Terms of Reference (TOR)

ENERGY FOR HEALTH – BANASKANTHA DISTRICT, GUJARAT

Agency for Quality & Safety Check of Solar Installation at the Public Health Facilities at Banaskantha District, Gujarat

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 Banaskantha District, Gujarat.
Timeline	3 Months (Nov 2024 – Jan 2025)
Expected area of expertise	Solar agencies/consultants for the quality check
Apply link	https://forms.gle/B4iSUPPJ2aUZU7tb7 (Contact Procurement for Form Link)
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 Banaskantha District, Gujarat.

The SELCO Foundation plans to have a quality and safety check of installed Solar DRE systems in public health facilities in Banaskantha District, Gujarat. 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 200 Health facilities in Banaskantha District, Gujarat 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
7	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:

Tentatively from 18th 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 Banaskantha District, Gujarat.

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/B4iSUPPJ2aUZU7tb7 on before **15th 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 Banaskantha District, Gujarat."

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 (✗)**	**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	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			
10	R.C.C. roof, regular set-up: Front side clearance from the roof surface and the panel is 2-feet			
11	R.C.C. roof, regular set-up: The length of concrete work is 1 ft. x 1 ft. x 1 ft. (LxBxH)			
12	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)			
13	The orientation of the panel is south facing (For sites in India)			
14	Tilt angle of the panel is as per the latitude of the location			
15	Tin roof: 4-Inch uniform elevation from the sheet roof and the panel is seen			
16	Tin roof wind deflectors: Wind deflectors are firmly fastened at the back of panels			
17	Tin roof: E.P.D.M./Silicone gel/Butyl sealant used			
18	M.M.S. & Panel are given earthing protection			
19	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			
Charge Controller Setup (if Applicable)				
1	Charge Controllers have the same technical specifications as mentioned in the B.O.M sheet			
2	Charge Controllers have the serial number & barcode mentioned over them			
3	There are no damages seen on the Charge Controller body			
4	Charge Controller display is clearly readable			
5	Good ventilation space is provided around the Charge Controller			
6	There is no direct sunlight over the Charge Controller			
7	The Chargecontroller is placed in a clean, dust-free and dry place			
8	There are no flammable materials placed around the Chargecontroller			
9	Charge controller is easy to reach and easy to read the display parameters			
10	Cables entering the charge controller are intact, and there is no loose connection			
11	Cables connected with chargecontroller are given conduit pipe protection			
12	Settings are made in the charge controller			
13	Cable sizes used are as per the B.O.M. specifications			
14	Cables don’t coil or lie on the floor			
Inverter/P.C.U. Setup				
1	Inverters have the same technical specifications as mentioned in the B.O.M sheet			
2	Inverters have the serial number & barcode mentioned over them			
3	There are no damages seen on the inverter body			
4	Inverter display is clearly readable			
5	Inverter makes minimal noise during operations			
6	The room is well ventilated			
7	Good ventilation space is provided around the inverter			
8	3-inch ground clearance is provided for ventilation (< 2 kVA systems)			
9	There is no direct sunlight over the inverter			
10	The inverter is placed in a clean, dust-free and dry place			
11	There are no flammable materials placed around the inverter			
12	Inverter is easy to reach and easy to read the display parameters			
13	Cables entering the inverter are intact, and there is no loose connection			
14	Cables connected with inverter are given conduit pipe protection			
15	Priority settings are made as Solar-> Battery-> Grid			
16	Cable sizes used are as per the B.O.M. specifications			
17	Cables don’t coil or lie on the floor			
18	Battery-Inverter distance is 50 cm. to 75 cm.			
Changeover Switch Setup				

1	Changeover switches have the same technical specifications as mentioned in the B.O.M. sheet			
2	Labelling is made for both the changeover switches			
3	(In case of changeover switch-1) Connectivity for both solar and grid is checked			
4	(In case of changeover switch-1) The orientation of the switch is towards solar power			
5	(In case of changeover switch-2) Connectivity for both grid and generator are checked			
6	(In case of changeover switch-2) The orientation of the switch is towards grid power			
7	Changeover switches are firmly mounted to the walls			
8	Earthing protection is provided for the change-over switches including the doors			
Lightning Arrestor Setup				
1	Lightning arresters have specifications as mentioned in the B.O.M. sheet			
2	There are no physical damages seen to the L.A.s			
3	There is no corrosion seen in the L.A.s			
4	Insulation is provided between L.A.s & elevation pole (ceramic or porcelain insulators)			
5	Sheet roof: The entire L.A. set-up is firmly fixed over the roof surface using T-base			
6	R.C.C. roof: The entire L.A. set-up is firmly fixed over the roof surface using anchors and concrete blocks			
7	The L.A. set-up is given additional support by using support-wires			
8	R.C.C. roof: G.I. strips are supported with saddle insulators			
9	Sheet roof: G.I. strips are supported with capping-casing			
10	G.I. conductor strip does not make any contact with other D.C. cables or with any cables passing around			
11	The L.A. set-up stands vertical to the ground surface			
12	The L.A. maintains a distance of 0.75 metres from the panels			
13	The tip-height of the L.A. is 3-metre or more from the panel-top edge			
Earthing Pits Setup				
1	The no. of electrodes used, matches with the no. of electrodes mentioned in the B.O.M. sheet			
2	Electrodes have the same technical specifications as mentioned in the B.O.M. sheet			
3	There is no physical damages seen at the electrodes			
4	There is no corrosion seen over the electrodes			
5	The no. of earth pits made matches with the no. of earth pits as specified in the B.O.M. sheet			
6	Separate earth pit is provided for A.J.B., G.I.P.B., Inverter and lightning arrestor			
7	Chemical earthing is made, and the pit are filled with chemical powder, up to the tip/green mark of electrode			
8	Chambers are built around the earth pits			
9	Earth conductors are protected with conduit pipe, till the pits			
10	Earth conductors and electrodes are making full contact			
11	Distance between pit-to-pit is 3 meters			

12	Distance between pit to building foundation/water sump is 1.5 meters			
13	Earth electrodes are fully buried in the earth			
14	Earth pit diameter is 1-feet & 4-feet by depth			
15	Earthing pits are made at backyard of the centre			
16	Earthing cable are of the size as mentioned in the B.O.M.			
17	Earth pits are given identification/labelling (A.J.B., G.I.P.B., Inverter, L.A.)			
Cable Routing Setup				
1	The sizes of the cables used, matches with the specifications as mentioned in the B.O.M. sheet			
2	Cable lugs are used for termination of cables			
3	Cable lugs are properly crimped			
4	Cable lugs are insulated			
5	There are no loose connections seen at the end termination points			
6	Cables are given solid conduit pipe protection along their entire run			
7	u.P.V.C. conduit pipes are used for cable protection			
8	M.C.-4 connectors are properly interlocked			
9	Cables don't make unnecessary loops/circles			
10	(In case of overhead transmission from block-to-block), cables are given G.I. wire support along with conduit pipe protection, and are given pole-support from sagging			
11	Labelling of cables/conduit pipes are done for the panels, batteries, inverter and load side			
12	Dressing/laying of conduit pipes are neatly done			
13	Conduit pipes are firmly held to building surfaces with metal clamps			
Fire Extinguisher Setup				
1	The specifications of the fire extinguisher is as per the specification in B.O.M. sheet			
2	The pointer of the indicator lies in the green zone			
3	Fire extinguisher is placed at the entrance of battery-inverter room			
4	Fire extinguisher is placed in cool place			
5	Fire extinguisher can be easily reached and picked up			
Luminaries Setup				
1	The no. of L.E.D. bulbs & tube lights installed matches with the numbers as specified in the B.O.M. sheet			
2	The specifications of the luminaries are as per the specifications in the B.O.M. sheet			
3	The luminaries installed are functional			
4	There are no physical damages seen on the luminaries			
5	The luminaries are fixed firm over the wall/ceiling			
Fan Setup				
1	The no. of fans & regulators installed, matches with the numbers as specified in the B.O.M. sheet			
2	The specifications of the fans & regulators, are as per the specifications in the B.O.M. sheet			
3	The installed fans and regulators are functional			

