Ministry of Health and Family Welfare
Government of India

# STANDARD OPERATING PROCEDURE

## for Solarization of Healthcare Facilities

unicef
for every child

NISE

National Programme on Climate Change and Human Health

National Centre for Disease Control
Government of India


Ministry of Health and Family Welfare
Government of India

# STANDARD OPERATING PROCEDURE

## for Solarization of Healthcare Facilities

unicef
for every child

NISE

National Programme on Climate Change and Human Health

National Centre for Disease Control
Government of India

# Contents

# Acknowledgement

We express our gratitude to the National Institute of Solar Energy (NISE) for their support in developing this document. Our special thanks to Dr. Nikhil PG (Deputy Director, Technical, NISE) and Mr. Rahul Pachauri (Subject Expert PV modules and Technology, NISE) for their consistent and invaluable technical insights to help develop this resource. We appreciate Children's Environmental Health team at UNICEF India Country office, including Dr. Vivek Virendra Singh (Chief of Health), Dr. Ranganai Matema (Immunization Specialist) and Dr. Mainak Chatterjee (Health Specialist, Climate and Environmental Health), UNICEF for their leadership and vision. We thank Ms. Chehak Ahuja (Consultant Climate Resilient and Sustainable Healthcare) for preparing the guidelines, supported by Mr. Vivek Mudgal (Cold chain officer) and Dr. Sandeep Thacker (Consultant Climate and Environmental Health) from UNICEF. We acknowledge the pivotal role being played by State Health Departments and State and District Nodal Officers–NPCCHH in implementing health facility solarization efforts, exemplifying the health sector's leadership in climate-health adaptation and resilience

This **Standard Operating Procedure for Solarization of Healthcare Facilities** is prepared under the guidance of Dr. Aakash Shrivastava, Additional Director and HoD, National Programme on Climate Change and Human Health (NPCCHH), National Centre for Disease Control (NCDC), support from Dr. Purvi Patel, Sr. Consultant and NPCCHH team. This guidance document supplements the existing Guidelines for Solar Powering Healthcare Facilities (2023) and Guidelines for Green and Climate Resilient Healthcare Facilities (2023) under NPCCHH.

# Abbreviations

| | |
|---|---|
| NCDC | National Center for Disease Control |
| NPCCHH | National Programme on Climate Change and Human Health |
| SAPCCHH | State Action Plan on Climate Change and Human Health |
| DAPCCHH | District Action Plan on Climate Change and Human Health |
| GCR | Green and climate resilient |
| GHG | Greenhouse gas |
| IPHS | Indian Public Health Standards |
| SOP | Standard Operating Procedure |
| PV | Photovoltaic |
| MoHFW | Ministry of Health and Family Welfare |
| NISE | National Institute of Solar Energy |
| MNRE | Ministry of New and Renewable Energy |
| SNA | (State Nodal Agency – Renewable Energy |
| CMC | Comprehensive Maintenance Contract |
| SNO | State Nodal Officer |
| DNO | District Nodal Officer |
| PHCs | Primary Health Centres |
| REDA | Renewable Energy Development Agency |
| WHO | World Health Organization |
| UNICEF | United Nations Children's Fund |

CHAPTER 1

# Context

Climate change-induced heat waves, increased flood intensity and frequency, cyclones, heavy rainfall, droughts, and other shocks, as well as slow-onset events, contribute to increasing the vulnerability of human health. Further, they exacerbate the challenges related to maintaining functionality and continuity of healthcare services. Thereby, making it pertinent to building resilient healthcare systems that are equipped to cope up with and respond to the climate change concerns. The WHO Guidelines on Building Climate Resilient Healthcare 2023 identifies energy efficiency as a key action for building resilient healthcare.

**Climate Resilient Health Systems**

*"…those that are capable of anticipating, responding to, coping with, recovering from, and adapting to climate-related shocks and stress, to bring about sustained improvements in population health, despite an unstable climate"*

*– World Health Organization*

National Programme on Climate Change and Human Health (NPCCHH), as a part of the "Health Mission on climate change", has been supporting the development of climate-resilient healthcare in the country. The programme objectives underline "Health Systems Strengthening" as a key component. In this regard, the programme has developed technical guidelines, engaged in health workforce capacity building, and knowledge creation and communication pillars. The Green and Climate Resilient guidelines disseminated under the programme in 2023 highlight the components of energy efficiency, water and waste management, green buildings, and climate-smart healthcare. Further, the guidelines for Solar powering Healthcare Facilities disseminated in February 2023 detail the technical processes and costing estimations for solarisation of facilities.

Since healthcare solarization component forms an important implementation pillar under the programme, these Standard Operating Procedure (SOP) have been drafted to provide a ready reference material for the State Nodal Officers-NPCCHH, District Nodal Officers-NPCCHH, and programme managers for implementation of this activity. The key components covered under this document include:

- Pre-Solarization (Baseline) Energy Assessment
- Photovoltaic Solar Panel Instalment

CHAPTER 2

# Using the SOP

This document may be utilized by the National Health Mission, health departments and renewable energy departments in states, and nodal officers, hospital managers, and facility in charge to adopt a systematic and scientific approach to healthcare solarization based on suggestive tools and methodologies by NPCCHH, Ministry of Health and Family Welfare (MoHFW) and the National Institute of Solar Energy (NISE), Ministry of New and Renewable Energy.

