forwarded to the registered office. Upon the termination of this contract and payment of the said fees due up to such termination, and payment of all disbursements and out-of-pocket expenses incurred up to the date thereof (provided the same have been incurred after obtaining prior approval), the Consultant shall deliver all deeds, documents and paper in his possession relating to the business of the Foundation or as the Foundation shall direct, and shall continue to afford him all reasonable assistance for concluding pending matters at the date of such termination without making any charge thereof.

9. **Force Majeure:**

(i) *Force majeure* as used herein means any unforeseeable and irresistible act of nature, any act of war (whether declared or not), invasion, revolution, insurrection, terrorism, or any other acts of a similar nature or force, *provided that* such acts arise from causes beyond the control and without the fault or negligence of the Consultant

(ii) In the event of and as soon as possible after the occurrence of any cause constituting *force majeure*, the affected Party shall give notice and full particulars in writing to the other Party, of such occurrence or cause if the affected Party is thereby rendered unable, wholly or in part, to perform its obligations and meet its responsibilities under the Contract. The affected Party shall also notify the other Party of any other changes in condition or the occurrence of any event which interferes or threatens to interfere with its performance of the Contract. Not more than fifteen (15) days following the provision of such notice of *force majeure* or other changes in condition or occurrence, the affected Party shall also submit a statement to the other Party of estimated expenditures that will likely be incurred for the duration of the change in condition or the event of *force majeure*.

(iii) On receipt of the notice or notices required hereunder, the Party not affected by the occurrence of a cause constituting *force majeure* shall take such action as it reasonably considers to be appropriate or necessary in

the circumstances, including the granting to the affected Party of a reasonable extension of time in which to perform any obligations under the Contract.

(iv) If the Consultant is rendered unable, wholly or in part, by reason of *force majeure* to perform its obligations and meet its responsibilities under the Contract, the Foundation shall have the right to suspend or terminate the Contract on the same terms and conditions as are provided for in this Contract.

10. Both the Foundation and the Consultant fully and freely intend to create an independent Contractor relationship under this Contract. Nothing herein shall be deemed to establish a partnership, joint venture, association or employment relationship between the parties. Both parties agree that the consultant has the right to sole and exclusive control over the manner and means employed in performing their activities under this Contract.

11. Settlement of disputes:

(i) The Parties shall use their best efforts to amicably settle any dispute, controversy, or claim arising out of the Contract or the breach, termination, or invalidity thereof.

Any dispute, controversy, or claim between the Parties arising out of the Contract or the breach, termination, or invalidity thereof, unless settled amicably, within sixty (60) days after receipt by one Party of the other Party's written request for such amicable settlement, the matter shall be referred by either Party to arbitration in accordance with the Arbitration and Conciliation Act, 1996. The venue of the arbitration shall be Bangalore. Likewise, the jurisdiction will vest with courts in Bangalore.

Annexure-1A

Solar installation monitoring checklist				
Sl. No.	**Observation point**	**If "Yes", then mark with (✓)**	**If "No", then mark with (X)**	**Remarks if any:**
	Solar Panels Setup			
1	Number of panels used in the installation matches with the number of panels mentioned in the B.O.M. sheet			
2	Panels installed have the same technical specifications as mentioned in the B.O.M. sheet			
3	Serial numbers & bar codes are present inside the panels			
4	Discoloration of the solar panels are not seen			
5	Damages are not seen on the solar panels (Both front & back sides)			
6	The solar panels are free from shadows			
7	Cables are tied to panel frame and are protected with conduit pipes			
8	Panels are mounted well within the roof area			
9	Panels are clammped and firm & stable			
10	R.C.C. roof, low elevation set-up: The wind shields are firmly fastened at the back of panels, along with concrete works/ballast blocks			
11	R.C.C. roof, regular set-up: Front side clearance from the roof surface and the panel is 2-feet			
12	R.C.C. roof, regular set-up: The length of concrete work is 1 ft. x 1 ft. x 1 ft. (LxBxH)			
13	R.C.C. roof, high elevation set-up: The length of concrete work is 1.5 ft. x 1.5 ft. x 1.5 ft. (LxBxH)			
14	The orientation of the panel is south facing (For sites in India)			
15	Tilt angle of the panel is as per the latitude of the location			
16	Tin roof: 4-Inch uniform elevation from the sheet roof and the panel is seen			
17	Tin roof wind deflectors: Wind deflectors are firmly fastened at the back of panels			
18	Tin roof: E.P.D.M./Silicone gel/Butyl sealant used			
19	M.M.S. & Panel are given earthing protection			
20	4 Sq. mm cable from panel-panel-M.M.S. are used, and 10 Sq. mm cable from M.M.S. to A.J.B. is used			
	A.J.B. (Array Junction Box) Setup			
1	A.J.B.s have the same technical specifications as mentioned in the B.O.M. sheet			
2	Positive & negative lines are separated with separate termination blocks			
3	Positive lines have the in-line fuses provided			
4	PV1-F cables are used			
5	Cables used are of the specifications as mentioned in the B.O.M. sheet			
6	Cable colour codes are followed			
7	All cables are provided with solid conduit pipe protection			
8	A.J.B. is mounted firmly over the wall surface			
9	M.C.B.s, SPDs used in the A.J.B. are of the specifications as mentioned in B.O.M. copy			
10	Earthing down conductor is connected to S.P.D. and D.C. earth pit			
11	There are no physical damages seen at the A.J.B.'s body			
12	A.J.B. glands are tightened			
	G.I.P.B. (Grid Input Protection Box) Setup			

1	G.I.P.B.s have the same technical specifications as mentioned in the B.O.M. sheet			
2	Cables used are of the specifications as mentioned in the B.O.M. sheet			
3	Cable colour codes are followed			
4	Cables are provided with solid conduit pipe protection			
5	G.I.P.B. is mounted firmly over the wall surface			
6	Earthing down conductor is connected to S.P.D. and A.C. earth pit			
7	M.C.B.s, S.P.D.s are of the specifications as mentioned in B.O.M. copy			
8	There are no physical damages seen at the G.I.P.B.'s body			
9	G.I.P.B. glands are tightened			
Battery Bank Setup				
1	No. of batteries used in the installation matches with the no. of batteries mentioned in the B.O.M. sheet			
2	Batteries have the same technical specifications as mentioned in the B.O.M. sheet			
3	Batteries have the serial number & barcode over them			
4	No physical damages are seen at the battery body			
5	Battery bank is placed in a clean, dust-free and dry place			
6	Battery room is well ventilated			
7	2-Inch ventilation space is provided between batteries			
8	There is no direct sunlight falling over the batteries			
9	Acid absorbent mat is provided at both the racks			
10	Petroleum based jelly/Vaseline is applied at all terminals of batteries			
11	Cable lugs are insulated			
12	Battery caps are firmly fixed at each terminal			
13	Battery cable size used should be as specified in the B.O.M. sheet			
14	Conduit pipe protection is provided to cables			
15	Float indicators are not damaged			
16	Distilled water level is up to the green mark of the indicator			
17	There are no fire and flammable materials placed/stored around the battery bank			
18	Minimum cable distance is maintained between battery bank and the inverter (No looping of cables)			
19	Cables don't have sharp bending			
20	Insulation mats are provided			
21	Battery rack setup is as per the specifications mentioned in the B.O.M. sheet			
D.C. Combiner Box Setup				
1	D.C.C.B has the same technical specifications as mentioned in the B.O.M. sheet			
2	D.C.C.B. is mounted firm on to the wall surface			
3	The number of H.R.C. fuses provided are as per the B.O.M. specifications			
4	H.R.C. fuse ratings are as per the B.O.M. specifications			

Annexure-1B

MONITORING OBSERVATION REPORT		
1	Name of Visitor	
2	Date	
3	Visit Number	
4	Date:	
5	Name & Address of Installation site: (Please mention the complete address of the site including Health facility name, address, state, district, block, P.O, Pin code etc.)	

Solar Installation Bill Of Material (AC System)

Sl. No.	Product	Serial Number	Capacity	Quantity	As per BOM Yes/No	
1	Solar Module					
2	Solar Battery					
3	Module Mounting Structure					
4	Solar Inverter/PCU					
5	Changeover Switch / Bypass Switch - 1					
6	Changeover Switch / Bypass Switch - 2					
7	Copper cable (Module –Module) -PV1-F (Solar cables)					
8	Cables (or) Strips (Battery - Inverter) - (DC Cables)					
9	Copper Cable (Battery - Inverter) - (DC Cables)					
10	Copper Cable (Red + Black) (AJB - Inverter)- (DC Cables)					
11	DC Earthing (Panels + MMS + AJB)					
12	Earthing Cable (AJB, GIPB, Inverter & Battery Rack)					
13	Cable/down conuctor for lightning arrestor					
14	Earthing Kit					
15	Lightning Protection System					
16	Grid Input Protection Box with AC SPD and AC MCB					
17	Battery trolley box with Wheels - Har Plastic					
18	Battery rack with Following: 1. Acid absorbent mat 2. Electrical Insulation mat					
19	Inverter Elevation Leg					
20	DC Combiner Box					
21	Solar Array Junction Box with AC MCB and AC SPD and String Fuse					
22	Load Side AC MCB with Conduit box					
23	Marking for AC earthing with Elevated Plaques (GIPB + Inverter + Loads)					
24	Marking for DC earthing with Elevated Plaques (AJB + MMS + Panels +					
25	Marking of Lightning Arrester Earthing with Elevated Plaques					
26	Single Line Diagram (SLD) for the system					
27	Do's and Don'ts Practices Poster (Solar Panels, Battery and Inverter)					
28	Signboards - Danger (Electric Shock & High Voltage), No Fire and PASS					
29	I/P and O/P wiring of Grid Connection- AC cable					
30	Fire Extinguisher					

31	Metallic enclosures with Isolator's having minimum gap of 1 inch (PV, Battery & Grid Input to Inverter)					
32	Consumables					
Bill of material (For luminaries & fans)						
Sl. No.	**Products**	**Make**	**Capacity**	**Installed Quantity**	**Balance Quantity**	Additional Informati
1	LED Bulb					
2	LED Bulb					
3	LED Tube light					
4	LED Tube light					
5	Ceiling Fan with regulators - Two Modular					
6	Wall Mounted Fan					
7	Outdoor light with automatic control switch (For Dusk to dawn operations)					
8	Outdoor light arm - Rust Free (GI Material)					
Sl. No.	**System Side As per BOM**	**Tick Yes/No**	**Remarks**			
1	Solar panel setup					
2	AJB Setup					
3	GIPB Setup					
4	Cables Size as per BOM					
5	Load MCB Rating is Correct					
6	Battery set up					
7	P.C.U set up					
8	L.A setup					
9	Earthing pits					
10	Cable management					
11	SLD's are pasted					
12	Earthing Metal plaque installed					
13	Signboard Installed					
	Date of recording:		**Time of recording:**			
				(Tick on the appropriate box)		
	Weather Condition at the time of recording	Clear Sky	Partially Cloudy	Over cast	Rainy	
	At the AJB (Input side)					
	Test Condition	**Voltage in DC**	**Measured Value**	**Current in DC**	**Measured Value**	
	Measurement with Grid OFF + AJB MCB OFF	Voc (in Volts)		NA	NA	
	Measurement with Grid OFF + AJB MCB ON	Vmp (in Volts)	String 1: String 2: String 3: String 4:	Imp (in Amperes)	String 1: String 2: String 3: String 4:	
	At the AJB (Input side)					
	Test Condition	**Voltage in DC**	**Measured Value**	**Current in DC**	**Measured Value**	
	Measurement with Grid OFF + AJB MCB ON	Vmp (in Volts)		Imp (in Amperes)		

	Battery Bank parameters					
	Particulars	**Measured Value**	**Unit**			
	Battery Bank Volatge		V			
	Battery Bank Current		A			
	1- Phase System - PCU/Inverter parameters					
	Measurement with Grid OFF			**Measurement with Grid ON**		
	Particulars	**Measured Value**	**Unit**	**Particulars**	**Measured Value**	**Unit**
	Load voltage/Inverter output voltage		V	Grid input voltage (Phase – Neutral)		V
	Inverter Output Frequency		Hz	Inverter Output Frequency		Hz
	Inverter output current at full load (All solar loads turned on continuously for 10 minutes)		A	Grid input voltage (Neutral- Earth)		V
	3 - Phase System - PCU/Inverter parameters					
	Measurement with Grid OFF			**Measurement with Grid ON**		
	Particulars	**Measured Value**	**Unit**	**Particulars**	**Measured Value**	**Unit**
	Load voltage/Inverter output voltage **(Red & Neutral)**		V	Grid Input Voltage (Red & Neutral)		V
	Inverter output frequency (Red & Neutral)		Hz	Grid Input Frequency (Red & Neutral)		Hz
	Inverter output current at full load (Red & Neutral) (All solar loads turned on continuously for 10 minutes)		A	Grid Input Voltage (Yellow & Neutral)		V
	Load voltage/Inverter output voltage (Yellow & Neutral)		V	rid Input Frequency (Yellow & Neutral)		Hz
	Inverter output frequency (Yellow & Neutral)		Hz	Grid Input Voltage (Blue & Neutral)		V
	Inverter output current at full load (Yellow & Neutral) (All solar loads turned on continuously for 10 minutes)		A	Grid Input Frequency (Blue & Neutral)		Hz
	Load voltage/Inverter output voltage (Blue & Neutral)		V	Grid Input Voltage (Red & Yellow)		V
	Inverter output frequency (Blue & Neutral)		Hz	Grid Input Frequency (Red & Yellowl)		Hz
	Inverter output current at full load (Blue & Neutral) (All solar loads turned on continuously for 10 minutes)		A	Grid Input Voltage (Blue & Yellow)		V
	Inverter output voltage between Red & Yellow		V	Grid Input Frequency (Blue & Yellowl)		Hz
	Inverter output voltage between Red & Blue		V	Grid Input Voltage (Red & Blue)		V
	Inverter output voltage between Yellow & Blue		V	Grid Input Frequency (Red & Bluel)		Hz