4	Fans and regulators are intact and there is no physical damages seen			
5	Fan regulators control the speed at different levels			
6	The fans are fixed firm under the ceiling			
Medical Equipment Setup				
1	The no. of medical equipment installed, matches with the numbers as specified in the B.O.M. sheet			
2	Medical equipment is assembled and are functional			
M.C.B.s, A.C., D.C. Isolators & Load Side Protection Setup				
1	A.J.B.'s M.C.B. ratings are as per the B.O.M. specifications			
2	A.J.B.'s S.P.D. ratings are as per the B.O.M. specifications			
3	G.I.P.B.'s M.C.B. ratings are as per the B.O.M. specifications			
4	G.I.P.B.'s S.P.D. ratings are as per the B.O.M. specifications			
5	Load M.C.B. rating is as per the B.O.M. specifications			
6	When PV isolator is used: Switch disconnector installed is as per the B.O.M. specifications			
7	When battery isolator is used: Switch disconnector installed is as per the B.O.M. specifications			
8	When grid isolator is used: Switch disconnector installed is as per the B.O.M. specifications			
Metal Plaque Setup				
1	Metal plaques are installed at the reception/main-entrance of the health centre			
2	Metal plaque is clearly visible to the visitors at the health centre			
3	Metal plaques are not damaged			
DOs and DON'Ts Plaque Setup				
1	DOs and DON'Ts practices foam plaques are pasted in the Battery/Inverter room			
2	Size of the foam plaques are as per the B.O.M. specifications			
3	Plaques have the emergency contact details and the customer-care details mentioned in them			
4	The plaques are firmly attached to the wall using round-clips			
5	Plaques are easy to reach and read.			
Luminaries, Fans & Medical equipment Plaque Setup				
1	The B.O.M. sheet containing number of fans, luminaries & medical equipment provided to the health centre is pasted in the battery-inverter room			
Load Details Plaque Setup				
1	The load details sheet containing the list of solar loads which are to be connected to inverter is pasted in the battery-inverter room			
Solar System - Single Line Diagram Setup				
1	The S.L.D. of the solar system installed, is pasted in the battery-inverter room, and it is firmly pasted			
Other Sign Boards Setup				
1	High voltage/caution sign board is pasted at the entrance of the battery-inverter room			
2	No-fire poster is pasted at the entrance of the battery-inverter room			

3	PASS poster (Fire extinguishing instructions) is pasted at the entrance of the battery-inverter room			
Complete System Functional Status				
1	Solar system functionality is normal without any fault/warning messages			
Solar System - Documentation				
1	In-efficient equipment handover document is cleared			
2	Solar system handover document is cleared			
3	Installation completion report with electrical readings are made			
Load Wiring Installation Setup				
1	All critical solar loads (As specified in the load details) are connected to the solar system			
2	The new solar lines installed, are functional			
3	Non-solar loads (Heavy, inefficient loads) are connected to the grid lines			
4	RCCBs used are as per the B.O.M. specifications			
5	Isolators used are as per the B.O.M. specifications			
6	M.C.B.s used are as per the B.O.M. specifications			
7	A separate circuit connects only fans, bulbs and tube lights			
8	A separate circuit connects only sockets			
9	The sockets are functional			
10	The number of sockets installed matches with the numbers as specified in the B.O.M. sheet			
11	The specifications of the installed sockets are as per the B.O.M. specifications			
12	The switches are functional and have specifications as mentioned in B.O.M sheet			
13	The number of switches installed matches with the numbers as specified in the B.O.M. sheet			
14	Labelling of the circuits are made			
15	Cable sizes used are as per the B.O.M. specifications			
16	Separate earthing is provided for medical loads			
17	Cables are protected using u.P.V.C. conduit pipes			
Load Wiring - Single Line Diagram				
1	The S.L.D. of the load wiring installation (circuits) and the loads they are connected with, is pasted at the entrance of the battery-inverter room			
Load Wiring - Documentation				
1	Installation completion report is made			

Sl. No.	Image details
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	Clear image of batteries from a range in which gives better visibility including the water level (Please capture image with standard marking)
3	Clear image of inverter from a range in which gives better visibility (Front and back) (Please capture image with standard marking)
4	Clear image of the charge controller
5	Clear image of the inverter switch disconnectors & Load MCB

6	Clear image of cable routing from the complete system (Please capture image with standard marking)
7	Clear image of AJB
8	Clear image of GIPB
9	Clear image of Lightning Arrestor
10	Clear image of Earthing pits
11	Clear image of Changeover Switch
12	Clear image of DO's and Don'ts Poster
13	Clear image of Foam Palques (SLD, High Voltage, PASS, No Fire, Danger, Risk of Electric Shock)
14	Clear image of Metal Plaque
15	Clear image of Outdoor Light
16	Clear image of the Health Centre (Long Shot)
17	Clear image of Health staff with Solar system

Note: **Pictures taken should cover all the details mentioned in the master checklist for each component**

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 (DC 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 Chrage Controller (CCU)					
5	Copper Cable (Module – CCU) - PV 1F (Solar Cables)					
6	Copper Cable (Battery - Battery & Battery - CCU) -(DC Cables)					
7	Battery Trolley Box with Wheels - Hard Plastic					
8	MC4 Connector with Inline Fuse					
9	MC4 Connectors					
10	MC4 Connector Y Branch					
11	Double Pole MCB (load Side) with Conduit box					
12	Single Line Diagram (SLD) for the system					
13	Do's and Don'ts Practices Poster (Solar Panels, Battery and CCU)					
14	Signboards - Danger (Electric Shock), No Fire and PASS					

15	Fire Extinguisher					
16	Metallic Enclosure with isolators having minimum gap of 1 inch (PV & Battery)					
17	Consumables					
Bill of material (For luminaries & fans)						
Sl. No.	**Products**	**Make**	**Capacity**	**Installed Quantity**	**Balance Quantity**	Additional Information
1	LED Bulb					
2	LED Bulb					
3	LED Tube light					
4	LED Tube light					
6	Wall Mounted Fan					
7	Mobile Charging USB Port					
Sl. No.	**System Side As per BOM**	**Tick Yes/No**	**Remarks**			
1	Solar panel setup					
2	Cables Size as per BOM					
3	Load MCB Rating is Correct					
4	Battery set up					
5	CCU Setup					
6	Cable management					
	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 CCU (Input side)					
	Test Condition	**Voltage in DC**	**Measured Value**	**Current in DC**	**Measured Value**	
	Measurement with CCU Solar Panel Input MCB OFF	Voc (in Volts)		NA	NA	
	CCU Solar Panel Input MCB ON (Wait for 15 Seconds)	Vmp (in Volts)	String 1: String 2: String 3: String 4:	Imp (in Amperes)	String 1: String 2: String 3: String 4:	
	Battery Bank parameters(With Grid OFF) and Load ON					

	Particulars	Measured Value	Unit			
	Battery Bank Volatge		V			
	Battery Bank Current		A			
	CCU parameters					
	Particulars	**Measured Value**	**Unit**			
	Load voltage/CCU output voltage		V			
	CCU Output current at full load (All solar loads turned on continuously for 10 minutes)		A			
	Measurements at Sockets (For both 1-Phase & 3-Phase connectivity)					
	Particulars	Measured Value	Unit			
	Voltage between Positive & Negative Line		V			
Images to be captured during Solar installation visit:						
Sl. No.	**Image details**	**Required no. of images**	**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 (Please capture image with standard marking)	1				
3	Clear image of CCU from a range in which gives better visibility (Front and back) (Please capture image with standard marking)	2				
4	Clear image of the CCU switch controls	1				

5	Clear image of cable routing from the complete system (Please capture image with standard marking)	3				
6	Clear image of DO's and Don'ts Poster	1				
7	Clear image of Metal Plaque	1				
8	Clear image of Connected Loads	1				
9	Clear image of the Health Centre (Long Shot)	1				
10	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 CCU					
2	CCU to Loads					

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 + Battery rack)					
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,					

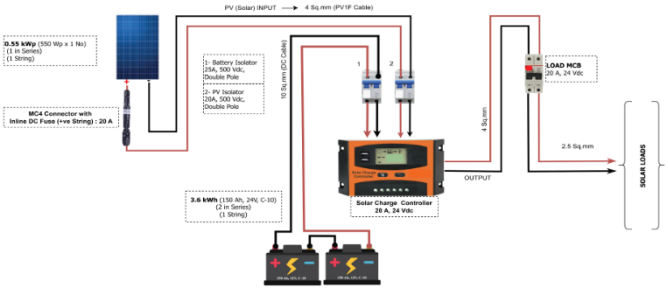
	Battery and Inverter)					
28	Signboards - Danger (Electric Shock & High Voltage), No Fire and PASS					
29	I/P and O/P wiring of Grid Connection- AC cable					
30	Fire Extinguisher					
31	Metallic enclosures with Isolator's having minimum gap of 1 inch (PV, Battery & Grid Input to Inverter)					
32	Consumables					
Bill of material (For luminaries & fans)						
Sl. No.	**Products**	**Make**	**Capacity**	**Installed Quantity**	**Balance Quantity**	Additional Information
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)					