CHAPTER 3

# Healthcare Facility Solarization

## Importance

Electricity is a critical enabler for improved primary healthcare. Primary Health Centres (PHCs) and Sub Health Centres (SHCs) play a major role in providing last mile medical services such as immunization, child deliveries, and neonatal care, all of which cannot be delivered without regular electricity supply. Hence, the primary need for solarization is to provide the electricity backup to critical loads in a health care facility. Powering of healthcare facilities by solar energy so as to deliver uninterrupted critical care and adapt to climate change. Use of solar energy also supports in reduction of greenhouse gas emissions by the healthcare sector and contributes to a safer world for children and women.

As climate change impacts the health of women, children, and the elderly differently, these measures to strengthen healthcare infrastructure support in improved preparedness and response to the needs of the vulnerable population groups.

**Solarizing a health care facility can significantly improve:**

- Last-mile access to quality health care service.
- Reduction in energy bills, and attributes to less carbon emissions.
- The provision to have a reliable electricity supply, especially during emergencies.
- Effective logistics and transfer of vaccines, owing to the availability of reliable vaccine storage.
- Improved productivity and well-being of facility staff.

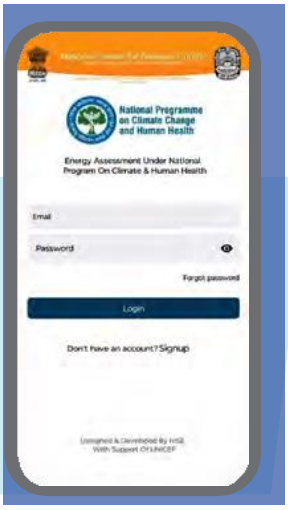
# Implementation Process

To make our healthcare facilities solarized, under the NPCCHH programme, an implementation plan has been designed. This is an institutionalized mechanism for healthcare solarisation arrived at based on the recommendations of the Baseline Energy Consumption study facilitated by NPCCHH and conducted by PHFI, as well as the ongoing work in a few states. The key components include-

- Establishing the intention for the need for solarisation as per the state and district priorities and climate change concerns
- Establishing the protocol and identifying the healthcare facilities for Energy Health Assessment
- Conduct of Baseline energy assessment and survey to assess the feasibility of facility solarisation and arrive at the apt model and investment scenario
- Tendering and Procurement of Services through bidding, for the supply, installation, and commissioning of the solar PV power plant
- Required capacity building for the users and the operators across the life cycle
- Monitoring of the maintenance activities
- Monitoring and reporting energy efficiency and emission reduction practices
- Community awareness activities
- Documentation

## Step 1: Pre-solarization Energy Assessment

Under the programme, a Pre-solarization Energy Assessment tool and a Mobile Application has been developed with the technical support from UNICEF ICO and National Institute of Solar Energy (NISE) under MNRE. The tool seeks to build on the national and state-level data on energy consumption and energy performance in healthcare facilities to derive a roadmap for planning and implementation of energy-efficient and low-carbon healthcare. The tool responds to the current electricity demand and the supply in healthcare facilities and serves the purpose of bridging the health energy nexus.




The Energy Assessment serves two **objectives**:

- Understanding energy needs and consumption pattern of healthcare facilities across the country
- Developing costed plans for solarisation of healthcare facilities based on the energy needs, as well as infrastructure feasibility

The broad assessment heads as a part of the tool include:

- Preliminary profile of HCF
- Services and Working Hours
- Infrastructure Details
- Vaccine storage
- Electrical Parameters
- Load Considerations
- Specific infrastructure-based questions to assess solarisation feasibility
- Water resource access and availability
- Climate-sensitive Disease Profile

Based on the surveyed data, analysis will be conducted to design the Technical Specifications document and the Draft Bid document as two outputs for the state health department to make an evidence base informed decision on the feasibility of solarization of healthcare facilities with the most appropriate solarization model as per facility type and services provided. The Technical Specifications prepared detail the current energy consumption pattern of healthcare facilities and the future needs, solarization models and their suitability, infrastructure needs, and the associated costs.

## Digital system for assessment and monitoring of Solar PV installation

An **energy assessment portal** (https://nise.res.in/ncdc_portal/) is developed to record and monitor the health facility solarization process. It establishes a baseline against which future energy usage; cost savings may be tracked. To begin with, the pre-solarization health facility assessment is conducted through a linked digital mobile application (available on above link). The digital data collection allows standardization of the data collection, analysis, and report generation. State/District Health Departments will be provided with necessary log in details and reports for further necessary actions.

## Step 2: Installation of Solar Panels in Healthcare Facilities

This exercise includes prioritization of healthcare facilities for the conduct of energy assessment and solarization based on the requirements of the state health department,

leveraging the existing financial provisions with the health department for addressing climate change and human health concerns. The technical designs and the cost estimations are also governed by typical requirements of the facility type, the disease load, the critical load identified, vulnerability to extreme weather events, and other factors. Finally, a complete outline will be submitted to the state health department along with draft tender documents to support in installation of the solar panels.

For solarization, a circular approach is being undertaken by ensuring the utilization of local resources and vendors, building a comprehensive management contract agreement, and introducing efficient systems management and disposal measures.

## Implementation Model

The following methodology is explored as an implementation model-

- State Health Department, under MD-NHM and with the support of State Nodal Officer Climate Change and Human Health (SNO-NPCCHH) to convene inter-sectoral meeting to prioritise the conduct of energy assessment and healthcare facilities solarization.
- SNO-NPCCHH to request SNA (State Nodal Agency – Renewable Energy) for Energy Assessment with provision of a list of districts and sample HCF names and contact points, this is done in agreement with the District Nodal Officers- Climate Change and Human Health (DNO-NPCCHH).
- SNA to perform the baseline energy assessment as per the request (using the Standard checklist/ Mobile App tool developed). The tool is also shared with SNO-NPCCHH and DNO-NPCCHH. SNO-NPCCHH can also carry out baseline energy assessment, as and when required. The required capacity building to operate the mobile application is provided by NISE to SNA/ SNO-NPCCHH and DNO-NPCCHH.
- Based on the data received in the mobile application, a technical report will be prepared.