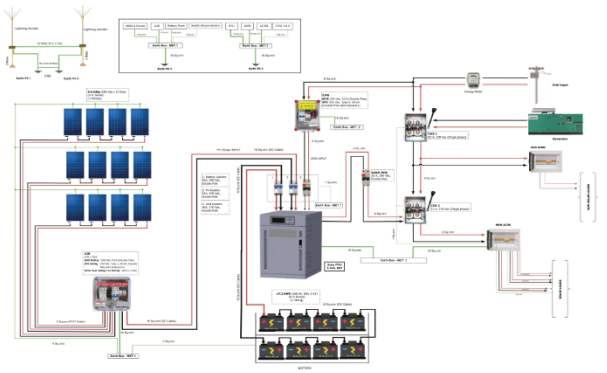
	PCU/Inverter display & setting					
	For both 1-Phase & 3-Phase connectivity					
	Inverter Priority Settings	Solar Priority	Grid Priority	(Tick on the appropriate box)		
	The load is running on:	Inverter	Grid	(Tick on the appropriate box)		
	Changeover Switch settings					
	Changeover switch orientation is:	Solar	Grid	(Tick on the appropriate box)		
	Is change over switch functional for both solar & grid?	Yes	No	(Tick on the appropriate box)		
	Measurements at Sockets (For both 1-Phase & 3-Phase connectivity)					
	Particulars	Measured Value	Unit			
	Voltage between Phase & Neutral		V			
	Voltage between Phase& Earth		V			
	Voltage between Earth & Neutral		V			
	● **Testing**	**2. Load Wiring**				
	Demo testing of Lines using Temporary Connection					
	Test Condition		**Working Yes/No**	**Remarks**		
	RCCB					
	MCB					
	Socket 16A					
	Socket 6A					
	Switch 16 A					
	Switch 6 A					
	Fan points and Regulator					
	Outdoor Light					
Images to be captured during Solar installation visit:						
Sl. No.	**Image details**	**Required no. of**	**Tick if taken**	**Remarks**		
1	Clear image of solar panels with Module mounting structure from a range in which gives better visibility (Please capture image with standard marking)	2				
2	Clear image of batteries from a range in which gives better visibility including the water level (Please capture image with standard marking)	1				
3	Clear image of inverter from a range in which gives better visibility (Front and back) (Please capture image with standard marking)	2				
4	Clear image of the inverter switch controls	1				
5	Clear image of cable routing from the complete system (Please capture image with standard marking)	3				
6	Clear image of AJB	1				
7	Clear image of GIPB	1				
8	Clear image of Lightning Arrestor	1				
9	Clear image of Earthing pits	1				
10	Clear image of Changeover Switch	1				
11	Clear image of DO's and Don'ts Poster	1				
12	Clear image of Foam Plaques (SLD, High Voltage, PASS, No Fire, Danger, Risk of Electric Shock)					
13	Clear image of Metal Plaque	1				
14	Clear image of Outdoor Light	1				
15	Clear image of the Health Centre (Long Shot)	1				
16	Clear image of Health staff with Solar system	1				
Images to be captured during Load Wiring						
Sl. No.	**Image details**	**Required no. of images**	**Tick if taken**	**Remarks**		
1	Distribution or MCB Box if Visible	2				
2	Switchboard	3				
3	Socket	3				
4	Fan And Bulb Points	5				
5	Outdoor Point	2				
Data to Be Captured for Solar Installation Side						
Sl. No	**Description**	**Distance in Feet**	**Remarks**			
1	Module to AJB					
2	AJB to Inverter					
3	AJB to Earthing					
4	Inverter & GIPB to Earthing Pits					
5	Earthing Strip					
6	Module to Earthing					

Annexure-1C

Primary Health Centre Solar System Details

Solar System Details	
Solar Panel Capacity	6.6 kWp (550 Wp x 12 Nos)
Solar Battery Capacity	17.2 kWh (180 Ah, 12 V x 8 Nos)
Solar Inverter Capacity	6 kVA, 96 V x 01 No
Maximum Load that can be connected	4.030 kW
Maximum units of energy (kWh) usage per day	10.443 kWh

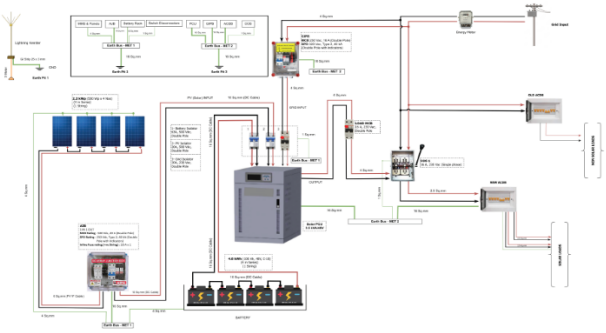
Equipments Connected to Solar System	
Labour Room	Baby Warmer, Suction Machine, Spot Light, Oxygen Concentrator & Baby Weighing Machine
Cold Chain	ILR & Deep freezer
Laboratory	Microscope, Centrifuge, Semiauto Analyser & Hematology Analyser
Other Equipments	Desktop, Printer, Water Purifier, X-Ray Viewer, Needle Cutter, Nebulizer, ECG Machine, Refrigerator, Lights & Fans



Sub Centre Solar System Details

Solar System Details	
Solar Panel Capacity	2.2 kWp (550 Wp x 4 Nos)
Solar Battery Capacity	4.8 kWh (100 Ah, 12 V x 4 Nos)
Solar Inverter Capacity	3.5 kVA, 48 V x 01 No
Maximum Load that can be connected	1.530 kW
Maximum units of energy (kWh) usage per day	2.564 kWh

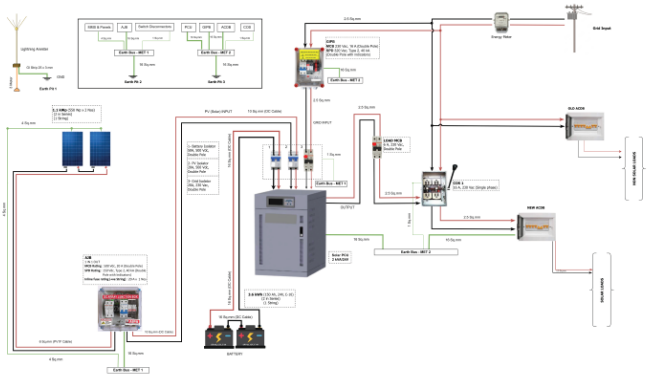
Equipments Connected to Solar System	
Labour Room	Baby Warmer, Suction Apparatus, Spot Light & Refrigerator
Other Equipments	Needle Cutter, Lights & Fans



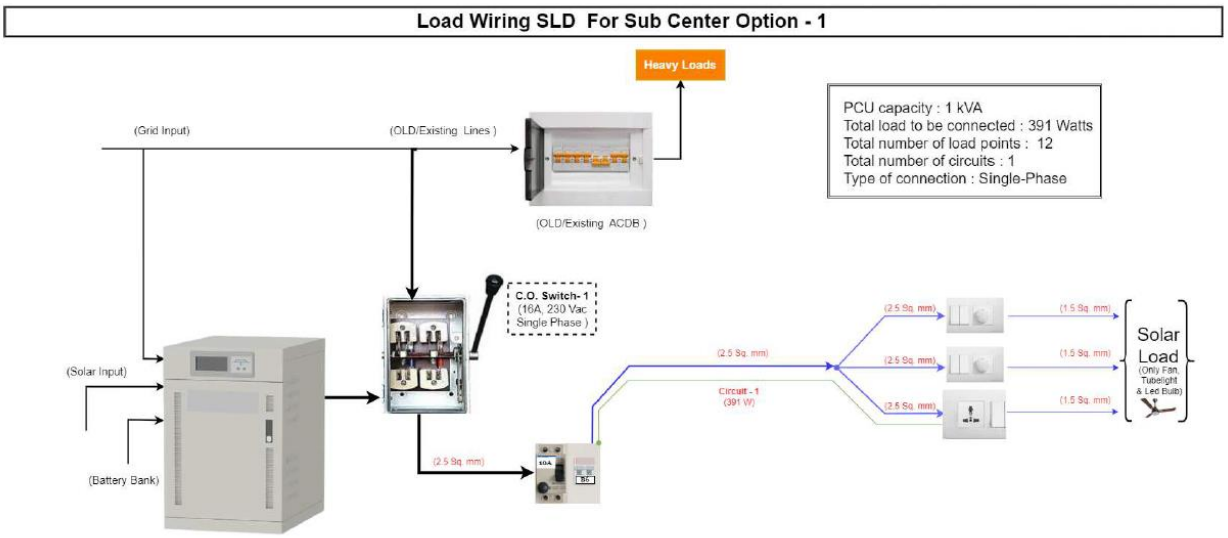
Sub Centre Solar System Details

Solar System Details	
Solar Panel Capacity	1.1 kWp (550 Wp x 2 Nos)
Solar Battery Capacity	3.6 kWh (150 Ah, 12 V x 2 Nos)
Solar Inverter Capacity	2 kVA, 24 V x 01 No
Maximum Load that can be connected	0.391 kW
Maximum units of energy (kWh) usage per day	1.722 kWh

Equipments Connected to Solar System	
Other Equipments	Needle Cutter, Refrigerator, Lights & Fans



Annexure 1D



Annexure-1E&F

ANNEXURE 1: TECHNICAL SPECIFICATIONS OF SOLUTIONS

Sub Centre :

Option 1 :

Bill of Materials for Solar System :

Sl. No	Products	Capacity	Qty
1	Solar Module	Solar Photovoltaic Array of Minimum Capacity 545 Wp (Monoperc) Panel Make and Model should be approved under MNRE ALMM List	2 Nos
2	Solar Battery	Valve regulated lead-acid (VRLA) battery - 150Ah @ 12 V, C – 10 (Battery terminal caps used, must be big enough to cover the entire terminal area and the nut bolt assembly. Also, spring washers to be used at each battery terminal).	2 Nos

3	Module Mounting Structure (MMS*)	Solar PV Module support structure. **RCC Roof:** Lower elevation/Landscape Orientation (Triangular MMS withconcrete block). **Tin Roof:** Aluminium - Mini Rails **It should withstand the wind speed of 200 – 250 km/hr** **It should be suitable for above mentioned solar module** - As perSl.No. 1	1 Set.
4	Solar Inverter/PCU - 230 Vac, 50 Hz	Total Minimum Capacity **1 kVA, 24V – MPPT** based Single PhaseSupply, With Data Port (RS 485) Output. Inverter should be placed on battery trolley box.	1 No.
5	Change over switch / Bypass Switch(PCU -Grid - Solar Loads)	**16 A, 230 Vac** (Single Phase)	1 No.
6	Copper Cable Red+Black (Module – Module - AJB) - PV1-F (Solar Cables)	**6 sq.mm** UV Protected Cable	16 m
7	Copper Cable Red + Black (AJB - Inverter) - (DC Cables)	**10 sq.mm**	10 m
8	Copper Cable (Battery - Battery & Battery - Inverter) - (DC Cables)	**16 Sq.mm** (Tin-coated copper lugs with insulation to be used at each batteryterminal).	10 m
9	DC Earthing (Panels + MMS)	**Panel to Panel, Panel to MMS, MMS leg to Main Earthing Terminal (MET)** -Grounding Lugs with 4 sq.mm earthing cable should be used.	15 m
10	Earthing Cable (AJB, GIPB, Inverter &Battery rack)	**16 Sq.mm** (Tin-coated copper lugs with insulation to be used at the cable-earth electrode interface).	30 m
11	Cable/Down conductor for LightningArrestor	Insulated (outdoor) GI strip of size 25 x 3 mm to be used. Each joint should consist of 2 - hexagonal nut and bolt assembly.Saddle insulators to be provided along the length of the down conductor. Termination to the earthing electrode using SS Test links with clamps	10 m

12	Earthing Kit ● LA ● GIPB+Inverter+Loads ● MMS+AJB+Battery rack	Solid electrode (Steel) Bonded copper – 16 mm diameter, 2000 mm long with 250 microns Bonding thickness, tin-coated copper lugs with insulation, clamps with nut-bolts assembly. protective concrete construction (Chamber) to earthing pit (L x B x H - 1.5 x 1.5 x 1.5 feet) with Metallic/FRP lid should be made. Earthing pit size should be minimum of 6 inch diameter and should be filled with back fill compound. Typology – Equipotential (Refer Annexure 2)	3 Set
13	Lightning Protection System	Lightning arrestor Solid Aluminium Alloy of 15 mm diameter and 2000 mm long with base plate should be used. GI Elevation pole 40 mm diameter, 3000 mm height. Supporting wires to be incorporated for stability to withstand wind speed of 200 – 250 km/hr. Ceramic insulation to be provided between lightning arrestor base plate and GI elevation pole.	1 Set
14	Grid Input Protection Box with SPD and MCB	MCB Rating: **230 Vac, 16 A (Double Pole)** SPD Rating: **320 Vac, Type 2, 40 kA (Double pole with indicators)** Inter connection of the components inside the GIPB should be 2.5 Sq.mm	1 No.
15	Battery trolley box with wheels - Hard Plastic	**As per Solar Battery Sl. No. - 2**	1 Set.
16	Solar Array Junction Box with MCB and SPD and String Fuse.	**1 IN 1 OUT** MCB Rating : **500 Vdc, 20 A (Double Pole)** SPD Rating: **150 Vdc, Type 2, 40 KA (Double pole with indicators)** Inline DC Fuse rating*: (+ve Strings): **20 A X 1 No.** Inter connection of the components inside the AJB should be DC cable of 10 Sq.mm	1 No.
17	Load Side MCB with Conduit box	MCB Rating: **6 A, 230 Vac (Double Pole)**	1 No.
18	Marking for AC earthing with Elevated Plaques (GIPB+Inverter+Loads)	Elevation pole length - 3 Feet. Metal plaque dimension - A5	1 No.
19	Marking for DC earthing with Elevated Plaques (MMS+AJB+Panels)	Elevation pole length - 3 Feet. Metal plaque dimension - A5	1 No.