Annexure-1C

Sub Centre Solar System Details

Solar System Details	
Solar Panel Capacity	0.55 kWp (550 Wp x 1 No)
Solar Battery Capacity	3.6 kWh (150 Ah, 12 V x 2 Nos)
Solar Charge Controller Capacity	20 A, 24 Vdc x 1 No
Maximum Load that can be connected	0.245 kW
Maximum Units of Energy(kWh) usage per day	0.987 kWh

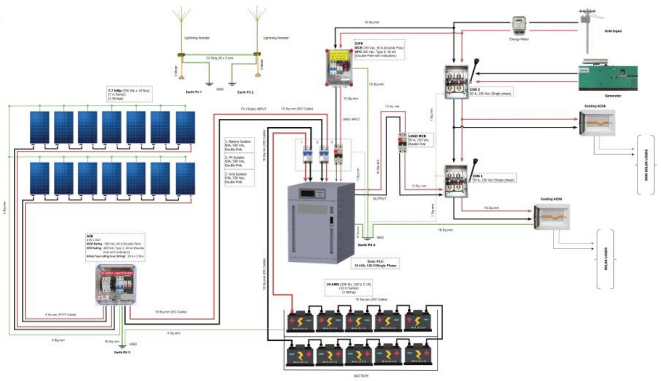
Equipments Connected to Solar System	
Other Equipments	Lights & Fans



Primary Health Centre Solar System Details

Solar System Details	
Solar Panel Capacity	7.7 kWp (550 Wp x 14 Nos)
Solar Battery Capacity	24 kWh (200 Ah, 12 V x 10 Nos)
Solar Inverter Capacity	10 kVA, 120 V, Single Phase x 1 No
Maximum Load that can be connected	5.816 kW
Maximum Units of Energy(kWh) usage per day	17.889 kWh

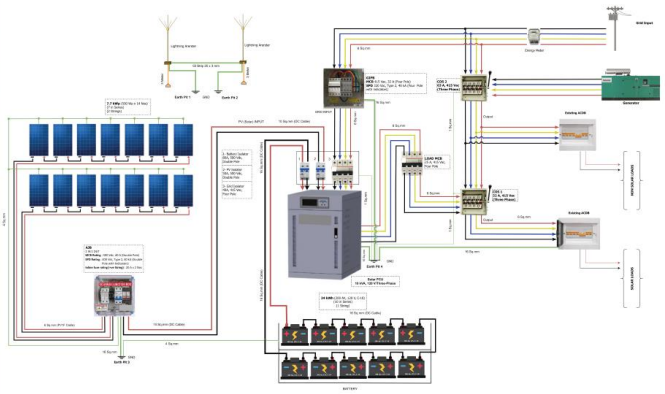
Equipments Connected to Solar System	
Labour Room	Baby Warmer, Suction Machine, Spot Light, Oxygen Concentrator & Baby Weighing Machine
Cold Chain	ILR & Deep freezer
Laboratory	Microscope, Centrifuge, Semiauto Analyser & Hematology Analyser
Other Equipments	Eye Vision Machine, X-Ray Viewer, Neubilizer,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



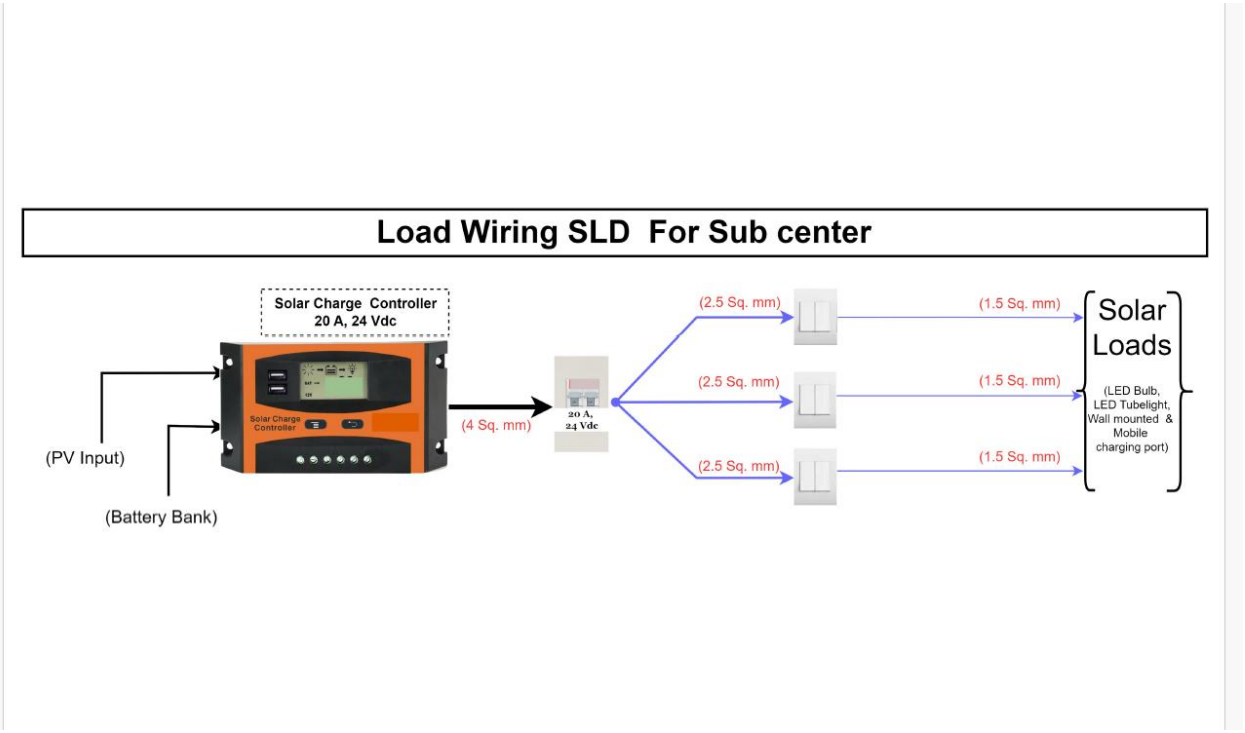
Primary Health Centre Solar System Details

Solar System Details	
Solar Panel Capacity	7.7 kWp (550 Wp x 14 Nos)
Solar Battery Capacity	24 kWh (200 Ah, 12 V x 10 Nos)
Solar Inverter Capacity	10 kVA, 120 V, Three Phase x 1 No
Maximum Load that can be connected	5.816 kW
Maximum units of energy (kWh) usage per day	17.889 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	Eye Vision Machine, X-Ray Viewer, Neubilizer, Refrigerator, Water Purifier, Desktop, Printer, Wi-Fi, Lights & Fans



Annexure-1D



Annexure-1E&F

ANNEXURE 1: TECHNICAL SPECIFICATIONS OF SOLUTIONS

Sub Centre:
Bill of Materials for Solar System:

Sl.No	Products	Capacity	Qty
1	Solar Module	Solar Photovoltaic Array of Total Minimum Capacity 550 Wp (Monoperc Half cut cells)	1 No
2	Solar Battery	Valve regulated lead-acid (VRLA) battery - 150 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).	2 Nos
3	Module Mounting Structure (MMS*)	Solar PV Module support structure. **RCC Roof :** Lower elevation/Landscape Orientation (Triangular MMS with concrete block). **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 Charge Controller (CCU)	20 A, 24 Vdc with dedicated load port. (Wall Mount with base plate)	1 No.
5	Copper Cable Red+Black (Module – CCU) - PV1-F (Solar Cables)	**4 sq.mm** UV Protected Cable	30 m
6	Copper Cable (Battery -Battery & Battery - CCU) - (DC Cables)	**10 Sq.mm** (Tin-coated copper lugs with insulation to be used at each battery terminal).	10 m
7	Battery trolley box with wheels - Hard Plastic	For 150 Ah, 12 V - 2 Nos	1 Set.
8	MC4 Connector with Inline Fuse	Inline DC Fuse rating*: (+ve Strings): **20 A**	1 No.
9	MC4 Connectors	Male and Female	1 Set
10	Double Pole MCB (load Side) with Conduit box	**20 A, 24 Vdc**	1 No.
11	Single Line Diagram - (SLD) for the system	Sun board with 3 mm Thickness - 4 ft x 2 ft	1 No.