## Roles and Responsibilities

### Role of State Nodal Officer- NPCCHH

- Understanding the need and the process for HCF solarisation

- Inclusion of Energy Assessment and HCF solarisation costing as part of PIP exercise.
- Preparing a roadmap for HCF solarisation and monitoring framework in the state.
- Initiating the procedure by convening the relevant stakeholders in the state under the MD NHM.
- Facilitating Energy Assessment by state REDA officials and or UNICEF/NISE team.
- Participate in training sessions on conducting energy assessment using the Mobile App.
- Monitor the Energy Assessment by state REDA officials and or UNICEF/NISE team.
- Review and approval for the Technical Design Report prepared by the UNICEF/NISE team.
- Sanctioning (with necessary approval) the implementation of the solar system design to identified state agency based on the feasibility report / availability of the funds.
- Coordination with the state agency for required monitoring/maintenance and awareness of the system.
- Coordinating the implementation at the district level, as well as the maintenance of relevant installed systems
- Inclusion of healthcare energy efficiency measures as a part of the State Action Plan on Climate Change and Human Health
- Documentation

## Role of District Nodal Officer- NPCCHH

- Understanding the need and the process for HCF solarisation
- Identifying the district vulnerabilities and needs for energy assessment and facility solarisation as per the district climate health risk profile
- Participation in training sessions toward building energy efficiency and healthcare solarisation
- Inclusion of Energy Assessment and HCF solarisation costing as part of the PIP exercise in DAPCCHH

- Facilitating Energy Assessment by state REDA officials and or UNICEF/NISE team
- Monitor the Energy Assessment by state REDA officials and or UNICEF/NISE team
- Support in solar panel installation procedure in the district, as per coordination with SNO and REDA officials
- Undertake training on Maintenance and Operations of Solar Systems in Healthcare Facilities
- Conduct sensitization sessions for the facility in-charge and other identified resources for the preventive maintenance of solar systems, reporting the operations and maintenance concerns to the designated authorities, regular monitoring of energy consumption patterns, and implementation of energy-efficient measures
- Monitor the efficiency of solar designs and coordinate with REDA officials on such matters
- Support community awareness generation and campaigns on energy efficiency and conscious utilization of non-fossil fuel-based energy resources
- Document the practices related to the utilization of solar-powered healthcare, service provision, and resiliency measures during and after witnessing extreme weather events
- Update the DAPCCHH as per the targets and needs of HCF solarisation

## Role of State Agency (SNA), REDA

- Participation in state level meetings with health department
- Regular interaction and support with the state health department on energy efficiency concerns
- Coordination with NISE and SNO-NPCCHH
- To carry out the site survey / Energy Assessment (using Mobile App) as per the requested list of districts and facility names.
- To gather data in the Mobile-App as per site assessment and as per the inputs by DNO-NPCCHH
- State Agency to implement the project in the through the standard bidding process including installation/ commissioning / maintenance scopes of the solar systems in the nominated health care facilities.

- To ensure proper performance of the installed solar systems through the comprehensive warranty (CMC).
- To provide guidance for the safe and regulated practices in the state for the end-of-life management of system components.
- To ensure operations and maintenance support to the SNOs and DNOs

## Facility Level Measures

- Monitor the Energy Assessment by state REDA officials and or UNICEF/NISE team
- Support in solar panel installation procedure in the district as per coordination with SNO and REDA officials
- Undertake training on Maintenance and Operations of Solar Systems in Healthcare Facilities
- Ensure preventive maintenance of solar systems, reporting the operations and maintenance concerns to the designated authorities, regular monitoring of energy consumption patterns, and implementation of energy efficient measures
- Monitor the efficiency of solar designs and coordinate with REDA officials on such matters
- Support community awareness generation and campaigns on energy efficiency and conscious utilization of non-fossil fuel-based energy resources
- Document the practices related to utilization of solar powered healthcare, service provision, and resiliency measures during and after witnessing extreme weather events

## Financial Provisions

The NPCCHH programme, as a part of its NHM PIP, has made provisions to support the healthcare facility solarisation in states and UTs. The PIP document provides estimations for each healthcare facility type i.e., PHC, CHC, and DH, as per the MNRE guidelines and evidence from a few field visits in multiple states. These include-

In addition to the NHM resources, the states and districts may utilize other funding resources such as Aspirational District Fund, Tribal District Fund, District Mineral Fund, and CSR funding resources amongst others as per their availability.