20	Marking of Lightning Arrester Earthing with Elevated Plaques	Elevation pole length - 3 Feet. Metal plaque dimension - A5	1 No.
21	Single Line Diagram (SLD) for the system	Sun board with 3 mm Thickness - 4 ft x 2 ft	1 No.
22	Do's and Don'ts Practices Poster (Solar Panels, Battery and Inverter)	Foam Plaque - A4 Size for each	1 No.
23	Signboard for Danger, No Fire and PASS	Danger - Electric shock – A4 Danger - High Voltage – A4 No Fire – A5 PASS - A4	1 No each
24	I/P and O/P wiring of Grid Connection- AC cable	**2.5 Sq. mm.**	30 m
25	Fire Extinguisher	Multi-Purpose - ABC Dry powder extinguishing agents (or) CO2 type with 3 kg net weight of the charge inside the cylinder.	1 No
26	Metallic Enclosure with Isolator's having minimum gap of 1 inch. (PV, Battery & Grid Input to Inverter)	1st Switch for Battery Input - 50 A, 500 Vdc, Double Pole 2nd Switch for PV Input – 20 A, 500 Vdc, Double Pole 3rd Switch for Grid Input – 20 A, 230 Vac, Double Pole	1 Set
27	Consumables	Includes: UPVC pipes and fittings, Flexible pipes, Screws, Nuts and Bolts etc	1 Set

Bill of Materials for Load Wiring:

Sl.no	Item	Description	UoM	Qty
1	AC Distribution Box	4-way, Single phase, Double door, Wall mounting type, DIN rail, Neutral busbar, Earth busbar.	Pcs	1
2	RCCB	30mA, 10 A, AC, Double Pole, 10 kA, 230 Vac	Pcs	1
3	Main MCB	6 A, AC, Double pole, B-curve, 10 kA, 230 Vac	Pcs	1
4	Socket (Modular)	3 pin, 6 A, 230 V, (White colour).	Pcs	4
5	Switch (Modular)	6 A, 1-Way, 240 V, (White colour).	Pcs	11
6	16 A Combo Socket with Fuse and Box	5-Pin, 16 A, 240 V, Socket, FR polycarbonate material (White Colour)	Pcs	1
7	Power Cable - 1 (Red)	1.5 Sq. mm, EFFR copper cables. (Interconnecting switchboards with loads)	Mtrs	80
	Power Cable - 1 (Black)	1.5 Sq. mm, EFFR copper cables. (Interconnecting switchboards with loads)	Mtrs	80
8	Earthing Cable (Green)	1 Sq. mm, EFFR copper cables. (Interconnecting earth pin (3-pin sockets) with new distribution box)	Mtrs	15
9	Earthing Cable (Green)	16 Sq. mm, EFFR copper cables. (Cable from AC Distribution box to Earth Pit)	Mtrs	20
10	Ceiling Rose	6 A, 240 V, FR polycarbonate outer housing with ducts, Inner metal ring with high conductive brass terminals (White colour).	Pcs	2
11	2 modular Switch Box with plate	Surface mounting type, ABS material with brass studs, Provision for conduits. (White colour)	Pcs	3
12	4 modular Switch Box with plate	Surface mounting type, ABS material with brass studs, Provision for conduits. (White colour)	Pcs	3
13	6 modular Switch Box with plate	Surface mounting type, ABS material with brass studs, Provision for conduits. (White colour)	Pcs	2
14	Modular Box Blank plate (Dummy)	Dummy Modular	Pcs	2
15	UPVC Conduit Pipe (White)	Polypropylene material, 20 mm diameter, White colour, Flame retardant, Anti-distortion.	Pcs	20
16	UPVC - Coupler (White)	UPVC pipe (White color), 19 mm diameter, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable.	Pcs	10
17	UPVC Conduit Tee Joint	UPVC pipe (White color), 19 mm diameter, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable.	Pcs	8
18	UPVC - Short & Long Elbow (White)	UPVC material, 19 mm diameter, White colour, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable. "	Pcs	20

19	2way Junction Box	UPVC material, 19 mm diameter, White colour, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable.	Pcs	6
20	3way Junction Box	UPVC material, 19 mm diameter, White colour, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable.	Pcs	6
21	4way Junction Box	UPVC material, 20 mm diameter, White colour, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable.	Pcs	6
22	Square Box		Pcs	6
23	Plastic wall lug	UPVC material, Size - 25 x 5 mm, Crack-proof, White colour, Eco-friendly.	Packs	1
24	Screw	Stainless steel/Galvanized Iron - rust-free material, Size - 35 x 8 mm, Flat head with deep slot.	Packs	1
25	Screw	Stainless steel/Galvanized Iron - rust-free material, Size - 25 x 7 mm, Flat head with deep slot.	Pcs	1
26	Electrical Insulating Tape	Size - 18 x 0.125 mm, High insulating resistance, Moisture & Corrosion resistant, Flame-retardant, Long-lasting adhesion.	Pcs	2
27	Pipe Saddle Clamps	UPVC material, Size: 20 mm diameter, Light duty pipe clamp, Single nail.	Pcs	40
28	Saddle Nail	Concrete nail Size - 1.5 inch GI/ Astel string steel	kg	0.6
29	Cable Tie	Polypropylene Material, Size – 150 mm, White Colour.	Packs	2
30	Cable Lugs - 1	2.5 Sq.mm, Pin-type, Tin-coated copper.	Pcs	8
31	Flexible Pipe	Polypropylene material, 20 mm diameter, White colour, Flame retardant, Anti-distortion.	Mtrs	5
32	Labelling Tags (Load identification tags)	Size - 3 x 1 Inch, Synthetic paper, Self-adhesive, Fluorescent Green colour, Waterproof, Temperature resistant.	Pack	1
33	Labelling Tags (Cable identification tags)	Size - 40 x 10 mm Synthetic paper, Self-adhesive, White colour, Waterproof, Temperature resistant.	Pack	1
34	Labelling Pen 1 Marker Pen	Line Width - 0.4 mm Dark black colour water resistance, Temperature resistance	Pcs	1
35	Labelling Pen 2 Marker Pen	Line Width - 2 mm Dark black colour water resistance, Temperature resistance	Pcs	1

Bill of Materials for Luminaries:

Sl.no	Products	Capacity	Qty
1	LED Tube light	20 W, 230 Vac	2 Nos
2	LED Bulb	9 W, 230 Vac	4 Nos
3	Outdoor Light with automatic control switch (For dusk-to-dawn operation)	20 W, 230 Vac	1 No.
3.1	Outdoor Light Arm - Rust Free (GI Material)		1 No.

Option 2 :

Bill of Materials for Solar System :

Sl. No	Products	Capacity	Qty
1	Solar Module	Solar Photovoltaic Array of Minimum Capacity 545 Wp (Monoperc) Panel Make and Model should be approved under MNRE ALMM List	4 Nos
2	Solar Battery	Valve regulated lead-acid battery (VRLA) – 100 Ah @ 12 V, C - 10 (Battery terminal caps used, must be big enough to cover the entire terminal area and the nut bolt assembly. Also, spring washers to be used at each battery terminal).	4 Nos
3	Module Mounting Structure (MMS*)	Solar PV Module support structure. **RCC Roof:** Lower elevation/Landscape Orientation (Triangular MMS withconcrete block). **Tin Roof:** Aluminium - Mini Rails **It should withstand the wind speed of 200 – 250 km/hr** **It should be suitable for above mentioned solar module** - As per Sl.No. 1	1 Set.
4	Solar Inverter/PCU - 230 Vac, 50 Hz	Total Minimum Capacity **3 kVA, 48 V – MPPT** based Single PhaseSupply, With Data Port (RS 485) Output	1 No.
5	Change over switch / Bypass Switch(PCU -Grid - Solar Loads)	**16 A, 230 Vac** (Single Phase)	1 No.
6	Copper Cable Red+Black (Module – Module - AJB) - PV1-F (Solar Cables)	**6 sq.mm** UV Protected Cable	32 m
7	Copper Cable Red + Black (AJB - Inverter) - (DC Cables)	**10 sq.mm**	10 m

8	Copper Cable (Battery - Battery & Battery - Inverter) - (DC Cables)	**16 Sq.mm** (Tin-coated copper lugs with insulation to be used at each batteryterminal).	10 m
9	DC Earthing (Panels + MMS)	**Panel to Panel, Panel to MMS, MMS leg to Main Earthing Terminal (MET)** -Grounding Lugs with 4 sq.mm earthing cable should be used.	15 m
10	Earthing Cable (AJB, GIPB, Inverter &Battery rack)	**16 Sq.mm** (Tin-coated copper lugs with insulation to be used at the cable-earth electrode interface).	30 m
11	Cable/Down conductor for LightningArrestor	Insulated (outdoor) GI strip of size 25 x 3 mm to be used. Each joint should consist of 2 - hexagonal nut and bolt assembly.Saddle insulators to be provided along the length of the down conductor. Termination to the earthing electrode using SS Test links with clamps	10 m
12	Earthing Kit ● LA ● GIPB+Inverter+Loads ● MMS+AJB+Battery rack	Solid electrode (Steel) Bonded copper – 16 mm diameter, 2000 mm long with 250 microns Bonding thickness, tin-coated copper lugs with insulation, clamps with nut-bolts assembly. protective concrete construction (Chamber) to earthing pit (L x B x H - 1.5 x 1.5 x 1.5 feet) with Metallic/FRP lid should be made. Earthing pit size should be minimum of 6 inch diameter and should be filled with back fill compound. Typology – Equipotential (Refer Annexure 2)	3 Set
13	Lightning Protection System	Lightning arrestor Solid Aluminium Alloy of 15 mm diameter and 2000 mm long with base plate should be used. GI Elevation pole 40 mm diameter, 3000 mm height. Supporting wires to be incorporated for stability to withstand wind speed of 200 – 250 km/hr. Ceramic insulation to be provided between lightning arrestor base plate and GI elevation pole.	1 Set
14	Grid Input Protection Box with SPD and MCB	MCB Rating : **230 Vac, 16 A (Double Pole)** SPD Rating : **320 Vac, Type 2, 40 kA (Double pole with indicators)** Inter connection of the components inside the GIPB should be 4 Sq.mm	1 No.
15	Battery rack with the following: 1. Acid absorbent mat 2. Electrical Insulation mat (Minimum 0.4 kV)	**As per Solar Battery Sl. No. - 2** (Each leg should be given a base flat plate) The elevation height of battery rack should be 3 inch and should be with fireproof material and corrosion free (GI rack is preferable). In the battery rack, each joint should be with nut and bolt assembly and should not be with any type of welding assembly	1 Set.

16	Inverter rack with the following: Electrical Insulation mat (Minimum 0.4 kV)	(Each leg should be given a base flat plate) The elevation height of inverter rack should be 3 inch and should be with fireproof material and corrosion free (GI rack is preferable). In the inverter rack, each joints should be with nut and bolt assembly and should not be with any type of welding assembly.	1 Set.
17	Solar Array Junction Box with MCB and SPD and String Fuse.	**1 IN 1 OUT** MCB Rating : **500 Vdc, 20 A (Double Pole)** SPD Rating: **250 Vdc, Type 2, 20 KA (Double pole with indicators)** Inline DC Fuse rating*: (+ve Strings): **20 A X 1 No.** Inter connection of the components inside the AJB should be DC cable of 10 Sq.mm	1 No.
18	Load Side MCB with Conduit box	MCB Rating: **16 A, 230 Vac (Double Pole)**	1 No.
19	Marking for AC earthing with Elevated Plaques (GIPB+Inverter+Loads)	Elevation pole length - 3 Feet. Metal plaque dimension - A5	1 No.
20	Marking for DC earthing with Elevated Plaques (AJB+MMS+Panels)	Elevation pole length - 3 Feet. Metal plaque dimension - A5	1 No.
21	Marking of Lightning Arrester Earthing with Elevated Plaques	Elevation pole length - 3 Feet. Metal plaque dimension - A5	1 No.
22	Single Line Diagram (SLD) for the system	Sun board with 3 mm Thickness - 4 ft x 2 ft	1 No.
23	Do's and Don'ts Practices Poster (Solar Panels, Battery and Inverter)	Foam Plaque - A4 Size for each	1 No.
24	Signboard for Danger, No Fire and PASS	Danger - Electric shock – A4 Danger - High Voltage – A4 No Fire – A5 PASS - A4	1 No each

25	I/P and O/P wiring of Grid Connection- AC cable	**4 Sq. mm.**	30 m
26	Fire Extinguisher	Multi-Purpose - ABC Dry powder extinguishing agents (or) CO2 type with 3 kg net weight of the charge inside the cylinder.	1 No
27	Metallic Enclosure with Isolator's having minimum gap of 1 inch. (PV, Battery & Grid Input to Inverter)	1st Switch for Battery Input - 63 A, 500 Vdc, Double Pole 2nd Switch for PV Input – 20 A, 500 Vdc, Double Pole 3rd Switch for Grid Input – 20 A, 230 Vac, Double Pole	1 Set
28	Consumables	Includes: UPVC pipes and fittings, Flexible pipes, Screws, Nuts and Bolts etc	1 Set

Bill of Materials for Load Wiring:

Sl.no	Item	Description	UoM	Qty
1	AC Distribution Box	6-way, Single phase, Double door, Wall mounting type, DIN rail, Neutral busbar, Earth busbar.	Pcs	1
2	RCCB	30mA, 25 A, AC, Double Pole, 10 kA, 230 Vac	Pcs	1
3	Main MCB	16 A, AC, Double pole, B-curve, 10 kA, 230 Vac	Pcs	1
4	MCB Circuit - 1	6 A, AC, Single Pole, B Curve, 10 kA, 230 vac	Pcs	1
5	MCB Circuit - 2	10 A, AC, Single Pole, B Curve, 10 kA, 230 vac	Pcs	1
6	Socket (Modular)	3 pin, 6 A, 230 V, (White colour).	Pcs	7
7	Switch (Modular)	6 A, 1-Way, 240 V, (White colour).	Pcs	16
8	16 A Combo Socket with Fuse and Box	5-Pin, 16 A, 240 V, Socket, FR polycarbonate material (White Colour)	Pcs	3
9	Power Cable - 1 (Red)	1.5 Sq. mm, EFFR copper cables. (Interconnecting switchboards with loads)	Mtrs	75
	Power Cable - 1 (Black)	1.5 Sq. mm, EFFR copper cables. (Interconnecting switchboards with loads)	Mtrs	75
10	Power Cable – 2 (Red)	2.5 Sq. mm, EFFR copper cables. (Interconnecting distribution box with switchboards)	Mtrs	50
	Power Cable - 2 (Black)	2.5 Sq. mm, EFFR copper cables. (Interconnecting distribution box with switchboards)	Mtrs	50
11	Earthing Cable (Green)	1 Sq. mm, EFFR copper cables. (Interconnecting earth pin (3-pin sockets) with new distribution box)	Mtrs	15
12	Earthing Cable (Green)	16 Sq. mm, EFFR copper cables. (Cable from AC Distribution box to Earth Pit)	Mtrs	20
13	Ceiling Rose	6 A, 240 V, FR polycarbonate outer housing with ducts, Inner metal ring with high conductive brass terminals (White colour).	Pcs	3
14	1 modular Switch Box with plate	Surface mounting type, ABS material with brass studs, Provision for conduits. (White colour)	Pcs	7
15	2 modular Switch Box with plate	Surface mounting type, ABS material with brass studs, Provision for conduits. (White colour)	Pcs	2
16	3 modular Switch Box with plate	Surface mounting type, ABS material with brass studs, Provision for conduits. (White colour)	Pcs	10
17	Modular Box Blank plate (Dummy)	Dummy Modular	Pcs	5
18	UPVC Conduit Pipe (White)	Polypropylene material, 20 mm diameter, White colour, Flame retardant, Anti-distortion.	Pcs	20

19	UPVC - Coupler (White)	UPVC pipe (White color), 19 mm diameter, Flame retardant, Low halogen, Lowsmoke, smoke suppressing, Temperature stable.	Pcs	10
20	UPVC Conduit Tee Joint	UPVC pipe (White color), 19 mm diameter, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable.	Pcs	8
21	UPVC - Short & Long Elbow (White)	UPVC material, 19 mm diameter, White colour, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable. "	Pcs	20
22	2way Junction Box	UPVC material, 19 mm diameter, White colour, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable.	Pcs	6
23	3way Junction Box	UPVC material, 19 mm diameter, White colour, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable.	Pcs	6
24	4way Junction Box	UPVC material, 20 mm diameter, White colour, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable.	Pcs	9
25	Square Box		Pcs	8
26	Plastic wall lug	UPVC material, Size - 25 x 5 mm, Crack-proof, White colour, Eco-friendly.	Packs	5
27	Screw	Stainless steel/Galvanized Iron - rust-free material, Size - 35 x 8 mm, Flat head with deep slot.	Packs	1
28	Screw	Stainless steel/Galvanized Iron - rust-free material, Size - 25 x 7 mm, Flat head with deep slot.	Pcs	1
29	Electrical Insulating Tape	Size - 18 x 0.125 mm, High insulating resistance, Moisture & Corrosion resistant, Flame-retardant, Long-lasting adhesion.	Pcs	4
30	Pipe Saddle Clamps	UPVC material, Size: 20 mm diameter, Light duty pipe clamp, Single nail.	Pcs	40
31	Saddle Nail	Concrete nail Size - 1.5 inch GI/ Astel string steel	kg	0.6
32	Cable Tie	Polypropylene Material, Size – 150 mm, White Colour.	Packs	2
33	Cable Lugs - 1	2.5 Sq.mm, Pin-type, Tin-coated copper.	Pcs	8
34	Flexible Pipe	Polypropylene material, 20 mm diameter, White colour, Flame retardant, Anti-distortion.	Mtrs	5
35	Labelling Tags (Load identification tags)	Size - 3 x 1 Inch, Synthetic paper, Self-adhesive, Fluorescent Green colour, Waterproof, Temperature resistant.	Pack	1
36	Labelling Tags (Cable identification tags)	Size - 40 x 10 mm Synthetic paper, Self-adhesive, White colour, Waterproof, Temperature resistant.	Pack	1
37	Labelling Pen 1 Marker Pen	Line Width - 0.4 mm Dark black colour water resistance, Temperature resistance	Pcs	1
38	Labelling Pen 2	Line Width - 2 mm Dark black colour	Pcs	1

	Marker Pen	water resistance, Temperature resistance		

Bill of Materials for Luminaries:

Sl.no	Products	Capacity	Qty
1	LED Tube light	20 W, 230 Vac	3 Nos
2	LED Bulb	9 W, 230 Vac	5 Nos
3	Outdoor Light with automatic control switch (For dusk-to- dawn operation)	20 W, 230 Vac	1 No.
3.1	Outdoor Light Arm - Rust Free (GI Material)		1 No.

Primary Health Centre:

Bill of Materials for Solar System :

Sl. No	Products	Capacity	Qty
1	Solar Module	Solar Photovoltaic Array of Minimum Capacity 545 Wp (Monoperc) Panel Make and Model should be approved under MNRE ALMM List	12 Nos
2	Solar Battery	Valve regulated lead-acid battery (VRLA) – 180 Ah @ 12 V, C - 10 (Battery terminal caps used, must be big enough to cover the entire terminal area and the nut bolt assembly. Also, spring washers to be used at each battery terminal).	8 Nos
3	Module Mounting Structure (MMS*)	Solar PV Module support structure. **RCC Roof:** Lower elevation/Landscape Orientation (Triangular MMS withconcrete block). **Tin Roof:** Aluminium - Mini Rails **It should withstand the wind speed of 200 – 250 km/hr** **It should be suitable for above mentioned solar module** - As per Sl.No. 1	1 Set.
4	Solar Inverter/PCU - 230 Vac, 50 Hz	Total Minimum Capacity **6 kVA, 96 V – MPPT** based Single PhaseSupply, With Data Port (RS 485) Output	1 No.
5	Changeover / Bypass Switch-1(DG – Grid – Solar & Non-Solar Loads)	**63 A, 230 Vac** (Single Phase)	1 No.
6	Changeover / Bypass Switch - 2(PCU -Grid - Solar Loads)	**32 A, 230 Vac** (Single Phase)	1 No.

7	Copper Cable Red+Black (Module – Module - AJB) - PV1-F (Solar Cables)	**6 sq.mm** UV Protected Cable	96 m
8	Copper Cable Red + Black (AJB - Inverter) - (DC Cables)	**16 sq.mm**	20 m
9	Copper Cable (Battery - Battery & Battery - Inverter) - (DC Cables)	**16 Sq.mm** (Tin-coated copper lugs with insulation to be used at each batteryterminal).	15 m
10	DC Earthing (Panels + MMS)	**Panel to Panel, Panel to MMS, MMS leg to Main Earthing Terminal (MET)** -Grounding Lugs with 4 sq.mm earthing cable should be used.	15 m
11	Earthing Cable (AJB, GIPB, Inverter &Battery rack)	**16 Sq.mm** (Tin-coated copper lugs with insulation to be used at the cable-earth electrode interface).	45 m
12	Cable/Down conductor for LightningArrestor	Insulated (outdoor) GI strip of size 25 x 3 mm to be used. Each joint should consist of 2 - hexagonal nut and bolt assembly. Saddle insulators to be provided along the length of the down conductor. Termination to the earthing electrode using SS Test links with clamps	60 m
13	Earthing Kit ● LA - 1 ● LA - 2 ● GIPB+Inverter+Loads ● MMS+AJB+Battery rack	Solid electrode (Steel) Bonded copper – 16 mm diameter, 2000 mm long with 250 microns Bonding thickness, tin-coated copper lugs with insulation, clamps with nut-bolts assembly. protective concrete construction (Chamber) to earthing pit (L x B x H - 1.5 x 1.5 x 1.5 feet) with Metallic/FRP lid should be made. Earthing pit size should be minimum of 6 inch diameter and should be filled with back fill compound. Typology – Equipotential (Refer Annexure 2)	4 Set
14	Lightning Protection System	Lightning arrestor Solid Aluminium Alloy of 15 mm diameter and 2000 mm long with base plate should be used. GI Elevation pole 40 mm diameter, 3000 mm height. Supporting wires to be incorporated for stability to withstand wind speed of 200 – 250 km/hr. Ceramic insulation to be provided between lightning arrestor base plate and GI elevation pole.	2 Set
15	Grid Input Protection Box with SPD and MCB	MCB Rating : **230 Vac, 32 A (Double Pole)** SPD Rating : **320 Vac, Type 2, 40 kA (Double pole with indicators)** Inter connection of the components inside the GIPB should be 6 Sq.mm	1 No.
16	Double row battery rack with the following: 1. Acid absorbent mat 2. Electrical Insulation mat (Minimum 0.4 kV)	**As per Solar Battery Sl. No. - 2** (Each leg should be given a base flat plate) The elevation height of battery rack should be 3 inch and should be with fireproof material and corrosion free (GI rack is preferable).	1 Set.

		In the battery rack, each joints should be with nut and bolt assembly and should not be with any type of welding assembly.	
17	Inverter rack with the following: Electrical Insulation mat (Minimum 0.4 kV)	(Each leg should be given a base flat plate) The elevation height of Inverter rack should be 3 inch and should be with fireproof material and corrosion free (GI rack is preferable). In the Inverter rack, each joints should be with nut and bolt assembly and should not be with any type of welding assembly.	1 Set.
18	Solar Array Junction Box with MCB and SPD and String Fuse.	**3 IN 1 OUT** MCB Rating : **500 Vdc, 63 A (Double Pole)** SPD Rating: **250 Vdc, Type 2, 40 KA (Double pole with indicators)** Inline DC Fuse rating*: (+ve Strings): **20 A X 3 nos.** Inter connection of the components inside the AJB should be DC cable of 16 Sq.mm	1 No.
19	Load Side MCB with Conduit box	MCB Rating: **32 A, 230 Vac (Double Pole)**	1 No.
20	Marking for AC earthing with Elevated Plaques (GIPB+Inverter+Loads)	Elevation pole length - 3 Feet. Metal plaque dimension - A5	1 No.
21	Marking for DC earthing with Elevated Plaques (AJB+MMS+Panels)	Elevation pole length - 3 Feet. Metal plaque dimension - A5	1 No.
22	Marking of Lightning Arrester Earthing with Elevated Plaques	Elevation pole length - 3 Feet. Metal plaque dimension - A5	2 Nos.
23	Single Line Diagram (SLD) for the system	Sun board with 3 mm Thickness - 4 ft x 2 ft	1 No.
24	Do's and Don'ts Practices Poster (Solar Panels, Battery and Inverter)	Foam Plaque - A4 Size for each	1 No.

25	Signboard for Danger, No Fire and PASS	Danger - Electric shock – A4 Danger - High Voltage – A4 No Fire – A5 PASS - A4	1 No each
26	I/P and O/P wiring of Grid Connection- AC cable	**6 Sq. mm.**	30 m
27	Fire Extinguisher	Multi-Purpose - ABC Dry powder extinguishing agents (or) CO2 type with 6 kg net weight of the charge inside the cylinder.	1 No
28	Metallic Enclosure with Isolator's having minimum gap of 1 inch. (PV, Battery & Grid Input to Inverter)	1st Switch for Battery Input - 63 A, 500 Vdc, Double Pole 2nd Switch for PV Input – 63 A, 500 Vdc, Double Pole 3rd Switch for Grid Input – 40 A, 230 Vac, Double Pole	1 Set
29	Consumables	Includes: UPVC pipes and fittings, Flexible pipes, Screws, Nuts and Bolts etc	1 Set

Bill of Materials for Load Wiring:

Sl.no	Item	Description	UoM	Qty
1	AC Distribution Box	8-way, Single phase, Double door, Wall mounting type, DIN rail, Neutral busbar, Earth busbar.	Pcs	1
2	RCCB	30mA, 40 A, AC, Double Pole, 10 kA, 230 Vac	Pcs	1
3	Main MCB	32 A, AC, Double pole, B-curve, 10 kA, 230 Vac	Pcs	1
4	MCB Circuit - 1	10 A, AC, Single Pole, B Curve, 10 kA, 230 vac	Pcs	1
5	MCB Circuit - 2	16 A, AC, Single Pole, B Curve, 10 kA, 230 vac	Pcs	1
6	MCB Circuit - 3	16 A, AC, Single Pole, B Curve, 10 kA, 230 vac	Pcs	1
7	Socket (Modular)	3 pin, 6 A, 230 V, (White colour).	Pcs	22
8	Switch (Modular)	6 A, 1-Way, 240 V, (White colour).	Pcs	52
9	16 A Combo Socket with Fuse and Box	5-Pin, 16 A, 240 V, Socket, FR polycarbonate material (White Colour)	Pcs	8