12	Do's and Don'ts Practices Poster (Solar Panels, Battery and CCU)	Foam Plaque - A4 Size for each	1 No.
13	Signboard for Danger, No Fire and PASS	Danger - Electric shock - A4 No Fire - A5 PASS - A4	1 No each
14	Fire Extinguisher	Multi Purpose - ABC Dry powder extinguishing agents (or) CO2 type with 2 kg net weight of the charge inside the cylinder.	1 No
15	Metallic Enclosure with Isolator's having minimum gap of 1 inch. (PV and Battery)	1st MCB for Battery Input - 25 A, 500 Vdc, Double Pole 2nd MCB for PV Input – 20 A, 500 Vdc, Double Pole	1 Set
16	Consumables	Includes: UPVC pipes and fittings, Flexible pipes, Screws, Cable lugs, Nuts and Bolts etc….	1 Set

Bill of Materials for Load Wiring:

Sl.no	Item	Description	UoM	Qty
1	Switch (Modular)	6 A, 1-Way (White colour).	Pcs	12
2	Socket (Modular)	3 pin, 6 A (White colour).	Pcs	3
3	USB Port for mobile charging	Input Voltage - 24 Vdc (Max - 25 Watt)	Pcs	2
4	Cables - For Load Connection (Red)	1.5 Sq. mm, EFFR copper cables. (Interconnecting switchboards with loads)	Mtrs	80
	Cables - For Load Connection (Black)	1.5 Sq. mm, EFFR copper cables. (Interconnecting switchboards with loads)	Mtrs	80
5	Power Cable - From CCU to Room (Red)	2.5 Sq. mm, EFFR copper cables. (Interconnecting distribution box with switchboards)	Mtrs	50
	Power Cable - From CCU to Room (Black)	2.5 Sq. mm, EFFR copper cables. (Interconnecting distribution box with switchboards)	Mtrs	50
6	Ceiling Rose	FR polycarbonate outer housing with ducts, Inner metal ring with high conductive brass terminals (White colour).	Pcs	6
7	Angle holder	FR polycarbonate outer housing with ducts, Inner metal ring with high conductive brass terminals (White colour).	Pcs	3

8	1 modular Switch Box with plate	Surface mounting type, ABS material with brass studs, Provision for conduits. (White colour)	Pcs	7
9	2 modular Switch Box with plate	Surface mounting type, ABS material with brass studs, Provision for conduits. (White colour)	Pcs	2
10	3 modular Switch Box with plate	Surface mounting type, ABS material with brass studs, Provision for conduits. (White colour)	Pcs	3
11	UPVC Conduit Pipe (White)	Polypropylene material, 19 mm diameter, White colour, Flame retardant, Anti-distortion.	Pcs	50
12	UPVC - Coupler (White)	UPVC pipe (White color), 19 mm diameter, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable.	Pcs	10
13	UPVC Conduit Tee Joint	UPVC pipe (White color), 19 mm diameter, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable.	Pcs	8
14	UPVC - Short & Long Elbow (White)	UPVC material, 19 mm diameter, White colour, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable. "	Pcs	30
15	2way Junction Box	UPVC material, 19 mm diameter, White colour, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable.	Pcs	6
16	3way Junction Box	UPVC material, 19 mm diameter, White colour, Flame retardant, Low halogen, Low smoke, Smoke suppressing, Temperature stable.	Pcs	6
17	Square Box		Pcs	9
18	Plastic wall lug	UPVC material, Size - 25 x 5 mm, Crack-proof, White colour, Eco-friendly.	Packs	5
19	Screw	Stainless steel/Galvanized Iron - rust-free material, Size - 35 x 8 mm, Flat head with deep slot.	Packs	1
20	Screw	Stainless steel/Galvanized Iron - rust-free material, Size - 25 x 7 mm, Flat head with deep slot.	Pcs	1
21	Electrical Insulating Tape	Size - 18 x 0.125 mm, High insulating resistance, Moisture & Corrosion resistant, Flame-retardant, Long-lasting adhesion.	Pcs	4

22	Pipe Saddle Clamps	UPVC material, Size: 20 mm diameter, Light duty pipe clamp, Single nail.	Pcs	50
23	Saddle Nail	Concrete nail Size - 1.5 inch GI/ Astel string steel	kg	0.6
24	Cable Tie	Polypropylene Material, Size – 150 mm, White Colour.	Packs	2
25	Cable Lugs - 1	2.5 Sq.mm, Pin-type, Tin-coated copper.	Pcs	8
26	Flexible Pipe	Polypropylene material, 20 mm diameter, White colour, Flame retardant, Anti-distortion.	Mtrs	5
27	Labelling Tags (Load identification tags)	Size - 3 x 1 Inch, Synthetic paper, Self-adhesive, Fluorescent Green colour, Waterproof, Temperature resistant.	Pack	1
28	Labelling Tags (Cable identification tags)	Size - 40 x 10 mm Synthetic paper, Self-adhesive, White colour, Waterproof, Temperature resistant.	Pack	1
29	Labelling Pen 1 Marker Pen	Line Width - 0.4 mm Dark black colour water resistance, Temperature resistance	Pcs	1
30	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	Unit	Qty
1	LED Tube light	20 W, 24 Vdc	Nos	3
2	LED Tube light	10 W, 24 Vdc	Nos	3
3	LED Bulb	5 W, 24 Vdc	Nos	3
4	Wall Mounted Fan	28 W, 24 Vdc	Nos	3
5	Mobile Charging USB Port	Input - 24 Vdc	Nos	2

Primary Health Centre: Option 1(Single Phase Grid Connection)

Bill of Materials for Solar System:

Sl.No	Products	Capacity	Qty
1	Solar Module	Solar Photovoltaic Array of Total Minimum Capacity 7 kWp (Monoperc Half cut cells)	1 Set
2	Solar Battery	Valve regulated lead-acid (VRLA) battery - 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).	10 Nos

3	Module Mounting Structure (MMS*)	Solar PV Module support structure. **RCC Roof :** Lower elevation/Landscape Orientation (Triangular MMS with concrete block). **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 10 kVA – MPPT based Single Phase Supply, With Data Port (RS 485) Output	1 No.
5	Change over switch / Bypass Switch - 1 (PCU -Grid - Solar Loads)	**50 A, 230 Vac** (Single Phase)	1 No.
6	Change over switch / Bypass Switch - 2 (DG -Grid - Solar & Non Solar Loads)	**63 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	40 m
8	Copper Cable Red + Black (AJB - Inverter) - (DC Cables)	**10 sq.mm**	30 m
9	Copper Cable (Battery -Battery & Battery - Inverter) - (DC Cables)	**16 Sq.mm** (Tin-coated copper lugs with insulation to be used at each battery terminal).	10 m
10	DC Earthing (Panels + MMS + AJB)	**Panel to Panel, Panel to MMS, MMS leg to AJB** - Grounding Lugs with 4 sq.mm earthing cable should be used.	10 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 Lightning Arrestor	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+Changeover 1 & 2 ● MMS+AJB+Switch Disconnector+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	4 Set

		size should be minimum of 6 inch diameter and should be filled with back fill compound.	
14	Lightning Protection System	Lightning arrester kit: Lightning arrester, base plate and elevation pole Solid Aluminium Alloy Lightning arrestor of 15 mm diameter and 2000 mm long should be used. Ceramic insulation to be provided at the lightning arrestor base plate. 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.	2 Set
15	Grid Input Protection Box with SPD and MCB	MCB Rating : **230 Vac, 50 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 10 Sq.mm	1 No.
16	Battery rack with the following: Electrical Insulation mat (Minimum 0.4 kV)	**As per Solar Battery Sl. No. - 2** (Each leg should be given a base flat plate)	1 Set.
17	Inverter Elevation Leg	Elevation rack with insulation Mat (or) 3 inch Leg Bush	1 No (or) 4 Nos.
18	Solar Array Junction Box with MCB and SPD and String Fuse.	**2 IN 1 OUT** MCB Rating : **500 Vdc, 40 A (Double Pole)** SPD Rating: **400 Vdc, Type 2, 40 KA (Double pole with indicators)** Inline DC Fuse rating*: (+ve Strings): **20 A** Inter connection of the components inside the AJB should be DC cable of 10 Sq.mm	1 No.
19	Double Pole MCB (load Side) with Conduit box	**50 A, 230 Vac**	1 No.
20	Marking for AC earthing with Elevated Plaques (GIPB+Inverter+Loads+Changeover 1 & 2)	Elevation pole length - 3 Feet. Metal plaque dimension - A5	1 No.
21	Marking for DC earthing with Elevated Plaques (AJB+MMS+Panels+Switch Dsiconnector+Battery rack)	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.	2 Nos.