PIP 24-26 Link- https://ncdc.mohfw.gov.in/wp-content/uploads/2024/06/PIP-Guidelines_FY24-25_25-26_Approved-2.pdf

| Output | Activities | Unit Cost |
|---|---|---|
| **Green Measures in Healthcare Facilities*** | Energy auditing in Healthcare Facilities<br>*(To be done once in 3 years for a facility)* | @Rs.10,000 for PHC<br>@Rs.30,000 for CHC<br>@Rs.1,00,000 for DH |
| | Replace existing lighting (Non-LED) with LED | @Rs.25,000 for PHC<br>@Rs.75,000 for CHC<br>@Rs.2,00,000 for DH |
| | Installation of Solar Panels<br>*(Annexure 10)* | @ Rs.15,00,000 for PHC<br>@Rs.40,00,000 for CHC<br>@Rs.70,00,000 for DH |
| | Install Rainwater Harvesting System | @Rs.5,00,000 for PHC<br>@Rs.8,00,000 for CHC<br>@Rs.10,00,000 for DH |

*Estimated based on field implementation and government benchmarks

**Note:** Submit budget proposal for above mentioned activity unless funds available from other sources

## MNRE Guidance:

**Subject: Amendment in Benchmark costs for Grid-connected Rooftop Solar PV systems for the financial year 2021-22-reg.**

Vide Order no.318/38/2018-GCRT dated 18.08.2021 dated 18.08.2021, benchmark costs including taxes, were issued for FY 2021-22 by the Ministry. Subsequently, applicable Goods & Services Tax (GST) rates have been revised by GST Council for identified renewable energy equipment. In order to address the recent changes in GST rates and also any further changes in GST rates in future, it has been decided to issue benchmark costs excluding GST. For the purpose of calculating CFA available under MNRE Scheme, applicable GST rates may be added to these benchmark costs. Accordingly, undersigned is directed to convey the approval of competent authority for issuing the benchmark costs, excluding GST, for Grid-connected Rooftop Solar PV systems applicable for MNRE Scheme for the year 2021-22. Rooftop solar system capacity-wise benchmark costs are given below:

**(A) For General Category States/UTs**

| RTS System Capacity range | Up to 1 kW | 1 kW upto 2 kW | >2kW Upto 3kW | > 3kW upto 10 kW | >10 kW upto 100 kW | >100 kW upto 500 kW |
|---|---|---|---|---|---|---|
| Benchmark cost (Rs./kW) excluding GST | 46923 | 43140 | 42020 | 40991 | 38236 | 35886 |

**(B) For Other State/UTs (i.e North-Eastern States including Sikkim, Himachal Pradesh, Uttarakhand, Jammu & Kashmir, Ladakh, Andaman and Nicobar and Lakshadweep islands):**

| RTS System Capacity range | Up to 1 kW | 1 kW upto 2 kW | >2kW Upto 3kW | > 3kW upto 10 kW | >10 kW upto 100 kW | >100 kW upto 500 kW |
|---|---|---|---|---|---|---|
| Benchmark cost (Rs./kW) excluding GST | 51616 | 47447 | 46216 | 45087 | 42056 | 39467 |

CHAPTER 4

# Solar-powering Healthcare: Progress report from Uttar Pradesh State Health Department

Uttar Pradesh state health department is championing the cause of climate change and health impacts. A systems approach was taken in the state to build energy efficiency by deployment of clean and renewable energy resources in the public healthcare facilities jointly with the support of UNICEF ICO, Uttar Pradesh team, and UPNEDA.

> *"We have successfully implemented solar projects in around 40 CHCs so far, we have rolled it out in about 24 PHCs, and we plan to expand this initiative to approximately 500 Ayushman Arogya Mandir, 140 CHCs and PHCs, where these solar panels would be required. Initiatives like these will motivate us to progress toward our climate change goals and also help us achieve our health-related SDGs."*
>
> *– Partha Sarthi Sen Sharma, IAS Principal Secretary, Medical Health & Family Welfare and Medical Education, Govt. of Uttar Pradesh*

Currently, the state is solarizing HCFs in the state by utilizing NPCCHH resources and with the technical support of UNICEF. The tender process has insured utilization of local resources and vendors, building a comprehensive management contract agreement, and introducing efficient systems management and disposal measures. The technical designs and the cost estimations are also governed by typical requirements of the facility type, the disease load, critical load identified, vulnerability to extreme weather events, and other factors. Finally, a complete outline was submitted to the state health department along with draft tender documents to support in installation of the solar panels.

## Solarization drive under NPCCHH


NISE

Technical Design Report

Solarization of Health

Facilities – Ghaziabad and

Gautam Buddh Nagar


Uttar Pradesh New & Renewable Energy Development Agency (UPNEDA)

Solarisation at 72 public health facilities (42 CHCs and 30 PHCs) in FY 2023-24

Order placed for another 71 public health facilities (32 CHCs and 39 PHCs) in FY 2024-25

Solarization of DHs using RESCO model

*"For us, the staff and lady doctors, having access to uninterrupted power supply is very important. Definitely it also reduces the cost and helps us adapt to climate change, but in our everyday functioning, continuous energy supply really helps in providing better health services to children and women."*

*– Medical Officer*

CHAPTER 5

# Pre-Solarization (Baseline) Energy Assessment Questionnair

| 1. SURVEYOR DETAILS | | |
|---|---|---|
| 1.1 | Surveyor Name | |
| 1.2 | Designation of the Surveyor | |
| 1.3 | Organization/Agency Name | |
| 1.4 | Date (and time) of the survey | |
| 1.5 | Time of the survey | |
| 1.6 | Surveyor Contact No. | |
| 1.7 | Other information, if any<br>Cloudy Day / Sunny Day / Rainy day | |

| 2. DETAILS OF HEALTH FACILITY | | |
|---|---|---|
| 2.1 | Name of Health facility | |
| 2.2 | Health Facility Category<br>(e.g. Sub Health Centre/ Primary Health Centre / Community Health Centre) | |
| 2.3* | *Does the health facility belong to Health and Wellness Centre? | Yes / No |
| 2.4 | Name of the District | |
| 2.5 | Name of the State | |
| 2.6 | Mobile network strength at the Facility | Good / Poor |
| 2.7 | District Category | (Aspirational district /Non Aspirational district) |
| 2.8 | Address and Location in Detail | |
| 2.9 | Latitude of site | N |
| 2.10 | Longitude of site | E |
| 2.11 | Country | India |