10	Power Cable - 1 (Red)	1.5 Sq. mm, EFFR copper cables. (Interconnecting switchboards with loads)	Mtrs	90
	Power Cable - 1 (Black)	1.5 Sq. mm, EFFR copper cables. (Interconnecting switchboards with loads)	Mtrs	90
11	Power Cable – 2 (Red)	2.5 Sq. mm, EFFR copper cables. (Interconnecting distribution box with switchboards)	Mtrs	90
	Power Cable - 2 (Black)	2.5 Sq. mm, EFFR copper cables. (Interconnecting distribution box with switchboards)	Mtrs	90
12	Power Cable – 2 (Red)	4 Sq. mm, EFFR copper cables. (Interconnecting distribution box with switchboards)	Mtrs	75
	Power Cable - 2 (Black)	4 Sq. mm, EFFR copper cables. (Interconnecting distribution box with switchboards)	Mtrs	75
13	Earthing Cable (Green)	1 Sq. mm, EFFR copper cables. (Interconnecting earth pin (3-pin sockets) with new distribution box)	Mtrs	50
14	Earthing Cable (Green)	16 Sq. mm, EFFR copper cables. (Cable from AC Distribution box to Earth Pit)	Mtrs	30
15	Ceiling Rose	6 A, 240 V, FR polycarbonate outer housing with ducts, Inner metal ring with high conductive brass terminals (White colour).	Pcs	10
16	1 modular Switch Box with plate	Surface mounting type, ABS material with brass studs, Provision for conduits. (White colour)	Pcs	10
17	2 modular Switch Box with plate	Surface mounting type, ABS material with brass studs, Provision for conduits. (White colour)	Pcs	17
18	3 modular Switch Box with plate	Surface mounting type, ABS material with brass studs, Provision for conduits. (White colour)	Pcs	16
19	4 modular Switch Box with plate	Surface mounting type, ABS material with brass studs, Provision for conduits. (White colour)	Pcs	13
20	6 modular Switch Box with plate	Surface mounting type, ABS material with brass studs, Provision for conduits. (White colour)	Pcs	15
21	8 modular Switch Box with plate	Surface mounting type, ABS material with brass studs, Provision for conduits. (White colour)	Pcs	15
22	Modular Box Blank plate (Dummy)	Dummy Modular	Pcs	10
23	UPVC Conduit Pipe (White)	Polypropylene material, 20 mm diameter, White colour, Flame retardant, Anti-distortion.	Pcs	100
24	UPVC - Coupler (White)	UPVC pipe (White color), 19 mm diameter, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable.	Pcs	25
25	UPVC Conduit Tee Joint	UPVC pipe (White color), 19 mm diameter, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable.	Pcs	50

26	UPVC - Short & Long Elbow (White)	UPVC material, 19 mm diameter, White colour, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable. "	Pcs	50
27	2way Junction Box	UPVC material, 19 mm diameter,	Pcs	20
		White colour, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable.		
28	3way Junction Box	UPVC material, 19 mm diameter, White colour, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable.	Pcs	50
29	4way Junction Box	UPVC material, 20 mm diameter, White colour, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable.	Pcs	20
30	Square Box		Pcs	28
31	Plastic wall lug	UPVC material, Size - 25 x 5 mm, Crack-proof, White colour, Eco-friendly.	Packs	2
32	Screw	Stainless steel/Galvanized Iron - rust-free material, Size - 35 x 8 mm, Flat head with deep slot.	Packs	4
33	Screw	Stainless steel/Galvanized Iron - rust-free material, Size - 25 x 7 mm, Flat head with deep slot.	Packs	2
34	Electrical Insulating Tape	Size - 18 x 0.125 mm, High insulating resistance, Moisture & Corrosion resistant, Flame-retardant, Long-lasting adhesion.	Pcs	12
35	Pipe Saddle Clamps	UPVC material, Size: 20 mm diameter, Light duty pipe clamp, Single nail.	Pcs	200
36	Saddle Nail	Concrete nail Size - 1.5 inch GI/ Astel string steel	kg	0.6
37	Cable Tie	Polypropylene Material, Size – 150 mm, White Colour.	Packs	2
38	Cable Lugs - 1	2.5 Sq.mm, Pin-type, Tin-coated copper.	Pcs	15
39	Cable Lugs - 1	4 Sq.mm, Pin-type, Tin-coated copper.	Pcs	15
40	Flexible Pipe	Polypropylene material, 20 mm diameter, White colour, Flame retardant, Anti-distortion.	Mtrs	10
41	Labelling Tags (Load identification tags)	Size - 3 x 1 Inch, Synthetic paper, Self-adhesive, Fluorescent Green colour, Waterproof, Temperature resistant.	Pack	1
42	Labelling Tags (Cable identification tags)	Size - 40 x 10 mm Synthetic paper, Self-adhesive, White colour, Waterproof, Temperature resistant.	Pack	1
43	Labelling Pen 1 Marker Pen	Line Width - 0.4 mm Dark black colour water resistance, Temperature resistance	Pcs	1
44	Labelling Pen 2 Marker Pen	Line Width - 2 mm Dark black colour water resistance, Temperature resistance	Pcs	1

Bill of Materials for Luminaries:

Sl.no	Products	Capacity	Qty
1	LED Tube light	20 W, 230 Vac	10 Nos
2	LED Bulb	9 W, 230 Vac	18 Nos
3	Outdoor Light with automatic control switch (For dusk-to-dawn operation)	20 W, 230 Vac	2 Nos.
3.1	Outdoor Light Arm - Rust Free (GI Material)		2 Nos.

ANNEXURE 2- TECHNICAL SPECIFICATIONS OF COMPONENTS

The proposed project shall be commissioned as per the technical specifications given below. Any shortcomings or deviations may lead to the cancellation of the Letter of Award, and in such a case the Competent Authority's decision will be final and binding on the bidder.

1. SOLAR PV MODULE:

a. The PV modules used must qualify to the latest edition of the IEC PV module qualification test.
b. The total solar PV array capacity should not be less than the allocated capacity and should comprise solar crystalline modules of minimum Wp mentioned in the bill of materials. Module capacity less than minimum Wp mentioned in the BoM / Purchase Order shall not be accepted.
c. PV modules must be tested and approved by one of the IEC authorized test centers. The module frame shall be made of corrosion-resistant materials, preferably anodized aluminum of 10 microns thickness.

NOTE:

- Approval from SELCO Foundation should be sought before finalizing the choice of brand for SPV modules.

2. MODULE WARRANTY:

Module Warranty is defined as: The manufacturer should warrant the Solar Module(s) to be free from the defects and/or failures specified below for a period not less than Ten (10) years from the date of sale to the original customer

a. Defects and/or failures due to manufacturing.
b. Defects and/or failures due to quality of materials
c. Non-conformity to specifications due to faulty manufacturing and/or inspection processes. If the solar Module(s) fails to conform to this warranty, the manufacturer will repair or replace the solar module(s), at the supplier's sole cost

3. PERFORMANCE WARRANTY:

- The degradation of power generated by the module shall not exceed 20% of the maximum rated power over the 25-year period and not more than 8% after the first ten years period.
- Should have a positive power tolerance
- Should be Anti - L.eT.I.D & P.I.D Resistant
- Panel degradation should be linear over a period for 25+ years

- Should have temperature coefficient of power (Pmax) ≤ -0.38% /°C
- Should be able to withstand downward force ≥ 5600 pascals
- Should be able to withstand uplift force ≥ 2400 pascals
- Should have tempered/toughened solar glass of 3.2 mm thickness
- Should have anti-reflective surface treatment
- Should have optically clear glass with high transmittance

Additionally, modules should be certified with:

- PV module safety standards
- PID-d.
- Ammonia corrosion Resistance test
- Dynamic Mechanical Load
- Hailstone (35mm)
- Ignitability test
- FSI Tested.
- EL Tested.
- Enlisted Module Manufacturer of DGS&D.
- Application class - Class A (Electric hazard test - Operating voltage >50 Vdc & Modules area can be accessed by public)
- Module fire performance - Type 1 (Burning test & spread of flame test)

4. MODULE MOUNTING STRUCTURE (MMS):

For very low elevation & flat RCC surface mounting:

- Landscape orientation to be incorporated.
- Triangular MMS to be chosen.
- The MMS should be mounted to the RCC roof using wedge anchor fasteners and a concrete block of L x W x H = 1.5 x 1.5 x 0.25 feet at the front side of the MMS and concrete block of L x W x H = 1.5 x 1.5 x 0.75 feet at the back side of the MMS respectively. The sides of the cube and roof interface should be given a simple 1-inch filet construction. At the top side of the cubes, an upward taper should be formed from cube sides towards M.M.S leg. M15/M20 grade P.C.C should be used for the civil works with minimum 3 days of curing.

For inclined sheet roofs/Tin roofs (General purpose mounting):

- Mini rails to be incorporated
- Anodised mini rails of 70 microns thickness.
- Rail dimension should be of 300 mm X 40 mm with minimum thickness of 2.6 mm
- Distance between Solar panel to rail should be minimum 100 mm.
- Mini rails can be fastened to the purlins using self-driven screws. (Pop riveting can be incorporated on PPGL sheets which are in good condition.)
- EPDM strips to be used as sealant for waterproofing.

For roofs which are unfit for mounting panels:

- Roofs that are not fit for installation due to less structural stability/very old roofs/rainwater leakage problem, then a suitable location on the ground may be preferred for the panel

installation.

- The installation maybe a low elevation MMS with fencing protection around or may be a high elevation MMS (Approval and support from SELCO foundation should be taken prior to installation)

Orientation of the MMS:

- The orientation of the MMS should be due south in general case/flat mounting surfaces.
- If the roof orientation of the building is deviated away from the south (by less than 30 degrees), then the existing orientation of the building roof can be used for mounting the panels. If the deviation is more than 30 degrees, then action to correct the deviation should be taken only after consultation with SELCO Foundation.

NOTE:

- Approval from SELCO Foundation should be sought before finalizing the MMS design in case of any customization required as per the existing site situations.
- Approval from SELCO Foundation should be sought to mount the panels on an alternate location if the existing roof is unfit for mounting panels.

General guidelines:

- Each structure should have an angle of inclination as per the geographical location to receive maximum irradiation.
- All panels should be grounded together with grounding lugs and all the MMS structure should be grounded using grounding clips and should be connected to the respective earthing pit along with AJB.
- All nuts & bolts used should be made of G.I (> 120 microns) or of stainless steel.
- The structure shall be designed to allow easy replacement of any module with walking space around the MMS. The array structure shall be so designed that it will occupy minimum space without sacrificing the output from the SPV panels. Installation of solar structures should not damage the roof in any way. If any concrete or foundation is required, it should be precast type.
- Bidders must follow the above types of roof mounting options, and the solution is dependent on the type of roof at the location. a) Flat roof, b) Tin roof. In all cases, considerations must be made for the roof's age, structural integrity, access to equipment, and necessary setbacks for fire and life safety requirements.

5. ARRAY JUNCTION BOX/COMBINER BOXES:

The junction box should have good resistances against mechanical stresses and external impacts.

- The junction boxes are to be provided in the PV array for termination of connecting cables.
- The Junction Boxes (JBs) shall be made of GRP/FRP/Powder Coated Aluminium /cast aluminium alloy with full dust, water & vermin proof arrangement.
- All wires/cables must be terminated through cable lugs. The boxes shall be such that input & output termination can be made through suitable cable glands.
- Proper cable lugs (Fork, pin type) with insulation should be provided for the cables connected with the boxes.
- A.J.B should have segregated inputs for both positive and negative cables emerging from the

respective arrays.

- Positive strings should have a self-blown in-line DC fuses
- All the glands provided under the junction box should be used and any unused glands should be sealed for ingress protection.
- Suitable markings shall be provided on the busbar for easy identification and the cable ferrules must be fitted at the cable termination points for identification.
- The AJB should be placed in a shaded place, preferably at the inner side of the wall nearest to the roof.
- IP rating: IP-67.
- Should comply with the R.o.H.S. Directive 2002/95/EC

6. Battery:

The battery chosen for the project should have the following characteristics:

- **Battery type:** Valve Regulated Lead Acid (VRLA)
- **Plate technology:** Flat plate
- **Terminal type**: L - Type
- **Electrolyte:** Free flow electrolyte
- **Operating temperature**: -20°C to +55°C
- **Application** - Cyclic application, Float application above 1 hour discharge rate
- **Self-discharge @ STC** - Low self-discharge < 3.0 % per month
- **Life cycle @ 80% D.O.D @ 27°C** - 1500 cycles
- **Ah Efficiency**: >90 %
- **Wh Efficiency:** >80 %

Should have **additional characteristics of:**

- Should exhibit PSOC behavior
- Should have low fumes generation
- Should perform easy recovery after idle period.
- All the batteries capacities mentioned are at a C/10 rate of discharge and the same should also be followed by the bidder. The preferred voltage of each battery is 12 V due to better space utilization. However, bidders quoting for battery banks with 2V cells or other capacities should add a justification note as annexure to why the particular voltage was opted for. The technical committee will consider this and take a decision on the suitability of such an option. The decision of the technical committee/technical member of the buyer on this matter will be final and binding on the bidder.
- Battery should conform to the latest B.I.S/ International standards. A copy of the relevant test certificate for the battery should be furnished.
- The battery should be warranted for a minimum of 5 years.
- The battery should be installed inside the premises of the end user on a battery rack. The rack material size should be able to easily bear the battery load. (Each leg should have a respective base plate.)
- The rack's row length should be considered based on the size of the battery as well as the number of
  batteries placed per row including the 2-inch inter battery gap.
- Support rails of 6-inch height should be provided at the shorter side of the racks to support batteries from fall due to accidental impacts.
- In case of double row racks, the inter row height should be of a minimum 18-inch separation.

- The battery rack should be of fireproof material and corrosion free (GI rack is preferable).
- In the battery rack, each joints should be with nut and bolt assembly and should not be with any type of welding assembly.
- The non-reactive acid proof - Acid absorbent mats should be provided below the battery.
- Electrical Insulation mats (IS 15652:2006 standard) with minimum 0.4 kV insulation capacity should be provided on the floor.
- Tin-coated copper lugs (Ring type) with insulation to be used at cable ends to connect each battery terminal.
- Spring washers to be incorporated in the nut-bolt assembly at each battery terminal.
- Battery terminal caps used, should be big enough to cover the entire terminal area and the nut bolt assembly.
- At each battery terminal, petroleum-based gel coating should be applied.
- All cables connecting to the batteries should be provided "conduit pipe" protection and tied to the outer
  sides of the battery body using cable ties.