		Metal plaque dimension - A5	
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	**10 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 - 80 A, 500 Vdc, Double Pole 2nd Switch for PV Input – 50 A, 500 Vdc, Double Pole 3rd Switch for Grid Input – 63 A, 230 Vac, Double Pole	1 Set
29	Consumables	Includes: UPVC pipes and fittings, Flexible pipes, Screws, Cable lugs, Nuts and Bolts etc….	1 Set

***Note**:*
For heavy loads (Loads which are excluded from solar system design) such as Autoclave, Sterilizer, Geyser, Air conditioner, Water cooler, Water Pump and CCTV etc, separate wiring for grid connectivity has to be done accordingly. Costing will be considered separately and not included in the above BoM.

Primary Health Centre: Option 2 (Three Phase Grid Connection)
Bill of Materials for Solar System:

Sl.No	Products	Capacity	Qty
1	Solar Module	Solar Photovoltaic Array of Total Minimum Capacity 7 kWp (Monoperc Half cut cells)	1 Set
2	Solar Battery	Valve regulated lead-acid (VRLA) battery - 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).	10 Nos

3	Module Mounting Structure (MMS*)	Solar PV Module support structure. **RCC Roof :** Lower elevation/Landscape Orientation (Triangular MMS with concrete block). **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 - 415 Vac, 50 Hz	Total Minimum Capacity 10 kVA – MPPT based Three Phase Supply, With Data Port (RS 485) Output	1 No.
5	Change over switch / Bypass Switch - 1 (PCU -Grid - Solar Loads)	**32 A, 415 Vac** (Three Phase)	1 No.
6	Change over switch / Bypass Switch - 2 (DG -Grid - Solar & Non Solar Loads)	**63 A, 415 Vac** (Three Phase)	1 No.
7	Copper Cable Red+Black (Module – Module - AJB) - PV1-F (Solar Cables)	**6 sq.mm** UV Protected Cable	40 m
8	Copper Cable Red + Black (AJB - Inverter) - (DC Cables)	**10 sq.mm**	30 m
9	Copper Cable (Battery -Battery & Battery - Inverter) - (DC Cables)	**16 Sq.mm** (Tin-coated copper lugs with insulation to be used at each battery terminal).	10 m
10	DC Earthing (Panels + MMS + AJB)	**Panel to Panel, Panel to MMS, MMS leg to AJB** - Grounding Lugs with 4 sq.mm earthing cable should be used.	10 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 Lightning Arrestor	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+Changeover 1 & 2 ● MMS+AJB+Switch Disconnector+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	4 Set

		size should be minimum of 6 inch diameter and should be filled with back fill compound.	
14	Lightning Protection System	Lightning arrester kit: Lightning arrester, base plate and elevation pole Solid Aluminium Alloy Lightning arrestor of 15 mm diameter and 2000 mm long should be used. Ceramic insulation to be provided at the lightning arrestor base plate. 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.	2 Set
15	Grid Input Protection Box with SPD and MCB	MCB Rating : **415 Vac, 32 A (Four Pole)** SPD Rating : **320 Vac, Type 2, 40 kA (Four pole with indicators)** Inter connection of the components inside the GIPB should be 6 Sq.mm	1 No.
16	Battery rack with the following: Electrical Insulation mat (Minimum 0.4 kV)	**As per Solar Battery Sl. No. - 2** (Each leg should be given a base flat plate)	1 Set.
17	Inverter Elevation Leg	Elevation rack with insulation Mat (or) 3 inch Leg Bush	1 No (or) 4 Nos.
18	Solar Array Junction Box with MCB and SPD and String Fuse.	**2 IN 1 OUT** MCB Rating : **500 Vdc, 40 A (Double Pole)** SPD Rating: **400 Vdc, Type 2, 40 KA (Double pole with indicators)** Inline DC Fuse rating*: (+ve Strings): **20 A** Inter connection of the components inside the AJB should be DC cable of 10 Sq.mm	1 No.
19	Four Pole MCB (load Side) with Conduit box	**25 A, 415 Vac**	1 No.
20	Marking for AC earthing with Elevated Plaques (GIPB+Inverter+Loads+Changeover 1 &2)	Elevation pole length - 3 Feet. Metal plaque dimension - A5	1 No.
21	Marking for DC earthing with Elevated Plaques (AJB+MMS+Panels+Switch Disconnector+Battery rack)	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.**	60 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 - 80 A, 500 Vdc, Double Pole 2nd Switch for PV Input – 50 A, 500 Vdc, Double Pole 3rd Switch for Grid Input – 40 A, 415 Vac, Four Pole	1 Set
29	Consumables	Includes: UPVC pipes and fittings, Flexible pipes, Screws, Cable lugs, Nuts and Bolts etc….	1 Set

Note:

For heavy loads (Loads which are excluded from solar system design) such as Autoclave, Sterilizer, Geyser, Air conditioner, Water cooler, Water Pump and CCTV etc, separate wiring for grid connectivity has to be done accordingly. Costing will be considered separately and not included in the above BoM.

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 mentioned Wp in the BoM / Purchase Order shall not beaccepted.
c. PV modules must be tested and approved by one of the IEC authorized test centres. The module frame shall be made of corrosion-resistant materials, preferably anodized aluminiumof 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

d. Defects and/or failures due to manufacturing.
e. Defects and/or failures due to quality of materials
f. 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:

12. Landscape orientation to be incorporated.
13. Triangular MMS to be chosen.
14. The MMS should be mounted to the RCC roof using wedge anchor fasteners and a concrete block of Lx W x H = 1.5 x 1.5 x 0.25 feet at the front side of the MMS and concrete block of Lx 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 topside 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):

15. Mini rails to be incorporated
16. Anodised mini rails of 70 microns thickness.
17. Rail dimension should be of 300 mm X 100 mm X 2.6 mm
18. 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.)
19. EPDM strips to be used as sealant for waterproofing.

For roofs which are unfit for mounting panels:

20. 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.
21. 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:

22. The orientation of the MMS should be due south in general case/flat mounting surfaces.
23. 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:

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

General guidelines:

26. Each structure should have an angle of inclination as per the geographical location to receive maximum irradiation.
27. 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.
28. All nuts & bolts used should be made of G.I (> 120 microns) or of stainless steel.
29. 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.
30. Bidders must follow above types of roof mounting options and the solution is dependent on the typeof roof at the location. a) Flat roof, b) Tin roof. In all cases, considerations must be made for the roof'sage, 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:

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

Should have **additional characteristics of:**

(xiv) Should exhibit PSOC behavior
(xv) Should have low fumes generation
(xvi) Should perform easy recovery after idle period.
(xvii) 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 capacitiesshould 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 befinal and binding on the bidder.
(xviii) Battery should conform to the latest B.I.S/ International standards. A copy of the relevant testcertificate for the battery should be furnished.
(xix) The battery should be warranted for a minimum of 5 years.
(xx) 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.)
(xxi) 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.
(xxii) Support rails of 6-inch height should be provided at the shorter side of the racks to supportbatteries 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.
- 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:

(xxiii) Safety of the system
(xxiv) Safety of the end users
(xxv) 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 fulldust, water & vermin proof arrangement.

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

8.1 Solar Charge Controller:

The charge controller unit should be provided to convert DC power produced by SPV modules, into regulated DC power.

Typical technical features of the CCU shall be as follows:

Charge Controller of capacity & ratings as specified belowshould convert DC power into regulated DC power.

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

i. **The CCU will have the following features:**

(ii) MPPT/PWM charging.

(iii) CCU Efficiency should be more than 95%

h. Ambient temperature 50 degree Celsius (max.)

i. Operating humidity 95% maximum

j. Shall be equipped with RS 485 data port output

k. Wall Mounted

ii. **Protections:**

a. PV Over voltage

b. PV under voltage

c. Battery Low Disconnect (automatic shutdown)

d. Battery Reconnect (automatic Turnon)

e. Battery Over Voltage (automatic charger shutdown)

f. Overload - Short circuit (electronics protection against sustained fault)

g. Over Temperature

h. Temperature compensation

i. Battery, PV reverse polarity

iii. **Indicators**

a. Array on

b. Charger on

c. Battery connected, charging

d. Fault

iv. **Cooling:** cooling mechanism required - Passive / Active

NOTE:

Placement of CCU should be wall mounted with base plate and 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 brandfor solar PCU.

8.2 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 belowfor 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).