(* Marked information will be sought from the health facility officials)

| | | |
|---|---|---|
| 2.12 | Pin Code: | |
| 2.13 | Name of the contact person at health facility | |
| 2.14 | Email Id of the contact person at health facility | |
| 2.15 | Contact No. of the contact person at health facility | |
| 2.16 | Working Hours of the health facility (Duration) | hours ( AM to PM) |
| 2.17 | Extended Working hours, if any | (Yes/No) |
| 2.18 | Logistic Facility to approach the site | (Yes /No) |
| 2.19 | Distance from main road | kM |
| 2.20 | Approach to Site | Pucca Road / Motorable Road / Kacha Road |
| 2.21* | Name of the Electricity Board | |
| 2.22 | Consumer ID (if available) | |
| 2.23 | Full Name(s) on Consumer ID | |
| 2.24* | Total Number of staff in the facility including doctors, nurses and others | No.s |
| 2.25* | No. of beds available in the health facility | No.s |
| 2.26* | Number of Quarters available for staff at health facility: | No.s |
| 2.27 | Distance of Quarters from health facility. | m |
| 2.28 | Ambulance facility available? | (Yes/No) |
| 2.29* | Is the drinking water facility available? | (Yes/No) |
| 2.30 | Age of the building<br>(i.e. when was it constructed approximately) | (Years) |
| 2.31 | Date / year of Latest last major renovation | |
| 2.32 | Number of floors<br>(Numbers) | |
| 2.33 | Number of buildings in the health facility | (Numbers) |
| 2.34 | Ambient Temperature of the location<br>(approximately during the year) | Maximum: oC<br>Minimum: oC |
| 2.35 | Distance of some Commercial place space, for Local Purchases | Approximate Distance in km. |
| **3. ELECTRICAL PARAMETERS (FOR BASE LINE ENERGY ASSESMENT)** | | |
| 3.1 | Access To Electricity | (Yes/No) |
| 3.2 | Electricity Connection | (Yes/No) |
| 3.3 | Sanctioned Load as per the electricity bill<br>(May differ from actual load) | (kVA) |

| | | |
|---|---|---|
| 3.4 | Peak Load as per the electricity bill | (kVA) |
| 3.5 | Type of Connection | (Single Phase/ Three Phase) |
| 3.6 | Average electricity consumption in a month<br>(from the Electricity Bill) | (kWh / month) |
| 3.7 | Availability of Main Line Transformer [ if Yes :<br>Mention Rating in KVA and Line Voltage (e.g. 11 KV / 33KV … ... if Yes available)] | (Yes / No)<br>……..... |
| 3.8* | Average Power outage in a day | (Hrs. per day) |
| 3.9* | Which is the Primary Source of Supply | (Grid / Inverter / DG) |
| 3.10* | Which is the Secondary Source of Supply | (Grid / Inverter / DG) |
| 3.11* | List down the load equipment details as per the annexure A. | (Yes/No) |
| 3.12* | List down the inputs for energy assessment as per annexure B. | (Yes/No) |
| 3.13 | Meter connection available? | Yes/No |
| 3.14 | AC Voltage at the facility | 230V / 415V / 11kV<br>[Single Phase / Three Phase] |
| 3.15 | Scope of expansion of the loads<br>(or possibility of addition of new equipment in near future)<br>If yes, approximately expected load may be mentioned | (Yes/ No)<br>……..... |
| 3.16* | Number of Outdoor lightings | No.s |
| 3.17 | Whether a Existing Solar system exist at site, | (Yes/ No) |
| 3.18 | if yes, details: | Solar panel Capacity KWp,<br>Battery Capacity..... V, AH,<br>Inverter Details KVA,<br>Charge Controller details:<br>…..... V, Amp, |
| 3.19* | Average Electricity Consumption in Staff quarters | kWh |
| 3.20 | Provisions existing for separate distributed line in Health Facility? | Yes/No |
| 3.21 | Scope for adoption of energy efficiency measures | Yes/No |
| 3.22 | Average power factor (from the Bills) | |
| 3.23 | Number of distribution boards | …..... Numbers |
| 3.24 | Number of MCBs ( 5 to 10 A) | Numbers |
| 3.25 | Number of MCBs ( 10A to 15 A) | Numbers |
| 3.26 | Number of MCBs ( Greater than 20A ) | Numbers |
| 3.27 | Condition of Wiring | Good/ Average/ Poor/<br>Significant Damage |