NOTE:

Placement of battery should be in proper ventilated room and if not then ventilation in the room should be compulsorily incorporated for the following reasons:

- Safety of the system
- Safety of the end users
- Efficient performance of the system.

Also, approval from SELCO Foundation should be sought before finalizing the choice of brand for solar batteries.

7. Grid Input Protection Boxes:

The GIP box should have good resistances against mechanical stresses and external impacts. The Box shall be made of GRP/FRP/Powder Coated Aluminium /cast aluminium alloy with full dust, water & vermin proof arrangement.

- All wires/cables must be terminated through cable lugs.
- The boxes shall be such that input & output termination can be made through suitable cable glands.
- All the cables (Incoming & Outgoing) should be kept separated and should be given UPVC conduit pipe protection
- All the glands provided under the box should be used and any unused glands should be sealed for ingress protection.
- Preferably, the box should be placed in the PCU room.
- IP rating: IP-67.
- Proper cable lugs (Pin type) with insulation should be provided for the cables connected with the boxes.
- Should comply with the R.oH.S. Directive 2002/95/EC

8. Solar PCU:

The power conditioning unit should be provided to convert DC power produced by SPV modules into AC power. The power conditioning unit/inverter should be off-Grid with Grid interactive and grid charging features.

Typical technical features of the PCU shall be as follows:

Power conditioning unit with inbuilt charge controller of capacity & ratings as specified in the below for various capacities of Solar Power Plants should convert DC power into AC power.

The PCU should be tested from the MNRE approved test centres / NABL /BIS accredited testing- calibration laboratories. In the case of imported power conditioning units, these should be approved by international test houses.

In case of inverters with low ground clearance, a minimum of 3-inch elevation for the same should be incorporated. The elevating means should be a fireproof material (Leg bushes are preferable).

8.1.1 The PCU will have the following features:

a. MPPT charging.
b. Inverter efficiency should be more than 85%
c. The inverter should be compatible with alternators / Generators.
d. Output voltage for single phase 230 V, +/-3% with pure sine wave.
e. Output frequency: 50 Hz
f. Capacity of PCU is specified at minimum 0.8 lagging power factor
g. THD: less than 3%
h. Ambient temperature 50 degree Celsius (max.)
i. Operating humidity 95% maximum
j. Shall be equipped with RS 485 data port output

8.1.2 Protections:

a. Over voltage (automatic shutdown)
b. Under voltage (automatic shutdown)
c. Overload - Short circuit (circuit breaker & electronics protection against sustained fault)
d. Over Temperature
e. Temperature compensation
f. Battery, PV reverse polarity

8.1.3 Indicators

a. Array on
b. MPPT charger on
c. Battery connected, charging
d. Inverter ON
e. Load on solar/ battery
f. Grid charger on
g. Load on Grid
h. Grid on
i. Fault

8.1.4 Display Parameters

a. Battery Current
b. Battery Voltage
c. PV Panels Voltage
d. PV Panels Current
e. Energy Generation (kWh)
f. Energy – Grid Export (kWh)
g. Grid Voltage
h. PCU Load (kW)
i. PCU Output Voltage
j. PCU Output Frequency
k. PCU Output Current
l. Fault Codes

8.1.5 Cooling: cooling mechanism required - Air Cooled

NOTE:

Placement of PCU should be in proper ventilated room and if not then ventilation in the room should be compulsorily incorporated for the following reasons:

- Safety of the system
- Safety of the end users
- Efficient performance of the system.

Also, approval from SELCO Foundation should be sought before finalizing the choice of brand for solar PCU.

9. Protections:

The system should be provided with all necessary protections like earthing and lightning protection:-

1. LIGHTNING PROTECTION:

Code of practice for protective measures against lightning strikes and surges as per IS 2309-1989 and subsequent amendments should be followed. The main aim in this protection shall be to reduce the over voltage to a tolerable value before it reaches the PV or other sub system components. The source of over voltage can be lightning, atmosphere disturbances etc. The entire space occupying the SPV array shall be suitably protected against lightning by deploying the required number of lightning arresters.

To increase the coverage area of protection, the lightning arrestor should be given an additional elevation by using

G.I. pole. The height of the lightning arrester tip should be minimum 5 meters above the mounting surface. Insulation should be provided between the lightning arrestor and the elevation pole and the building structure. Down conductors should maintain 1.75 m distance from panels, arrays and other power cables around.

- Franklin Rods/Passive type lightning arresters should be incorporated.
- The entire lightning arrester set up (Air terminal pole, spikes and base plates should be of solid Aluminum Alloy).

- Minimum size of the lightning arrester should be 15 mm by diameter and 2000 mm by length.
- The base plate should be 90 mm X 90 mm X 5 mm in dimension
- GI Elevation pole 40 mm diameter and 3000 mm height.
- The lightning protection system incorporated in the installation is only for the protection of the solar PV systems installed.
- The lightning arrestor setup should always be vertical and should be stable against high wind loads.
- In case of RCC flat roofs, the lightning arrestor setup should be provided with anchor fasteners along with civil work made at its base plate.
- In case of metal sheet roof, the lightning arrester should be placed at the apex of the roof . T base clamps should be made use of it to install the lightning arrestor.
- Supporting wires should be used for additional stability of the lightning arrestor.
- A concrete cube (Civil work) of 1.5 ft x 1.5 ft x 1.5 ft (L x B x H) dimensions should be set.
- The base of the clamp should be given EPDM strips which are to be used as sealant for waterproofing.
- The lightning arrester should be placed preferably at the back of the array and at the sides, with a separation distance of 1.75 meters only (From the panel edges).
- Down conductor for lightning arrester should be of insulated GI strip of size 25x3 mm should be used.
- Each joint should be connected with 2-hexagonal nut-bolt assembly (SS), no twisting or brazing.
- Down conductor to be connected to earthing rod with steel clamps and test links.

NOTE:

Copper bonded and G.I rods are not allowed in the installation.
Approval from SELCO Foundation should be sought before finalizing the choice of brand for lightning arresters.

2. EARTHING:

Code of practice for protective earthing and protection against electric shocks as per the IEC 62305 and latest standards should be followed. Earthing is a way of transmitting any instant electricity discharge directly to the ground by providing a low resistance path (using electrical cables wires with no joints or metal strips with lesser joints). This instant electricity discharge is mostly in the form of lightning, surge voltages entering through grid lines and due to fault current/leakage current in the system. The goal is to protect the appliances from voltage surges and protect the users from the risk of electrocution due to leakage/fault current in the system.

- Earthing type - Chemical Earthing
- Electrodes used should be a Solid (Steel) copper-bonded electrode with 250 microns of bonding thickness
- The electrode should be minimum of 16 mm by diameter and 2000 mm by length, placing should be 500 mm from ground level.
- Earth backfill compound - Clay based (High Moisture), Graphite based (For normal soil conditions) and

  Bentonite based (For rocky soil conditions) should be used.
- Earth pit should should be filled with back fill compound.
- Earth pit should be 6-inch by diameter and 2500 mm by depth (As long as the electrode's length.)
- Individual earthing for AC Loads should be provided for these components: Grid input protection box, Inverter/PCU, Changeover Switches and connected loads. These all should be connected using MET (Main Earthing Terminal – Busbar).

- Individual earthing for DC Loads should be provided for these components: A.J.B and Battery rack. These all should be connected using MET (Main Earthing Terminal – Busbar).
- Individual earthing for Lightning Arrester should be provided.
- Interconnection of LA earthing - Each lightning arrester will have its respective down conductors going down to the respective earth pits. The lightning arresters are to be Inter-connected at the roof, to enhance the efficacy of the protection, using the down conductor same as the specified in the BOM. Additionally, the earthing pits allocated for the lightning arresters are to be interconnected below the ground (0.5 metres) to enhance the efficacy of the protection, using the down conductor same as the specified in the BOM. This equipotential bonding approach needs to be strictly incorporated at all sites of installations.
- A minimum of 3 m distance between each pit must be maintained and 1.5 m from building foundations and sumps.
- Lightning arrester earthing pit should not be mixed with other earth pits and should be well spaced away from them.
- Earthing pits should have a chamber set at the ground level and should be closed with a metallic lid/F.R.P lid and should have access for maintenance.
- Cable lugs of 16 Sq.mm with insulation should be used for cable-type down conductors to connect with the electrode.
- Proper cable-to-rod & strip-to-rod clamps should be used.
- Clamp materials should be that of stainless steel.
- Earth pit resistance should ideally be 0.5 Ohms and should not exceed 5 Ohms.
- All the earth pits should be given an identification/marking to the devices/structures they are connected to.
- The earthing electrodes used in the project should have CPRI test certification.

NOTE:

G.I electrodes are not allowed in the installation.
Approval from SELCO Foundation should be sought before finalizing the choice of brand for earth electrodes.

10. CABLES (Over-ground cables):

GENERAL INDOOR/AC CABLES:

(Grid input to G.I.P.B -> Inverter -> Changeover switch -> Load distribution box) -> Changeover switch (Solar & Grid-DG input)

Stranded cable conductors should be made of high purity annealed 99.97% electrolytic grade copper with unadulterated FR PVC insulation.

Cable size as mentioned in the bill of materials to be used in the project.

The cables used shall have the following characteristics:

- High thermal stability and temperature withstanding range: -15°C to +85°C.
- Should have a temperature index of 300°C.
- Should have excellent resistance to heat, cold, water, oil, abrasion & UV radiation.

- Should have flexibility & higher bending capacity- 8D minimum bending radius (EFFR wires).
- Should have anti-rodent & anti-Termite resistant properties.
- Should have a high oxygen index (LOI) of > 30%.
- Should have high insulation resistance/Rated for nominal voltage (Uo/U): 600/1100 V.
- Should have low conductor resistance (Maximum conductor resistance at 20°C < 7.41 Ω).
- Should have low smoke density and emissivity (Corrosive halogen acid & toxic gasses below 18%).
- Should be 100% bunching & 100% conductive.
- Should be lead free.

NOTE:

The cables chosen for the project:

- should have passed the flame-resistant flammability test.
- Should confirm the sizing standards tests.
- Should be RoHS & Reach Compliant and should be NABL accredited.
- Cables of multiple brands should not be used in the installation.
- Should have the IEC, CE & ISI certification
- Cables of multiple brands should not be used in the installation

Also, approval from SELCO Foundation should be sought before finalizing the choice of brand for AC cables.

SOLAR CABLES/D.C. CABLES/OUTDOOR CABLES:

(Panels -> arrays -> A.J.B -> inverter)
Solar cables should have these specified constructional features:

Type PV1 - F (With double insulation)

- **Conductor:** Fine stranded Wire Tinned Copper Conductor according to BS EN 60228:2005 cl. 5
- **Insulation:** UV resistant, cross linkable, halogen free, flame-retardant compound for core insulation
- **Core Identification:** Red/Black
- **Sheath:** UV resistant, cross linkable, halogen free, flame-retardant compound for Sheath over insulation
- **Cable Colour:** Red/Black
- **Voltage Rating:** 0.6 / 1.0 kV

BATTERY CABLES:

(Battery -> Battery -> Inverter)
Battery cables should have these specified constructional features:

- **Cable type:** Flexible cable
- **Insulation type:** Double Insulation
- **Insulation material**: Rubber with Flame-retardant, Oil-resistant
- **Conductor:** Fine multi stranded wires, Tinned Copper Conductor
- **Cable colour:** Black

- **Core Identification: White**
- **Crimping:** Both ends crimped
- **Voltage Rating:** 0.6 / 1.0 kV

NOTE:

- Cables of multiple brands should not be used in the installation.
- Should have the IEC, CE & ISI certification

The DC cables chosen for the project should have the following tests passed:

- Flame resistant flammability test.
- The sizing standards tests
- RoHS & reach compliant

Also, approval from SELCO Foundation should be sought before finalizing the choice of brand for DC cables.

A. - COLOR CODING & LABELING:

- Correct color codes should be followed for the laying of the cables.
- For the DC side - Red color for the positive side and Black color for the negative side should be incorporated and cables of other colors should not be used.
- For the AC side/Single phase - Both input and output (DB) of the inverter, Black color to be used for the neutral and Red color to be used for the line.
- For the AC side/Three phase - Both input and output (DB) of the inverter, Black color to be used for the neutral and Red, Blue & yellow color to be used for the lines.
- For earthing - Green-Yellow color should be used for the earth down conductors.
- Labelling:
- Each set of cables should be appropriately labelled by mentioning their origin point and their terminal point and should be easily identifiable for maintenance purposes.
- The components to which the cables are interconnected to, should be clearly labelled
- Labels should be made using permanent markers on white label tags

The cable should be so selected that it should be compatible up to the life of the solar PV panels i.e., twenty-five
(25) operational years. Cable ends should be crimped along with cable lugs thoroughly using appropriate lugs. This cable-lug interface must be Insulated. Tin-coated copper cable lugs with respect to cable sizes should be used and they should be of required current ratings. Connectors (MC4) used for the solar cables should be of an IP-67 rating or higher.

Conduit pipe protection to be given to cables connecting:

1. Battery to battery,
2. Battery to inverter,
3. All cables entering the inverter.

DC/Solar cables from PV arrays and earthing cables should be given UPVC pipe protection. The end points of the conduit pipes should be protected from the rainwater/termites/insect's ingress by using appropriate sealant (Foam duct sealant). Cable Tie for outdoor application should be UV resistant. UPVC long “L-bend” pipes to be used wherever the cables pass through sharp edges/roof edges/angles in the wall.

AC cables entering the inverter from the grid input box, and all cables running from inverter up to the main distribution board should be provided with UPVC conduit pipe protection as well.