8.2.1 The PCU will have the following features:

(iv) MPPT charging.
(v) Inverter efficiency should be more than 85%
(vi) The inverter should be compatible with alternators / Generators.
(vii) Output voltage for single phase 230 V, +/-3% with pure sine wave.
(viii) Output voltage for Three phase 415 V, +/-3% with pure sine wave.
(ix) Output frequency: 50 Hz
(x) Capacity of PCU is specified at minimum 0.8 lagging power factor
(xi) THD: less than 3%
l. Ambient temperature 50 degree Celsius (max.)
m. Operating humidity 95% maximum
n. Shall be equipped with RS 485 data port output

8.2.2 Protections:

j. Over voltage (automatic shutdown)
k. Under voltage (automatic shutdown)
l. Overload - Short circuit (circuit breaker & electronics protection against sustained fault)
m. Over Temperature
n. Temperature compensation
o. Battery, PV reverse polarity

8.2.3 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

8.2.4 Display Parameters

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

8.2.5 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 brandfor solar PCU.

9. PROTECTIONS:

The system should be provided with all necessary protections like earthing, lightning protection.

9.1 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 sourceof 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 shouldmaintain 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 Aluminium 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 testlinks.

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.

9.2 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 withno 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 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 should be provided for these components: Lighting arrester, A.J.B, Grid

input protection box, Inverter/PCU and connected loads.

- 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.
- Should not combine AC earthing & DC Earthing.
- 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 copperwith 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.

10.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/anglesin 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.B - LOAD WIRING:

- 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 besimultaneously 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:

a. 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.

a. Label the changeover switch 1:

- Outside the door of the switch, all three positions of the lever should have sticker in BOLDLETTERS 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

b. Label the changeover switch 2:

- Outside the door of the switch, all three positions of the lever should have sticker in BOLDLETTERS 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 aappearance 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 usedto 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 getsmaximum 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 witha 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 pressurein 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 shallbe 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 takento ensure no hindrance is caused to patients and medical professionals in the building while they willbe 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

Sub Centre - Load Details					
Sl.No	**Name of the Room**	**Load Type**	**Power Rating (Watt)**	**Qty (Nos)**	**Total Load (Watt)**
1	CHO/OPD Room	LED Tubelight	20	1	20
		Wall Mounted Fan	28	1	28
		Mobile Charging	25	1	25
	Toilet	LED Bulb	5	1	5
2	Waiting Area	LED Tubelight	12	1	12
3	Female Health Worker Room	LED Tubelight	20	1	20
		Wall Mounted Fan	28	1	28
	Toilet	LED Bulb	5	1	5
4	Staff Quarters - Bed Room	LED Tubelight	20	1	20
		Wall Mounted Fan	28	1	28
		Mobile Charging	25	1	25
	Staff Quarters - Hall	LED Tubelight	12	1	12
	Staff Quarters - Kitchen	LED Tubelight	12	1	12
	Staff Quarters - Toilet	LED Bulb	5	1	5
					245

Primary Health Centre - Load Details					
Sl.No	**Name of the Room**	**Load Type**	**Power Rating (Watt)**	**Qty (Nos)**	**Total Load (Watt)**
1	MO Room	CFL Tubelight	30	2	60
		Ceiling Fan	75	1	75
		Eye Vision Machine	30	1	30
		X Ray Viewer	45	1	45
		Desktop	100	1	100
		Printer	120	1	120
	Toilet	CFL Bulb	18	1	18
2	Ayush OPD	CFL Tubelight	30	1	30
		Ceiling Fan	75	1	75
	Toilet	CFL Bulb	18	1	18
	Male Toilet	CFL Bulb	18	1	18
	Female Toilet	CFL Bulb	18	1	18
3	Laboratory	CFL Tubelight	30	2	60
		Ceiling Fan	75	1	75
		Microscope	60	1	60
		Centrifuge	230	1	230
		Semiauto Analyser	100	1	100
		Hematology Analyser	200	1	200
4	Male Ward	CFL Tubelight	30	3	90
		Ceiling Fan	75	2	150
		Mobile Charging	25	1	25
	Toilet	CFL Bulb	18	2	36
5	Female Ward	CFL Tubelight	30	3	90
		Ceiling Fan	75	2	150
		Mobile Charging	25	1	25
	Toilet	CFL Bulb	18	2	36
6	Labour Room	CFL Tubelight	30	2	60
		Ceiling Fan	75	1	75
		Baby Warmer	800	1	800
		Suction Machine	180	1	180
		Spot Light	20	1	20
		Oxygen Concentrator	550	1	550
		Baby Weighing Machine	35	1	35
	Toilet	CFL Bulb	18	1	18
7	Preparation Room	CFL Tubelight	30	1	30
		Ceiling Fan	75	1	75
8	Minor OT	CFL Tubelight	30	1	30

		Ceiling Fan	75	1	75
		Neubiliser	60	1	60
9	Cold Chain Room	CFL Tubelight	30	1	30
		Ceiling Fan	75	1	75
		ILR	208	1	208
		Deep Freezer	138	1	138
10	Medicine Store Room	CFL Tubelight	30	1	30
		Ceiling Fan	75	1	75
11	Pharmacy	CFL Tubelight	30	1	30
		Ceiling Fan	75	1	75
		Refrigerator	100	1	100
		Desktop	100	1	100
12	Office Room	CFL Tubelight	30	1	30
		Ceiling Fan	75	1	75
		Desktop	100	1	100
		Printer	120	1	120
		Wi Fi	25	1	25
	Toilet	CFL Bulb	18	1	18
13	Material Store Room	CFL Tubelight	30	1	30
		Ceiling Fan	75	1	75
14	Waiting Area	CFL Tubelight	30	4	120
		Ceiling Fan	75	4	300
		Water Purifier	60	1	60
15	Outside	Outdoor Light	30	2	60
					5816

Annexure-2

Sl. No	*Name of health centre*	*Type of health centre*	*State Name*	*District Name*	*Block Name*	*Village Name*
1	Ajapupur Mota	Sub Centre	Gujarat	Banaskantha	Amirgadh	Ajapura (Mota)
2	Ajapupur Vanka	Sub Centre	Gujarat	Banaskantha	Amirgadh	Ajapura (Vanka)
3	Amirgadh	Sub Centre	Gujarat	Banaskantha	Amirgadh	Amirgadh
4	Balundra	Sub Centre	Gujarat	Banaskantha	Amirgadh	Balundra
5	Chiknvas	Sub Centre	Gujarat	Banaskantha	Amirgadh	Chikanwas
6	Dabhela	Primary Health Centre	Gujarat	Banaskantha	Amirgadh	Dabhela
7	Dabheli	Sub Centre	Gujarat	Banaskantha	Amirgadh	Dabheli
8	Deri	Sub Centre	Gujarat	Banaskantha	Amirgadh	Deri
9	Dhanpura	Primary Health Centre	Gujarat	Banaskantha	Amirgadh	Dhanpura
10	Dhanpura	Sub Centre	Gujarat	Banaskantha	Amirgadh	Dhanpura
11	Dholiya	Sub Centre	Gujarat	Banaskantha	Amirgadh	Dholiya
12	Gadhada	Sub Centre	Gujarat	Banaskantha	Amirgadh	Gadhada
13	Ganji	Primary Health Centre	Gujarat	Banaskantha	Amirgadh	Ganji
14	Gawra	Sub Centre	Gujarat	Banaskantha	Amirgadh	Gawra
15	Ghanghu	Sub Centre	Gujarat	Banaskantha	Amirgadh	Ghanghu
16	Ghanta	Sub Centre	Gujarat	Banaskantha	Amirgadh	Ghata
17	Jethi	Sub Centre	Gujarat	Banaskantha	Amirgadh	Jethi
18	Juni Roh	Sub Centre	Gujarat	Banaskantha	Amirgadh	Juni Roh
19	Juni Sarotari	Sub Centre	Gujarat	Banaskantha	Amirgadh	Juni Sarotri
20	Kakvada	Sub Centre	Gujarat	Banaskantha	Amirgadh	Kakwada
21	Kanpura	Sub Centre	Gujarat	Banaskantha	Amirgadh	Kanpura
22	Kansara	Sub Centre	Gujarat	Banaskantha	Amirgadh	Kansaravid
23	Kapasiya	Sub Centre	Gujarat	Banaskantha	Amirgadh	Kapasiya
24	Karja Mota	Sub Centre	Gujarat	Banaskantha	Amirgadh	Karza (Mota)
25	Khara	Primary Health Centre	Gujarat	Banaskantha	Amirgadh	Khara
26	Khari	Sub Centre	Gujarat	Banaskantha	Amirgadh	Khari
27	Khemrajiya	Sub Centre	Gujarat	Banaskantha	Amirgadh	Khemrajiya
28	Khuniya	Sub Centre	Gujarat	Banaskantha	Amirgadh	Khuniya
29	Kidotar	Sub Centre	Gujarat	Banaskantha	Amirgadh	Kidotar
30	Rabariya	Sub Centre	Gujarat	Banaskantha	Amirgadh	Rabariya
31	Sarotra	Sub Centre	Gujarat	Banaskantha	Amirgadh	Sarotra
32	Sonvadi	Sub Centre	Gujarat	Banaskantha	Amirgadh	Sonwadi