| 4. SPACE AVAILABILITY FOR ADOPTION OF SOLARIZATION | | |
|---|---|---|
| 4.1 | Approximate Shadow free Area Available on all the roof (s) of the building (s) | (Sq.m) |
| 4.2 | Approximate Shadow free Area on the open ground (including the roof of parking lot) | (Sq.m) |
| 4.3 | space to host Inverter / battery in the facility is available? | Yes/No |
| 4.4 | Whether Space Available for Secure Storage of Material during installation time) | (Yes / No) |
| 4.5 | Space available for earthing | Yes / No |
| 4.6 | Space available for LA Installation | Yes / No |
| 4.7 | Space available for CPU | Yes / No |
| 4.8 | Fencing required for the solar PV system (if on ground) | Yes/No |
| 4.9 | Risk of theft at site? | Yes / No |
| **4.1 Space Availability for Adoption of Solarization for (Building 1)** | | |
| 4.11 | Installation Location (Building Name) | |
| 4.10 | Type of Roof | Corrugated sheet / Flat RCC / / Roof tiles |
| 4.11 | Tilt and Orientation of the roof | Direction:<br>(South, North, East, West)<br>Tilt Angle degrees |
| 4.12 | Total Area Available in Roof | _____ (Sq.m) |
| 4.13 | Total Shadow free Area Available on the Roof | _____ (Sq.m) |
| 4.14 | Any obstructions on in the roof / near by | (Yes/No) |
| 4.15 | General shape of the roof | Square/Rectangular/Slanted/ Uneven |
| 4.16 | Access to the Roof | Stairs, Escalators/ Temporary / etc.<br>No access (Ladder has to be used for access) |
| 4.17 | Weight Restrictions on roof | Yes/No |
| 4.18 | List down the obstruction details as per the annexure C. | Yes / No |
| 4.19 | External wall construction material for the building | Burnt brick / Concrete Brick / Wood / Soil |
| 4.20 | External wall condition | Good/ Average/ Poor/ Significant Damage |
| 4.21 | Roof condition | Good/ Average/ Poor/ Significant Damage |

| | | |
|---|---|---|
| 4.22 | Roof support condition | Good/ Average/ Poor/ Significant Damage |
| 4.23 | Roof Material | Brick / Metallic / Wood |
| **5. WATER SOURCE and OTHER DETAILS** | | |
| 5.1 | Source of water for drinking and other purposes: | Bore well, Open Well, or Municipal Water supply? |
| 5.2 | Capacity of the water storage tank (if available) | (Litres) |
| 5.3 | Pumping mechanism | Motor Pump set / Hand Pump |
| 5.4 | If Motor Pump set, details, like capacity, and pattern of operation | (hp) (hrs) Wattage Voltage |
| 5.5 | Quantity of water required per day | Litres/day |
| 5.6 | Quality of the water, if available | PPM |
| 5.7 | Depth of the water table | meters. |
| 5.8 | Distance between water source and water tank. (including height to which it is pumped) | meters. |
| 5.9 | Availability of Water (For PV module cleaning) | Yes/No |
| **6. VACCINE STORAGE DETAILS** | | |
| 6.1 | Whether Vaccine storage Refrigerator available?? | If yes, whether in working condition Yes / No. |
| 6.2 | Whether Vaccine storage Refrigerator working? | Working / Not Working |
| 6.3 | Whether the Refrigerator is solar powered? | Yes / No. |
| 6.4* | Temperature maintained | degree Celsius |
| 6.5* | Usage pattern (frequency of use), | (Hours in a day) |
| **7. HEALTH RELATED INFORMATION** | | |
| 7.1 | Total Population Catered by the Health Facility | (Numbers) |
| 7.2 | Annual target infant population for current year | (Numbers) |
| 7.3* | Annual target pregnant women | (Numbers) |
| 7.4* | Average number of OPD patients every month (Calculate as the total number of OPD patients seen over last three months as per the OPD register divided by 3) | (Numbers) |
| 7.5 | Average number of total IPD every month (Calculate as the total number of IPD patients admitted over the last three months as per the IPD register divided by 3) | (Numbers) |
| 7.6 | Average number of surgeries conducted in a month (Calculate as the total number of surgeries – both major and minor – as per OT register divided by 3) | (Numbers) |

| | | |
|---|---|---|
| 7.7 | Average number of deliveries conducted in a month (Calculate as the total number of deliveries – both caesarean and normal deliveries – as per the labour room register conducted in last three months divided by 3) | (Numbers) |
| 7.8 | Does facility provide 24-hour emergency services or 24-hour labour room services? | Yes/No |
| 7.9 | Does the facility offer evening OPD services? | Yes/No |
| 7.10 | Is anti-rabies vaccine or the anti-snake venom available at the Health Facility? | Yes/No |
| 7.11 | Are low birth weight babies managed at Health Facility? | Yes/No |
| 7.12 | Is there a fixed immunization day? | Yes/No |
| 7.13 | Is blood examination for malaria/sputum examination for TB/urine examination for pregnant women done at Health Facility? | Yes/No |
| 7.14 | Does the facility have tele-medicine unit or AV unit for trainings/video conferencing? (Note- telemedicine used for online consultation with higher facilities/with beneficiaries, online learning facilities for staff training etc) | Yes/No |
| 7.15 | Is blood storage facility available at the facility? | Yes/No |
| 7.16 | If this facility is a cold chain point,<br>what is the distance between the health facility and the farthest session site?<br>What is the time taken to deliver the vaccine to the aforementioned session site? | Yes/No<br>…….m<br>…….m |
| 7.16 | Number of IPDs overnight? | (Numbers) |
| **8. PHOTOGRAPHS** | | |
| 8.1 | Building with Board | Yes/No |
| 8.2 | Electric Meter Connection and Distribution Board (s) | |
| 8.3 | Image of the proposed Roof / Ground Area for solar installation | Yes/No |
| 8.4 | Image of meter board. | Yes/No |
| 8.5 | Image of Equipment's noted in Annexure 1A. | Yes/No |
| 8.6 | Image of the Roof | Yes/No |
| 8.7 | Electricity Bill copy of last 3 months (if grid is av,) | Yes/No |
| 8.8 | Location (Google map link) | |
| 8.9 | Images of the site for solar installation from different directions (East, South, West, and North) | Yes/No |
| 8.10 | Indicative Load details are enclosed in Annexure A | Yes/No |
| 8.11 | Energy Assessment Inputs in Annexure B | Yes/No |
| 8.12 | Obstruction Specifics in annexure C | Yes/No |