UPVC conduit pipes of 19 mm by diameter should be used. UPVC long-L-bends of 19 mm diameter should be used at the corners, edges. UPVC 2-way/3-way junction boxes should be used at regular spacing for maintenance purposes. The brands used here should be **ISI** certified.

NOTE:

- Cables should not be left open and should be covered through conduit pipes.
- For DC connections use only DC cables and same for AC connections use only AC cables and do not interchange or mixed.
- Ordinary PVC conduit pipes, bends and junction boxes are not allowed in the installation/to protect the DC & AC cables.

10.A - LOAD WIRING:

Type-1, 100% new load wiring (For PHC, HWC & SC):

- Upon installation of the solar PV systems, the output power from the P.C.U should be fed to solar loads only.
- Non-solar loads i.e., loads other than i.e., heavy loads and non-critical loads, should be separated from the solar lines and these non-critical loads should be simultaneously powered using grid power (using the separate wiring at the health center). The provision to separate the solar loads & non-solar loads using two separate sets of wiring should be made at the health centers on a top-priority basis.
- Laying of cables should be followed by strictly implementing the below mentioned clauses of annexure 2:
- 10: Cables/AC cables
- 10-A: Colour coding & labelling
- 9.2: Earthing
- 11: Change-over switches
- Cable & lug sizes should be as per relevant load capacity/wattage.
- Cable tools such as wire stripper, crimping tools and heat shrink sleeve kits should be used to manage the cables
- Hammer drill tool set, along with core drill-bit should be used to manage cables through the walls
- UPVC solid conduit pipe protection should be provided to protect the connections (new cables laid) made throughout the center. UPVC Junction boxes should be used at junction points for ease of installation and maintenance. Long UPVC bends should be used at sharp edges and bends in the wall.
- Labeling should be done for the components and connections as mentioned below:
    - **Label the Non Solar Loads:**
        - The gang box of the 3-pin sockets provided should be provided with a sticker and the sticker should be 3 Sq. inch by area.
        - The sticker should have a main title **"Grid Power"** on top and a subtitle on the bottom. The name of the solar load that is to be connected with the socket should be mentioned in the subtitle (Say AC, Autoclave, Water Pump etc)
        - Stickers should be pasted such that the name of the non solar load can be seen from the front of the socket and the other part of the sticker covers the side of the gang box.

- **Label the changeover switch 1:**
  - Outside the door of the switch, all three positions of the lever should have sticker in BOLD LETTERS namely **"Solar - Off - Grid/DG"**
  - The incoming solar lines, the grid/DG lines from COS-2 and the outgoing lines to new DB should be labeled
- **Label the changeover switch 2:**
  - Outside the door of the switch, all three positions of the lever should have sticker in BOLD LETTERS namely **"Grid - Off - DG"**

11. CHANGE-OVER SWITCHES:

- Knife-type, metal case changeover switches should be used
- Plastic case changeover switches should not be used.
- Changeover switches as per the B.O.M specifications should be used.
- Labeling of the entry & exit points of cables should be clearly marked.
- The lever position at the changeover switch for “Solar” - “Off” - “Grid” should be clearly marked with
  permanent marker/labels.
- Metal case should be provided with earthing protection.

12. Remote Monitoring / Data Acquisition System:

Inverter should have the RS 485 communication port and the following are the details to be provided:

- Protocol documentation of the inverter model (with clarity of firmware version and models supported).
- Mod bus registers mapping document or string data of the inverter model.

13. PLAQUES, SLD, SIGN BOARDS, BOM & LOAD DETAILS:

Foam Plaques:

- “DOs & DON’Ts” practices for panel, battery and P.C.U handling/routine maintenance tips
- should be pasted at the battery-inverter room
- The size of the plaque should be of A4 size for each component i.e panel, battery & P.C.U maintenance. All the three plaques should then be made as one unit for better geometry of appearance and application over the wall.
- The plaque should carry the contact details of the vendor incharge of the projects, with their office address and customer care contact details. It is suggested to also have alternate contact details included in it for better reach out.
- The plaque should be of the dimensions specified in the BOM
- The plaque should be placed at an average height of 5 feet above the ground at the entrance of the battery-inverter room and should be easily readable.
- Both local language and English should be incorporated in description of details in the plaque
- Strong adhesive (Double sided glue tape) along with washer-screw-wall plugs, should be used to keep the plaques firmly stuck to the wall

Metal plaques:

- The plaques should be placed at the entrance of the main building or at the reception counters making them easily noticeable for the visitors at the hospital
- The plaque should be placed at a height of 6-feet from the floor and mounted firmly over the wall using self-tapping screws and plastic reinforcement
- Plaques of two sizes will be provided. The bigger sized plaques are to be used at the district hospitals, sub district hospitals & community health centers, while the smaller ones are to be used at the primary health centers, health and wellness centers, primary health sub centers/sub centers.

SLD of PV system:

- A single line diagram of the entire solar PV system components installed and the way they are interconnected at the center should be clearly printed along with their electrical specifications mentioned for each component.
- The size of the SLD board should be as per the BOM specifications as it varies for different types of health centers
- The Sunboard material used to draw the SLD should be a minimum of 3-mm thick and should be glued to the wall firmly along with washer-screw-wall plugs, should be used to keep the plaques firmly stuck to the wall
- The SLD board should be placed in the same room as that of the battery-inverter set-up, and depending upon the room condition the SLD board should be placed such that it gets maximum visibility

Note:

SELCO Foundation will provide the content for SLD.

Sign boards:

- A caution sign board mentioning prohibition of smoking and open flames should be placed at the entrance of the battery-PCU room.
- High voltage & Danger symbol to be depicted at the entrance of the room
- Fire extinguisher operating procedure (PASS sequence) during emergency

Earth pits:

- Each earth pit should be given a labelling to identify the systems they are connected to.
- The size of the sign board should be of A5 size and should be supported by a GI pole of 2.5 feet tall (1.5 feet above the ground), of 2 mm thickness and of 120-micron galvanizing thickness.
- The sign board should have the details

Earth pit number

- Earth pit connected to
- Ohmic value of the earth pit
- Tested date

14. FIRE EXTINGUISHERS:

The chosen fire extinguishers should be of the ABC Dry powder extinguishing agents or CO2 type with a minimum of 2 Kgs (Sub Centre) and 6 Kgs (Primary Health Centre) of charge or more in the cylinder. The fire extinguishers should be PESO/CCOE approved and CE certified.

Fire extinguishers should have the features as follows:

- Average discharge (%): >95%
- Average discharge time: >9 sec
- Average range of throw: >2 meters
- Operating temperature: -30°C to +60°C
- Fire rating: >1A:34B

Fire extinguishers should have the characteristics as follows:

- Non conductive
- Maximum visibility during discharge
- No thermal (or) static shocks

NOTE:
The fire extinguisher should be placed at the entrance of the battery room and should be serviced periodically to ensure there is proper charge and pressure in the cylinder.

15. SYSTEM COMPLETION-HANDOVER REPORTS:

- Once the installation is complete, the system functionality should be verified, and the instantaneous electrical parameters should be recorded and should be mentioned in the report and the same should be submitted to the SELCO foundation.
- The format sequence to record the parameters should be collected from SELCO foundation.
- All the components used in the installation process, their specifications, the quantity used, grand total should be clearly specified.
- Close-up pictures of the main components of solar PV set-up with GPS coordinates clicked at respective

  sites should be submitted along with the completion report and should be in the order as follows:
- Solar PV arrays
- A.J.B
- Battery bank
- P.C.U set-up
- G.I.P.B
- Combiner box
- Earth pits
- Lightning arrester
- Change-over switches
- Cable management (outdoor & indoor)

- Foam plaques
- Metal plaques
- SLD
- Load details pasted
- Earth pit sign boards

16. TOOLS & TACKLES AND SPARES:

After completion of installation & commissioning of the power plant, necessary tools & tackles shall be maintained by the successful bidder for maintenance purposes at the local service center.

17. SAFETY MEASURES:

The bidder shall take entire responsibility for electrical safety of the installation(s) and follow all the safety rules & regulations applicable as per Electricity Act, 2003 and CEA guidelines etc.
The work is to be done in a Health Centre that will be in service. During installation, care shall be taken to ensure no hindrance is caused to patients and medical professionals in the building while they will be on their work.

18. OPERATION AND MAINTENANCE MANUAL:

An operation, instruction and maintenance manual in English and/or local language should be provided along with the solar system. The following minimum details must be provided in the manual:

- Basic principles of photovoltaics.
- A block diagram on Solar PV System - Showing interconnection of its components viz PV modules, batteries, inverters & Charge controls and loads.
- A small write up on expected performance of the SPV systems.
- A list of the critical loads (luminaries and medical equipment) that are to be connected to the solar PV system.
- A separate list of heavy loads which are never to be connected to the system.
- A list containing specification details of panels, batteries, P.C.U., showing type of the model used, model number, voltage & current capacity
- A list of total numbers of items (Solar panels, battery, inverter, earthing pits, lightning arresters, luminaries, fans and medical equipment) that are provided to the center.
- Significance of audio and visual indicators of the solar PV system.
- A SLD of the system installed.
- Clear instructions on regular maintenance and troubleshooting of the solar PV System.
- A list of DOs and DON'Ts practices while handling the solar PV system.
- Name, address and contact details of the customer care service/service provider for repair complaints and scheduled & unscheduled maintenance services.

19. ANNUAL MAINTENANCE:

- Two Scheduled visits per year with 6 months of interval gap should be done.
- Schedule visits should consist of basic maintenance of the system:
- Cleaning of panels and inspecting their condition and performance
- Cleaning of batteries & inspect the battery performance.
- Inspecting inverter performance.

- Verifying the battery-inverter room has proper ventilation maintained
- Verifying the DOs & DON'TS plaques, SLD & load details sheets are present in the battery room
- Verifying the connectivity & condition of earth pits, ensure the resistance of the earth pits is below 5 Ohms
- Inspecting complete wiring (solar PV system with loads connected) as per bill of material.
- Verifying that non-solar loads are not connected to solar system
- Ensure all the solar loads (luminaries, fans, medical equipment) are functional.
- Verifying all the control switches & regulators of solar loads are functional
- Ensuring the lightning arrester set-up is intact
- Checking and verifying system performance with prescribed format provided by SELCO Foundation.

Annexure 1G

Subcentre Without Delivery Load Details					
Sl.No	**Name of the Room**	**Load Type**	**Suggested Power Rating (Watt)**	**Qty (Nos)**	**Total Load (Watt)**
1	Waiting Area	LED Bulb	9	1	9
2	OPD Room	LED Tubelight	20	1	20
		Wall Mounted Fan	55	1	55
		Needle Cutter	60	1	60
		Mobile Charging	25	1	25
3	Dressing Room	LED Tubelight	20	1	20
		Wall Mounted Fan	55	1	55
		Refrigerator	100	1	100
4	Store Room	LED Bulb	9	1	9
5	Kitchen	LED Bulb	9	1	9
	Toilet	LED Bulb	9	1	9
	Outside	Outdoor Light	20	1	20
					391

Subcentre With Delivery Load Details					
Sl.No	**Name of the Room**	**Load Type**	**Power Rating (Watt)**	**Qty (Nos)**	**Total Load (Watt)**
1	Waiting Area	LED Bulb	9	1	9
2	OPD Room	LED Tubelight	20	1	20
		Wall Mounted Fan	55	1	55
		Needle Cutter	60	1	60
		Mobile Charging	25	1	25
3	Dressing Room	LED Tubelight	20	1	20
		Wall Mounted Fan	55	1	55
4	Labour Room	LED Tubelight	20	1	20
		Wall Mounted Fan	55	1	55
		Baby Warmer	800	1	800
		Suction Machine	180	1	180
		Spot Light	20	1	20
		Refrigerator	100	1	100
5	MCH Room	LED Bulb	9	1	9
		Wall Mounted Fan	55	1	55
6	Store Room	LED Bulb	9	1	9
7	Kitchen	LED Bulb	9	1	9
	Toilet	LED Bulb	9	1	9
	Outside	Outdoor Light	20	1	20
					1530

Primary Health centre Load Details					
Sl.No	**Name of the Room**	**Load Type**	**Power Rating (Watt)**	**Qty (Nos)**	**Total Load (Watt)**
1	Entarnce / Waiting Area	LED Bulb	9	2	18
		Water Purifier	60	1	60
2	OPD Room	LED Tubelight	20	1	20
		Wall Mounted Fan	55	1	55
		X Ray Viewer	45	1	45
		Needle Cutter	60	1	60
3	Office	LED Bulb	9	1	9
		Wall Mounted Fan	55	1	55
		Desktop	100	1	100
		Printer	120	1	120
4	Doctor Room	LED Tubelight	20	1	20
		Wall Mounted Fan	55	1	55
5	Labour Room	LED Tubelight	20	2	40
		Wall Mounted Fan	55	1	55
		Baby Warmer	800	1	800
		Suction Machine	180	1	180
		Spot Light	20	1	20
		Oxygen Concentrator	550	1	550
	Toilet	LED Bulb	9	1	9
6	Cold Chain Room	LED Bulb	9	1	9
		ILR	140	1	140
		Deep Freezer	138	1	138
7	Laboratory	LED Tubelight	20	1	20
		Wall Mounted Fan	55	1	55
		Microscope	60	1	60
		Centrifuge	230	1	230
		Semiauto Analyser	100	1	100
		Hematology Analyser	200	1	200
8	Male Ward	LED Tubelight	20	2	40
		Wall Mounted Fan	55	1	55
		Mobile Charging	25	1	25
	Toilet	LED Bulb	9	1	9
9	Female Ward	LED Tubelight	20	2	40
		Wall Mounted Fan	55	1	55
		Mobile Charging	25	1	25
	Toilet	LED Bulb	9	1	9
10	Dressing Room / Minor OT	LED Tubelight	20	1	20
		Wall Mounted Fan	55	1	55