33	Surela	Primary Health Centre	Gujarat	Banaskantha	Amirgadh	Surela
34	Upalobandh	Sub Centre	Gujarat	Banaskantha	Amirgadh	Uplobandh
35	Uplaghoda	Sub Centre	Gujarat	Banaskantha	Amirgadh	Upla Ghoda
36	Vagdadi	Sub Centre	Gujarat	Banaskantha	Amirgadh	Vagdadi
37	Balodhan	Sub Centre	Gujarat	Banaskantha	Babhar	Balodhan
38	Beda	Sub Centre	Gujarat	Banaskantha	Babhar	Beda
39	Chembuva	Sub Centre	Gujarat	Banaskantha	Babhar	Chembuwa
40	Jasanvada	Sub Centre	Gujarat	Banaskantha	Babhar	Jasanvada Juna
41	Khara	Sub Centre	Gujarat	Banaskantha	Babhar	Khara
42	Mera	Sub Centre	Gujarat	Banaskantha	Babhar	Mera
43	Runi	Primary Health Centre	Gujarat	Banaskantha	Babhar	Runi
44	Runi	Sub Centre	Gujarat	Banaskantha	Babhar	Runi
45	Sanva	Sub Centre	Gujarat	Banaskantha	Babhar	Sanva
46	Suthar Nesdi	Sub Centre	Gujarat	Banaskantha	Babhar	Suthernesda
47	Tetarva	Primary Health Centre	Gujarat	Banaskantha	Babhar	Tetarva
48	Undai	Sub Centre	Gujarat	Banaskantha	Babhar	Undai
49	Vadpag	Primary Health Centre	Gujarat	Banaskantha	Babhar	Vadpag
50	Aderan	Sub Centre	Gujarat	Banaskantha	Danta	Aderan
51	Ambaji 3	Sub Centre	Gujarat	Banaskantha	Danta	Ambaji-3
52	Bamnoj	Sub Centre	Gujarat	Banaskantha	Danta	Bamnoj
53	Beda	Sub Centre	Gujarat	Banaskantha	Danta	Beda
54	Bhadramal	Sub Centre	Gujarat	Banaskantha	Danta	Bhadramal
55	Bhankhri	Sub Centre	Gujarat	Banaskantha	Danta	Bhankhri
56	Hadad	Primary Health Centre	Gujarat	Banaskantha	Danta	Hadad
57	Jamru	Sub Centre	Gujarat	Banaskantha	Danta	Jamroo
58	Jetvaas	Sub Centre	Gujarat	Banaskantha	Danta	Jetavas
59	Kanbiyavaas	Sub Centre	Gujarat	Banaskantha	Danta	Kanabiavas
60	Kansa	Primary Health Centre	Gujarat	Banaskantha	Danta	Kansa
61	Khermal	Sub Centre	Gujarat	Banaskantha	Danta	Khermal
62	Kundel	Sub Centre	Gujarat	Banaskantha	Danta	Kundel
63	Machkoda	Sub Centre	Gujarat	Banaskantha	Danta	Machkoda
64	Magvas	Primary Health Centre	Gujarat	Banaskantha	Danta	Magwas
65	Magvas	Sub Centre	Gujarat	Banaskantha	Danta	Magwas
66	Mandali	Sub Centre	Gujarat	Banaskantha	Danta	Mandali
67	Motapipodara	Sub Centre	Gujarat	Banaskantha	Danta	Motapipodar
68	Motasada	Primary Health Centre	Gujarat	Banaskantha	Danta	Motasada

69	Nagel	Sub Centre	Gujarat	Banaskantha	Danta	Nagel
70	Pancha	Sub Centre	Gujarat	Banaskantha	Danta	Pansa
71	Pethapur	Sub Centre	Gujarat	Banaskantha	Danta	Pethapur
72	Rangpur	Sub Centre	Gujarat	Banaskantha	Danta	Ranpur
73	Sanali	Sub Centre	Gujarat	Banaskantha	Danta	Sanali
74	Sekda	Sub Centre	Gujarat	Banaskantha	Danta	Senkada
75	Taleti	Sub Centre	Gujarat	Banaskantha	Danta	Taleti
76	Toda	Sub Centre	Gujarat	Banaskantha	Danta	Toda
77	Vadvera	Sub Centre	Gujarat	Banaskantha	Danta	Vadvera
78	Vekri	Sub Centre	Gujarat	Banaskantha	Danta	Vekree
79	Viramveri	Sub Centre	Gujarat	Banaskantha	Danta	Viramveri
80	Arakhi	Sub Centre	Gujarat	Banaskantha	Dantivada	Arakhi
81	Bhadlikantha	Sub Centre	Gujarat	Banaskantha	Dantivada	Bhadlikantha
82	Bhakhar Moti	Sub Centre	Gujarat	Banaskantha	Dantivada	Bhakharmoti-1
83	Dhaneri	Sub Centre	Gujarat	Banaskantha	Dantivada	Dhaneri
84	Dhaniyavada	Sub Centre	Gujarat	Banaskantha	Dantivada	Dantivada
85	Godh	Sub Centre	Gujarat	Banaskantha	Dantivada	Godh
86	Jegol	Primary Health Centre	Gujarat	Banaskantha	Dantivada	Jegol
87	Moti Mahudi	Sub Centre	Gujarat	Banaskantha	Dantivada	Moti Mahudi
88	Nandotra (Thakor Vas-1)	Sub Centre	Gujarat	Banaskantha	Dantivada	Nandotra (Thakor Vas-1)
89	Nilpur	Sub Centre	Gujarat	Banaskantha	Dantivada	Nilpur
90	Odhva	Sub Centre	Gujarat	Banaskantha	Dantivada	Odhava
91	Ramsida	Sub Centre	Gujarat	Banaskantha	Dantivada	Ramsida
92	Santarvada	Sub Centre	Gujarat	Banaskantha	Dantivada	Satarwada
93	Utampura(Da.)	Sub Centre	Gujarat	Banaskantha	Dantivada	Utampura(Da.)
94	Vaghrol	Primary Health Centre	Gujarat	Banaskantha	Dantivada	Vaghrol
95	Aalvada	Primary Health Centre	Gujarat	Banaskantha	Dhanera	Aalvada
96	Aashiya	Sub Centre	Gujarat	Banaskantha	Dhanera	Aashiya
97	Anupgadh	Primary Health Centre	Gujarat	Banaskantha	Dhanera	Anupgadh
98	Bhanjana	Sub Centre	Gujarat	Banaskantha	Dhanera	Bhanjana
99	Dhakha -1	Sub Centre	Gujarat	Banaskantha	Dhanera	Dhakha-1
100	Dharnodhar	Primary Health Centre	Gujarat	Banaskantha	Dhanera	Dharanodhar
101	Dharnodhar	Sub Centre	Gujarat	Banaskantha	Dhanera	Dharanodhar
102	Hadta	Sub Centre	Gujarat	Banaskantha	Dhanera	Hadta
103	Jadi	Sub Centre	Gujarat	Banaskantha	Dhanera	Jadi
104	Jivana	Sub Centre	Gujarat	Banaskantha	Dhanera	Jivana
105	Jorapura	Sub Centre	Gujarat	Banaskantha	Dhanera	Jorapura
106	Kumar	Sub Centre	Gujarat	Banaskantha	Dhanera	Kumar