## DETAILS OF CONNECTED LOAD

Building Name:

Total Number of Plug points ( Small…5Amps):

Total Number of Power plug points (Large….15 Amps) :

| S. No. | Connected Load (Category) | Name | Wattage (Watts) | Quantity (in numbers) | Operational Hours during DAY (6am to 6pm) | Operational hours during Night (6pm To 6am) | Is it critical load? (Yes or No) | Load Type (AC or DC) | Energy Rating (if any).....)?? ]\[e.g. 5 /4 /3 .. ..Star??] | Year of Installation |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

## DETAILS OF DIESEL GENERATOR

| DIESEL GENERATOR | |
|---|---|
| Manufacturer Name | |
| Model and Year | |
| Engine Rated power | |
| Voltage | |
| Fuel consumed in Ltrs. (per week) | |
| Operational hours in a week (Average) | |

## DETAILS OF UPS

| UPS | |
|---|---|
| Manufacturer Name | |
| Model and year | |
| Capacity one battery in AH | |
| Battery Voltage | |
| Number of batteries | |
| Inverter Rating (in kVA) | |
| Whether UPS is placed inside an air-conditioned room? | (Yes / No) |

## DETIALS OF ELECTRICTY BILLS (LATEST Year_____)

| Month | Energy Consumption in kWh | Energy cost (INR) |
|---|---|---|
| Jan | | |
| Feb | | |
| Mar | | |
| April | | |
| May | | |
| June | | |
| July | | |
| Aug | | |
| Sep | | |
| Oct | | |
| Nov | | |
| Dec | | |

# Annexure A: Indicative List of Loads for Residence Applications

| Load - Device Description | Load Category | Operating Source - AC/DC | Operating Voltage | Power - Watts |
|---|---|---|---|---|
| Ceiling Fan (55 to 100 watts) (36'-56') | FAN | AC | 220~240V | 75 |
| Wall mounted/table fan | FAN | AC | 220~240V | 60 |
| Exhaust fan | FAN | AC | 220~240V | 60 |
| Florescent Tube Lights | Tubelight | AC | 220~240V | 40 |
| LED Tube Lights | Tubelight | AC | 220~240V | 20 |
| LED Bulb | Bulb | AC | 220~240V | 9 |
| Bulb, Decorative Light etc. | Bulb | AC | 220~240V | 100 |
| CFL | Bulb | AC | 220~240V | 12 |
| LCD TV (20" to 50") (26 to 150 Watts) | TV | AC | 220~240V | 100 |
| LED TV (20" to 50") (24 to 100 Watts) | TV | AC | 220~240V | 80 |
| Fridge Single door (100 and 400 watts ) | Refrigerator | AC | 220~240V | 200 |
| Fridge Double door | Refrigerator | AC | 220~240V | 400 |
| Laptop (14-15 inch ) | Computer | AC | 220~240V | 60 |
| Computer | Computer | AC | 220~240V | 100 |
| Induction | Heavy Kitchen Appliances | AC | 220~240V | 1200 |
| Microwave Oven (850 to 1800 watts) | Heavy Kitchen Appliances | AC | 220~240V | 1500 |
| Mixture - Grinder (400- 750 watts) | Heavy Kitchen Appliances | AC | 220~240V | 1000 |
| AC (1 ton) | Air Conditioner | AC | 220~240V | 1300 |
| AC (1.5 ton) | Air Conditioner | AC | 220~240V | 2000 |
| AC (2 ton) | Air Conditioner | AC | 220~240V | 2.5 |
| AC (3 ton) | Air Conditioner | AC | 220~240V | 3750 |
| Cooler | Air Cooler | AC | 220~240V | 125 |
| Heater/Blower/Dryer | | AC | 220~240V | 1000 |
| Motor 1HP | | AC | 220~240V | 750 |
| Washing Machine | | AC | 220~240V | 800 |

| Load - Device Description | Load Category | Operating Source - AC/DC | Operating Voltage | Power - Watts |
|---|---|---|---|---|
| RO | | AC | 220~240V | 50 |
| Vaccuum Cleaner (500 and 3000 watts ) | | AC | 220~240V | 600 |
| Iron (800 to 2000 watts) | | AC | 220~240V | 1100 |
| Geyser | | AC | 220~240V | 2000 |
| Trade Mill (300-950 watts) | | AC | 220~240V | 600 |
| Music System | | AC | 220~240V | 250 |
| Sewing machine | | AC | 220~240V | 100 |
| Street/Campus Light | Tube light | AC | 220~240V | 40 |

## Indicative List of Loads for PHC Applications

| S.No | Item | Approx. Power consumption per item (Watts) |
|---|---|---|
| 1 | Refrigerator | 100 |
| 2 | ILR (Small) and DF (Small) | 265 |
| 3 | Computer with accessories | 300 |
| 4 | Printer | 250 |
| 5 | Radiant warmer | 650 |
| 6 | Table lamp with 200 watt bulb | 200 |
| 7 | Phototherapy unit | 20 |
| 8 | Room Heater | 2000 |
| 9 | Room Air Cooler | 100 |
| 10 | ECG machine | 25 |
| 11 | Nebuliser | 120 |
| 12 | Sterilisation equipment | 1500 |
| 13 | Lamp | 18 |
| 14 | Fans | 70 |
| 15 | Tube light | 20 |
| 16 | Shadow less lamp light | 80 |
| 17 | Light examination, mobile, 220-12 V | 20 |