		Neubilizer	60	1	60
		ECG Machine	65	1	65
11	Pharmacy	LED Bulb	9	1	9
		Wall Mounted Fan	55	1	55
		Refrigerator	100	1	100
12	Physiotheraphy	LED Bulb	9	1	9
13	Nurse Duty Room	LED Bulb	9	1	9
		Wall Mounted Fan	55	1	55
14	MCH Room	LED Bulb	9	2	18
15	Store Room	LED Bulb	9	1	9
16	Corridor	LED Bulb	9	3	27
17	Kitchen	LED Bulb	9	1	9
	Toilet	LED Bulb	9	1	9
	Outside	Outdoor Light	20	2	40
					4030

Annexure-2

Sl.No	Name of the health facility	Health facility type	District	Block/Taluk	Village	Pin code
1	Naga Namgor	Health C Wellness Center	North Sikkim	Mangan	Naga Namgor	737116
2	Singhik	Health C Wellness Center	North Sikkim	Mangan District	Singhik	737116
3	Tinghchim	Health C Wellness Center	North Sikkim	Zongu	Thingchim	737116
4	Tingbong	Health C Wellness Center	North Sikkim	Pasingbong	Tingbong	737116
5	Ramthang	Health C Wellness Center	North Sikkim	Pudung	Ramthang	737116
6	Kabi Tingda	Health C Wellness Center	North Sikkim	Kabi	Lingchum	737116
7	Simick Lingzey	Health C Wellness Center(Delivery)	Gangtok	Sang	Simick Lingzey	737134
8	Namok	Health C Wellness Center	North Sikkim	Pudung	Namok	737116
9	Gnathang	Health C Wellness Center	Pakyong	Rongli	Gnathang	737131
10	North Regu	Health C Wellness Center	Pakyong	Rongli	North Regu	737131
11	Lamaten	Health C Wellness Center	Pakyong	Regu	Lamaten	737131
12	Aritar	Health C Wellness Center	Pakyong	Rhenock	Aritar	737133
13	Sudunglakha	Health C Wellness Center	Pakyong	Rhenock	Sudunglakha	737133
14	Radhu Khandu	Health C Wellness Center	Gyalshing	Dentam	Radhu Khandu	737113
15	Dodak	Health C Wellness Center	Soreng	Soreng	Dodak Village	737121
16	Uttarey	Health C Wellness Center	Gyalshing	Dentam	Uttarey Village	737113
17	Sripatam	Health C Wellness Center	Namchi	Yangang	Sripatam	737134
18	Manglay	Health C Wellness Center	Namchi	Tokelbermoik	Manglay	737134
19	Turuk	Health C Wellness Center	Namchi	Melli	Turuk, Village	737128
20	Maniram Vanzyang	Health C Wellness Center	Namchi	Namthang	Bhanjyang	737126
21	Pachak	Health C Wellness Center	Pakyong	Duga	Pachak	737132
22	Namlung Ralong	Health C Wellness Center	Namchi	Ravanla	Ralong	737139
23	Chemchey	Health C Wellness Center	Namchi	Namchi	Chemchey	737126
24	Sangmo	Health C Wellness Center	Namchi	Rabong	Shangmoo	737139
25	Luing	Health C Wellness Center	Gangtok	Sandong	Luing	737101
26	Penlong	Health C Wellness Center	Gangtok	Sandong	Penlong	737103
27	Lower Kamrang	Health C Wellness Center	Namchi	Namchi	Kamrang	737126
28	Phongla	Health C Wellness Center	Namchi	Namthang	Phongla	737126
29	kabrey	Health C Wellness Center	Namchi	Namthang Rataytapani	Kabrey	737132
30	Tareythang	Health C Wellness Center	Pakyong	Machong	Tareythang	737106
31	Lower Bering	Health C Wellness Center	Pakyong	Singtam	Beering	737106
32	Barapathing	Health C Wellness Center	Pakyong	Parkha	Barapathing	737131
33	Changey	Health C Wellness Center	Pakyong	Pakyong	Changey	737103
34	Tinkitam	Health C Wellness Center	Namchi	Ravangla	Tinkitam	737139
35	BEN	Health C Wellness Center	Namchi	Temi	Ben	737134

36	Tingmoo	Health C Wellness Center	Namchi	Jorethang	Tingmoo	737139
37	Rateypani	Health C Wellness Center	Namchi	Namthang	Rateypani	737128
38	Damthang	Health C Wellness Center	Namchi	Temi	Damthang	737126
39	Kitam	Health C Wellness Center	Namchi	Namchi	Kitam	737126
40	Neh Brum	Health C Wellness Center	Namchi	Wangang	Neya Brum	737134
41	Lingmo	Health C Wellness Center	Namchi	Yangang	Lingmoo	737134
42	Aho	Health C Wellness Center	Pakyong	Pakyong	Aho Yangtan	737135
43	Temi	Primary Health Center	Namchi	Temi	Temi	737134
44	Bimbong	Health C Wellness Center	Namchi	Namthang South	Bimbong	737132
45	Sumbuk	Health C Wellness Center	Namchi	Sumbuk	Sumbuk	737128
46	Jarrong	Health C Wellness Center	Namchi	Ravangla	Jarrong	737139
47	Phamtam	Health C Wellness Center	North Sikkim	Kabi	Phamtam	737116
48	Central Pendam	Health C Wellness Center	Pakyong	Duga	Central Pendam	737132
49	Hee-Yangthang	Health C Wellness Center	Gyalshing	Dentam	Hee-Yangthang	737111
50	Naku Chungpung	Health C Wellness Center	Gyalshing	Naku Pelling	Naku Chumbung	737113
51	Samdong Kaluk	Health C Wellness Center(Delivery)	Soreng	Rinchenpong	Samdong	737121
52	Boom Reshi	Health C Wellness Center	Soreng	Rinchenbong	Boom Reshi	737121
53	Gerethang	Health C Wellness Center	Gyalshing	Arithang Chongrang	Gerethang	737111
54	Singling	Health C Wellness Center	Soreng	Soreng	Singling	737121
55	Nandok HWC	Health C Wellness Center	Pakyong	Nandok Saramsa	Nandok	737135
56	Yangsum HWC	Health C Wellness Center	Gyalshing	Hee Martam	Yangsum	737113
57	Zoom	Health C Wellness Center	Soreng	Soreng	Zoom	737121
58	Pakkigoan	Health C Wellness Center	Soreng	Budang	Pakkigoan	737121
59	Buriakhop	Health C Wellness Center	Soreng	Soreng	Bruriakhop	737121
60	Daramdin	Health C Wellness Center(Delivery)	Soreng	Lower Thambong	Daramdin	737121
61	Martam	Health C Wellness Center	Gangtok	Sang	Martam	737135
62	Ray Mindu	Health C Wellness Center	Gangtok	Ranka	Rey Mindu	737134
63	Sada Phamtam	Health C Wellness Center	Namchi	Rabangla	Sada Phamtam	737139
64	Nandugaon	Health C Wellness Center	Namchi	Jorethang	Nandugaon	737121
65	Lingi Pakyong	Health C Wellness Center	Namchi	Yangang	Lingee	737134
66	Pangthang	Health C Wellness Center	Gangtok	Pangthang	Pangthangg	737103
67	Deythang	Health C Wellness Center	Soreng	Kalukringenpong	Deythang	737121
68	Nambu	Health C Wellness Center	Gyalshing	Yaksom	Nambu	737111
69	Lingden	Health C Wellness Center	North Sikkim	Pasingang	Lingdem	737116
70	Phadamchey	Health C Wellness Center	Pakyong	Pakyong	Padamchey	737106
71	Ship Ger	Health C Wellness Center	North Sikkim	Chungthang	Ship Ger	737120
72	Loom	Health C Wellness Center	North Sikkim	Zangu	Loom	737107
73	Lachen	Health C Wellness Center	North Sikkim	Chungthang	Lachen	737120
74	Legship	Health C Wellness Center	Gyalshing	Geyzingomchung	Legship	737111
75	Chota Samdong	Health C Wellness Center	Soreng	Chakungthumbong	Chota Samdong	737121

76	Reshi	Health C Wellness Center	Soreng	Mangalagiri	Reshi	737121
77	Okhrey	Health C Wellness Center	Soreng	Daramdin	Okhrey	737121
78	Kateng Bokrong	Health C Wellness Center	Namchi	Namthang	Kateng	737132
79	Chumbung HWC	Health C Wellness Center	Soreng	Soreng	Chumbung	737121
80	Shyagyong Rumtek	Health C Wellness Center	East Sikkim	Ranka	Rumtek	737135
81	Basilakha	Health C Wellness Center	Pakyong	Namchebong	Basilakha	737106
82	Sadam	Health C Wellness Center	Namchi	Sumbuk	Sadam	737128
83	Kholagari	Health C Wellness Center	Namchi	Jorethang	Kholagari	737126
84	Lingzo	Health C Wellness Center	Namchi	Rabangla	Lingzoo	737139
85	Rayong	Health C Wellness Center	Namchi	Rabangla	Rayong	737126
86	Darap	Health C Wellness Center	Gyalshing	Darap	Darap	737113
87	Ribdi Bhareng	Health C Wellness Center	Soreng	Sombaria	Ribdi Bhareng	737121
88	Namthang	Primary Health Center	Namchi	Namthang	Namthang	737111
89	Zeel Hatidunga	Health C Wellness Center	Soreng	Kaluk	Zeel Hatidunga	737111
90	Hee Gyathang	Primary Health Center	North Sikkim	Hee Gyathang	Hee Gyathang	737116
91	Passingdong	Primary Health Center	North Sikkim	Passingdong	Passingdong	737116
92	Dikchu	Primary Health Center	North Sikkim	Dikchu	Dikchu	737137
93	Paney Phensong	Health C Wellness Center	North Sikkim	Kabi	Paney Phensong	737116
94	Mangalbaria	Primary Health Center	Soreng	Mangalbaria	Mangalbaria	737111
95	Bangten	Health C Wellness Center	Gyalshing	Bentam	Bangten	737113
96	Ravangla	Primary Health Center	Namchi	Ravangla	Ravangla	737139
97	Phodong	Primary Health Center	North Sikkim	Kabi	Phodong	737119
98	Machong	Primary Health Center	Pakyong	Parkha	Machong	737106
99	Kamling	Health C Wellness Center	West Sikkim	Mangalbaria	Kamling	737121
100	Yang Yang	Primary Health Center	East Sikkim	Yang Yang	Yang Yang	737134
101	West Pendam	Health C Wellness Center	Pakyong	Rangpo	Sakhu	737134
102	Pubuik Naitam	Health C Wellness Center	Pakyong	Nandok	Pabuik Naitam	737135
103	Rolep	Health C Wellness Center	Pakyong	Regu	Rolep	737131
104	Subaneydara	Health C Wellness Center	Pakyong	Rongli	Subaneydara	737131
105	Ranka	Health C Wellness Center	Gangtok	Sang	Ranka	767103
106	Samdong	Primary Health Center	Gangtok	Samdong	Samdong	737107
107	Pakyong	Primary Health Center	Pakyong	Pakyong	Pakyong	737106
108	Naya Bazar	Health C Wellness Center	Soreng	Soreng	Naya Bazar	737121
109	Sakyong	Health C Wellness Center	Gaijing	Tashiding	Sakyong	737111
110	Soreng	Primary Health Center	Soreng	Soreng	Soreng	737121
111	Rongbul	Health C Wellness Center	Namchi	Melli	Rongbul	737126
112	Tashiding	Primary Health Center	Gyalshing	Chongrang	Passingding	737111
113	Sakyong Pentong	Health C Wellness Center	MANGAN	Passingdong	Pentong	737111
114	Melli Dara	Primary Health Center	Namchi South	Melli	Meli Bazar	731128
115	Bermiok	Health C Wellness Center(Delivery)	Namchi	Heemartam	Bermiok	737113

116	Gor	Health & Wellness Center	North Sikkim	Dzongu Under Hee Yathang Phc	Gor	737116
117	Sang	Primary Health Center	Gangtok	Martam	Sang	737134
118	POLOT	Health & Wellness Center	Namchi	Ravangla	Polot	737139
119	Khanisherbong	Health & Wellness Center	Soreng	Mangalbaria	Khanisherbong	737121
120	Khamdong	Health & Wellness Center	Gangtok	Sang	Khamdong	737134
121	Middle Camp	Health & Wellness Center	Gangtok	Namli Gpu	Middle Camp	737135
122	Duga HWC	Health & Wellness Center	Pakyong	Rangpo	Duga	737132
123	Wok	Health & Wellness Center	Namchi	Jorethang	Wok	737126
124	Assam Lingey	Health & Wellness Center	Pakyong	Pakyong	Assam Lingey	737135
125	Siktam Tipur	Health & Wellness Center	Soreng	Sombaria	Tikpur	737121
126	Rhenock	Primary Health Center	Pakyong	Rhenock	Rhenock	737133
127	Rinchengpong	Primary Health Center	Soreng	Kaluk	Rinchenpong	737121
128	Salim Pakel	Health & Wellness Center	North Sikkim	Chungthang	Salim Pakyel	737116
129	Rangpo	Primary Health Center	Pakyong	Rangpo	Upper Bazar Rangpo	737132
130	Lingtam	Health & Wellness Center	Pakyong	Reghu	Lingtam	737131
131	South Regu	Health & Wellness Center	Pakyong	Regu	South Regu	737131
132	Makha	Health & Wellness Center	Gangtok	Rakdong Tintek/Samdong	Makha	737134
133	Lachung	Health & Wellness Center	North Sikkim	Lachung	Lachung	737120
134	Tokal Bermoik	Primary Health Center	Namchi	Tokal Bermoik	Tokal Bermoik	737113
135	UPHC-Gangtok	Primary Health Center	Gangtok	Gantok	Gangtok	737101
136	UPHC-Ranipool	Primary Health Center	Pakyong	Saramsa	Saramsa	737102
137	Pelling	Health & Wellness Center	Gyalshing	Geyzing	Pelling	737113