107	Kundi	Sub Centre	Gujarat	Banaskantha	Dhanera	Kundi
108	Ramuna	Sub Centre	Gujarat	Banaskantha	Dhanera	Ramuna
109	Runi	Sub Centre	Gujarat	Banaskantha	Dhanera	Rooney
110	Saral	Sub Centre	Gujarat	Banaskantha	Dhanera	Saral
111	Thavar - 1	Sub Centre	Gujarat	Banaskantha	Dhanera	Thavar-1
112	Thavar -2	Sub Centre	Gujarat	Banaskantha	Dhanera	Thavar-2
113	Valer	Sub Centre	Gujarat	Banaskantha	Dhanera	Valer
114	Agathala	Primary Health Centre	Gujarat	Banaskantha	Lakhani	Aagthala
115	Agthala	Sub Centre	Gujarat	Banaskantha	Lakhani	Aagthala
116	Cyhitroda	Sub Centre	Gujarat	Banaskantha	Lakhani	Cyhitroda
117	Dhunsol	Sub Centre	Gujarat	Banaskantha	Lakhani	Dhunsol
118	Godha	Sub Centre	Gujarat	Banaskantha	Lakhani	Godha
119	Jadiyali	Sub Centre	Gujarat	Banaskantha	Lakhani	Jadiyali
120	Jadiyali	Primary Health Centre	Gujarat	Banaskantha	Lakhani	Jadiyali
121	Jasra	Sub Centre	Gujarat	Banaskantha	Lakhani	Jasra
122	Kamoda	Sub Centre	Gujarat	Banaskantha	Lakhani	Kamoda
123	Kamodi	Sub Centre	Gujarat	Banaskantha	Lakhani	Kamodi
124	Kamodi	Primary Health Centre	Gujarat	Banaskantha	Lakhani	Kamodi
125	Kherola	Sub Centre	Gujarat	Banaskantha	Lakhani	Kherola
126	Kuda	Sub Centre	Gujarat	Banaskantha	Lakhani	Kuda
127	Lavana	Primary Health Centre	Gujarat	Banaskantha	Lakhani	Kuda
128	Lavana -1	Sub Centre	Gujarat	Banaskantha	Lakhani	Lavana-1
129	Lavana -2	Sub Centre	Gujarat	Banaskantha	Lakhani	Lavana-2
130	Madal	Primary Health Centre	Gujarat	Banaskantha	Lakhani	Madal
131	Mota Kapra	Primary Health Centre	Gujarat	Banaskantha	Lakhani	Mota Kapra
132	Nandla	Sub Centre	Gujarat	Banaskantha	Lakhani	Nandala
133	Nani	Sub Centre	Gujarat	Banaskantha	Lakhani	Nani
134	Peplu	Primary Health Centre	Gujarat	Banaskantha	Lakhani	Peplu
135	Peplu	Sub Centre	Gujarat	Banaskantha	Lakhani	Peplu
136	Sergadh	Sub Centre	Gujarat	Banaskantha	Lakhani	Shergarh
137	Vasna Vatam	Sub Centre	Gujarat	Banaskantha	Lakhani	Vasana (Vatam)
138	Aasodar	Sub Centre	Gujarat	Banaskantha	Tharad	Asodar
139	Bevta	Sub Centre	Gujarat	Banaskantha	Tharad	Bevta
140	Bhachar	Primary Health Centre	Gujarat	Banaskantha	Tharad	Bhachar
141	Bhalasara	Sub Centre	Gujarat	Banaskantha	Tharad	Bhalasara
142	Bhapi	Sub Centre	Gujarat	Banaskantha	Tharad	Bhapi

143	Bhordu	Primary Health Centre	Gujarat	Banaskantha	Tharad	Bhordu
144	Bhorol	Primary Health Centre	Gujarat	Banaskantha	Tharad	Bhorol
145	Charda	Sub Centre	Gujarat	Banaskantha	Tharad	Charda
146	Dantiya	Sub Centre	Gujarat	Banaskantha	Tharad	Dantia
147	Deduva	Sub Centre	Gujarat	Banaskantha	Tharad	Deduwa
148	Dipda	Sub Centre	Gujarat	Banaskantha	Tharad	Dipda
149	Dudhva	Primary Health Centre	Gujarat	Banaskantha	Tharad	Dudhva
150	Ghodasar	Sub Centre	Gujarat	Banaskantha	Tharad	Ghodasar
151	Jamda	Sub Centre	Gujarat	Banaskantha	Tharad	Jamda
152	Jetda	Sub Centre	Gujarat	Banaskantha	Tharad	Jetada
153	Khoda	Sub Centre	Gujarat	Banaskantha	Tharad	Khoda
154	Lunal	Sub Centre	Gujarat	Banaskantha	Tharad	Lunal
155	Luvana	Sub Centre	Gujarat	Banaskantha	Tharad	Luvana (K)
156	Luvana (K)	Primary Health Centre	Gujarat	Banaskantha	Tharad	Luvana (K)
157	Miyal	Sub Centre	Gujarat	Banaskantha	Tharad	Miyal
158	Morthal	Sub Centre	Gujarat	Banaskantha	Tharad	Morthal
159	Motipavad	Sub Centre	Gujarat	Banaskantha	Tharad	Moti Pavad
160	Nagla	Sub Centre	Gujarat	Banaskantha	Tharad	Nagla
161	Nanol	Sub Centre	Gujarat	Banaskantha	Tharad	Nanol
162	Naroli	Sub Centre	Gujarat	Banaskantha	Tharad	Naroli
163	Pavdasan	Sub Centre	Gujarat	Banaskantha	Tharad	Pavadasana
164	Radka	Sub Centre	Gujarat	Banaskantha	Tharad	Radka
165	Rah -1	Sub Centre	Gujarat	Banaskantha	Tharad	Rah-1
166	Rajkot	Sub Centre	Gujarat	Banaskantha	Tharad	Rajkot
167	Rampura	Sub Centre	Gujarat	Banaskantha	Tharad	Rampura
168	Ranesari	Sub Centre	Gujarat	Banaskantha	Tharad	Ranesani
169	Sanaviya	Sub Centre	Gujarat	Banaskantha	Tharad	Sanaviya
170	Savpura	Sub Centre	Gujarat	Banaskantha	Tharad	Savpura
171	Undarana	Sub Centre	Gujarat	Banaskantha	Tharad	Undrana
172	Vadgamda	Sub Centre	Gujarat	Banaskantha	Tharad	Vadgamada
173	Valadar	Sub Centre	Gujarat	Banaskantha	Tharad	Valadar
174	Vami	Sub Centre	Gujarat	Banaskantha	Tharad	Vami
175	Akoli	Sub Centre	Gujarat	Banaskantha	Vav	Aakoli
176	Bhakhari	Sub Centre	Gujarat	Banaskantha	Vav	Bhakhri
177	Bukna	Sub Centre	Gujarat	Banaskantha	Vav	Bukana
178	Chandarva	Sub Centre	Gujarat	Banaskantha	Vav	Chandrawa
179	Chothanesada	Sub Centre	Gujarat	Banaskantha	Vav	Chothanesda
180	Chotil	Sub Centre	Gujarat	Banaskantha	Vav	Chotil
181	Dhima-2	Sub Centre	Gujarat	Banaskantha	Vav	Dhima-2

182	Gambhirpura	Sub Centre	Gujarat	Banaskantha	Vav	Gambhirpura
183	Golgam	Primary Health Centre	Gujarat	Banaskantha	Vav	Golgam
184	Janavada	Sub Centre	Gujarat	Banaskantha	Vav	Janawada
185	Kundaliya	Sub Centre	Gujarat	Banaskantha	Vav	Kundaliya
186	Lalpura	Sub Centre	Gujarat	Banaskantha	Vav	Lalpura
187	Madka-1	Sub Centre	Gujarat	Banaskantha	Vav	Madka-1
188	Mavsari	Sub Centre	Gujarat	Banaskantha	Vav	Mawsari
189	Morikha	Sub Centre	Gujarat	Banaskantha	Vav	Morikha
190	Rachena	Sub Centre	Gujarat	Banaskantha	Vav	Rachhena
191	Radhaneshda	Sub Centre	Gujarat	Banaskantha	Vav	Radhanesada
192	Rampura	Sub Centre	Gujarat	Banaskantha	Vav	Rampura
193	Sanval	Primary Health Centre	Gujarat	Banaskantha	Vav	Sanval
194	Sapreda	Sub Centre	Gujarat	Banaskantha	Vav	Sapreda
195	Tadav	Sub Centre	Gujarat	Banaskantha	Vav	Tadav
196	Tirthgam	Primary Health Centre	Gujarat	Banaskantha	Vav	Tirthgam
197	Uchpa	Sub Centre	Gujarat	Banaskantha	Vav	Uchpa
198	Vasarada	Sub Centre	Gujarat	Banaskantha	Vav	Vasarda
199	Vav-1	Sub Centre	Gujarat	Banaskantha	Vav	Wav-1
200	Vavdi	Sub Centre	Gujarat	Banaskantha	Vav	Wavdi