# Annexure B: Inputs for Energy Assessment

| | | |
|---|---|---|
| B.1 | Fuels used for generating steam / water heating | Diesel / Natural Gas/ Electricity |
| B.2 | Total Built up area of the facility<br>(Exclude area used for staff quarters, parking, lawn etc) | _____ (Sq.m) |
| B.3 | Total number of buildings | _____ (Numbers) |
| B.4 | Total number of floors in the building | _____ (Numbers) |
| B.5 | Total number of windows in each floor | _____ (Numbers) |
| B.6 | Total Installed capacity of Air Conditioners<br>Window and Spilt AC (Numbers)__ | _____ TR |
| B.7 | Estimated hot water consumption per day | _____ (Litres) |
| B.8 | Availability of thermostatic radiator control for air conditioning? | (Yes/ No) |
| B.9 | Are there variable speed drives for controlling the fan speed? | Yes/No |
| B.10 | Are there incandescent bulbs / lighting which are older than 5 years? | Yes/No |
| B.11 | Do the facility have a maintenance plan to carry out regular maintenance of the electrical Equipment? | Yes /No |
| B.12 | Does the rooms have enough options for day light? | Yes/ No |
| B.13 | Does the facility have occupancy sensors? | Yes/No |
| B.14 | Are there proper labelling on the electrical Equipments? | For almost all / For some / Very few |
| B.15 | Does the regular maintenance of the Refrigerators / Freezers carried out? | Yes/ No |
| B.16 | Does the hot water pipes insulated well? | Yes/No |
| B.17 | Options to switch the lighting load in parallel. | Yes/No |
| B.18 | Automated mechanism to monitor the energy usage | Yes/ No |
| B.19 | Awareness to staff on the energy efficiency | Yes/No |
| B.20 | Are there electronic ballast in the lighting circuits?<br>[e.g. Electronic choke in Tube Lights] | Yes/No |
| B.21 | Is the label pasted in public for recommended temperature and humidity? | Yes / No |
| B.22 | Star rating of the Refrigerators | |
| B.23 | Star Rating of the Air conditioners | |
| B.24 | How old is the water pump? | _____ years |
| B.25 | Are there electrical loads in the facility which are 6 years or older? | Yes/No |

| | | |
|---|---|---|
| B.26 | Do the HCF monitor or track the usage of energy? | Yes/No |
| B.27 | Does your hospital have an energy conservation program? | Yes/No |
| B.28 | Have you engaged in Central plant or mechanical equipment upgrades? | Yes/No |
| B.29 | Have you engaged in Low-energy lighting, such as T-5 or LED? Maximizing day lightning | Yes/No |
| B.30 | Have you engaged in Install lighting control systems to minimize energy consumption? | Yes/No |
| B.31 | Install energy efficient equipment? | Yes/No |
| B.32 | Do you educate staff, patients and visitors about energy conservation and efficiency strategies/programmes (energy awareness campaigns)? | Yes/No |
| B.33 | Low carbon features incorporated in the Hospital | Tick the appropriate:<br>< Enhanced building thermal envelope Reflective roofing<br>< Open able windows<br>< Shading by overhangs or planting Use of local materials<br>< Low-flow water fixtures Solar water heating<br>< Energy labelling Equipments.<br>< Implement sleep mode on computer equipment"<br>< Automatic Turning off lighting and equipment when not in use Energy management systems |

## Details of Obstruction

| Date of Survey : | Time of Survey : | |
|---|---|---|
| **S. No.** | **Item** | **Description** |
| 1 | Name All the obstructions on the building roof proposed for installation, (ex. Water tank, civil columns or any tree etc.) (If No obstruction, please mention NIL) | 1a.<br>1b.<br>1c. |
| 2 | Name All the obstructions in the 30m radius of the building, which are taller than the building. (Ex. Trees, towers, buildings etc.)<br>(If No obstruction, please mention NIL) | 2a.<br>2b.<br>2c. |
| 3 | Is there any transmission line crossing across the roof? | |
| 4 | Any visible shadow observed during the visit? Yes of No? | |
| 5 | Any building construction in progress during the day of visit? | |
| 6. | Height of the building on which roof top installation is planned. (in meter) | |

Specifics Enclosed

## DETAIL SPECIFICS OF EACH OBSTRUCTION 1a,1b... 2a,2b,.....

**(Ref to S. Nos. 1 and 2 above)**

| Obstruction | 1a. ( Name) | |
|---|---|---|
| **S. No.** | **Specific** | **Description** |
| 1. | Height of the obstruction from the ground or roof of terrace (in meter) | |
| 2. | Azimuth angle of the obstruction with reference to south. | |
| 3. | Shortest approx. distance of the obstruction from the building. (in case obstruction is outside the building) | |
| 4. | Shortest distance of the obstruction from the centre of the module layout. | |
| 5. | Photograph of obstruction 1a. | |

| Obstruction | 1b. ( Name) | |
|---|---|---|
| **S. No.** | **Specific** | **Description** |
| 1. | Height of the obstruction from the ground or roof of terrace (in meter) | |
| 2. | Azimuth angle of the obstruction with reference to south. | |
| 3. | Shortest approx. distance of the obstruction from the building. (in case obstruction is outside the building) | |
| 4. | Shortest distance of the obstruction from the centre of the module layout. | |
| 5. | Photograph of obstruction 1a. | |

Please repeat the table (as above), for other obstruction


Ministry of Health and Family Welfare
Government of India

unicef
for every child

NISE

National Programme
on Climate Change
and Human Health

National Centre for
Disease Control
Government of India