TA-9389 SRI: Rooftop Solar Power Generation Project

CF-001 Implementation Support for Solar Power Generation Project (50373-002)

ROOFTOP SOLAR POWER GENERATION LINE OF CREDIT (RSPGLoC) PROJECT

OPERATIONS MANUAL

02 May 2019

(Revised from previous Operations Manual dated 07 January 2019)

Revisions to Operations Manual dated 07 January 2019

Page 3: Step 1	Tenor of the sub-loan shall be subject to the following • Both residential and commercial-scale rooftop subprojects may have a grace period not exceeding 6 months within the repayment period of 10 years
Page 4: Step3; Section ii	ii. CEB/LECO area engineer performs an initial review based on network absorption capacity and compliance with its technical guidelines. A copy of the request letter for initial clearance is detailed in Section 2, Annex 2-V.
Page 9: Step 10	If the subproject complies with the Standards, CEB/LECO connects the system and issues a connection certificate. A copy of the connection certificate is detailed in Section 8, Annex I.
Page 10: Section 3.0 Warranty and Insurance	Solar Panels • Minimum performance of 90% of the rated output for first 10 years, and 80% of the rated output for the next 10 years. • 20-year performance warranty that guarantees a maximum degradation will not exceed 2.5% in the first year, and 0.5–0.7%/yr thereafter
Page 14: Annex 1; Section iii	c. Solar PV system – vendor warranty: mounting structure and wiring for 5 years d. Minimum performance – 20-year performance warranty that guarantees a maximum degradation will not exceed 2.5% in the first year, and 0.5–0.7%/yr thereafter
Page 28: Section 7	7 Shutdown procedure and labelling of system components Shutdown procedure to ensure safe de-energization of the system shall be properly documented and displayed for an emergency situation. Solar PV system components shall be suitably labelled as stipulated in SLS 1522.
Page 29: Section 9	9 Test results and commissioning data Copies of all test and commissioning data shall be provided. As a minimum, these shall include the results from the verification tests detailed in Section 6 of this standard.
Page 34	New insertion Annex 2-V
Page 39 Annex 4-1	Pre-verification Form PV Service Provider details ADB Registration Number replaced with SLSEA Registration number
Page 70	New insertion Annex 8

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Abbreviations

ADB	Asian Development Bank
CEB	Ceylon Electricity Board
DFD	Development Finance Department
DGM	Deputy General Manager
GoSL	Government of Sri Lanka
IEC	International Electro Technical Commission
LECO	Lanka Electricity Company (Pvt) Ltd
MoPE	Ministry of Power, Energy and Business Development
MW	Megawatt
O&M	Operation and Maintenance
PAM	Project Administration Manual
PFI	Participating Financial Institutions
PIU	Project Implementation Unit
PMU	Project Management Unit
PV	Photovoltaic
SLS	Sri Lanka Standards
SLSEA	Sri Lanka Sustainable Energy Authority
TA	Technical assistance

1.0 Introduction

The “Rooftop Solar PV Power Generation Project” will provide long-term debt financing for installation of rooftop solar photovoltaic power generation systems in Sri Lanka. The credit line of US $ 50 million established by the Government of Sri Lanka (GoSL) through a loan from the Asian Development Bank (ADB) will provide the required financing with preferential terms. As part of the project, technical and commercial frameworks will be introduced including technical guidelines and standards for solar rooftop systems that would add value in developing solar rooftop installations. The credit line will be managed by the Ministry of Finance (MoF) and funds will be channeled to the beneficiaries through selected Participating Financial Institutions (PFI). The technical support will be provided by the Project Implementation Unit (PIU) in close collaboration with MoF, Ministry of Power, Energy and Business Development (MoPE) and Sri Lanka Sustainable Energy Authority (SLSEA).

The Operations Manual describes the essential administrative and management requirements to implement the “Rooftop Solar PV Power Generation Project” in accordance with the policies, procedures and regulations of GoSL and ADB.

The Operation Manual includes the procedures for technical conformity from the project identification to commissioning as well as during the post commissioning. In this context, this manual covers

i) Technical guidelines and standards for rooftop solar systems;

ii) Subproject screening, implementation, monitoring, and compliance activities;

iii) Post implementation monitoring and

iv) Project monitoring.

The flowchart of application and approval process of the rooftop solar PV loan scheme is detailed below (Figure I) and action to be taken by each stakeholder is described in the following section.

2.0 Application and Approval Process of Loan Scheme

The following flow illustrate the various steps of loan application and approval process

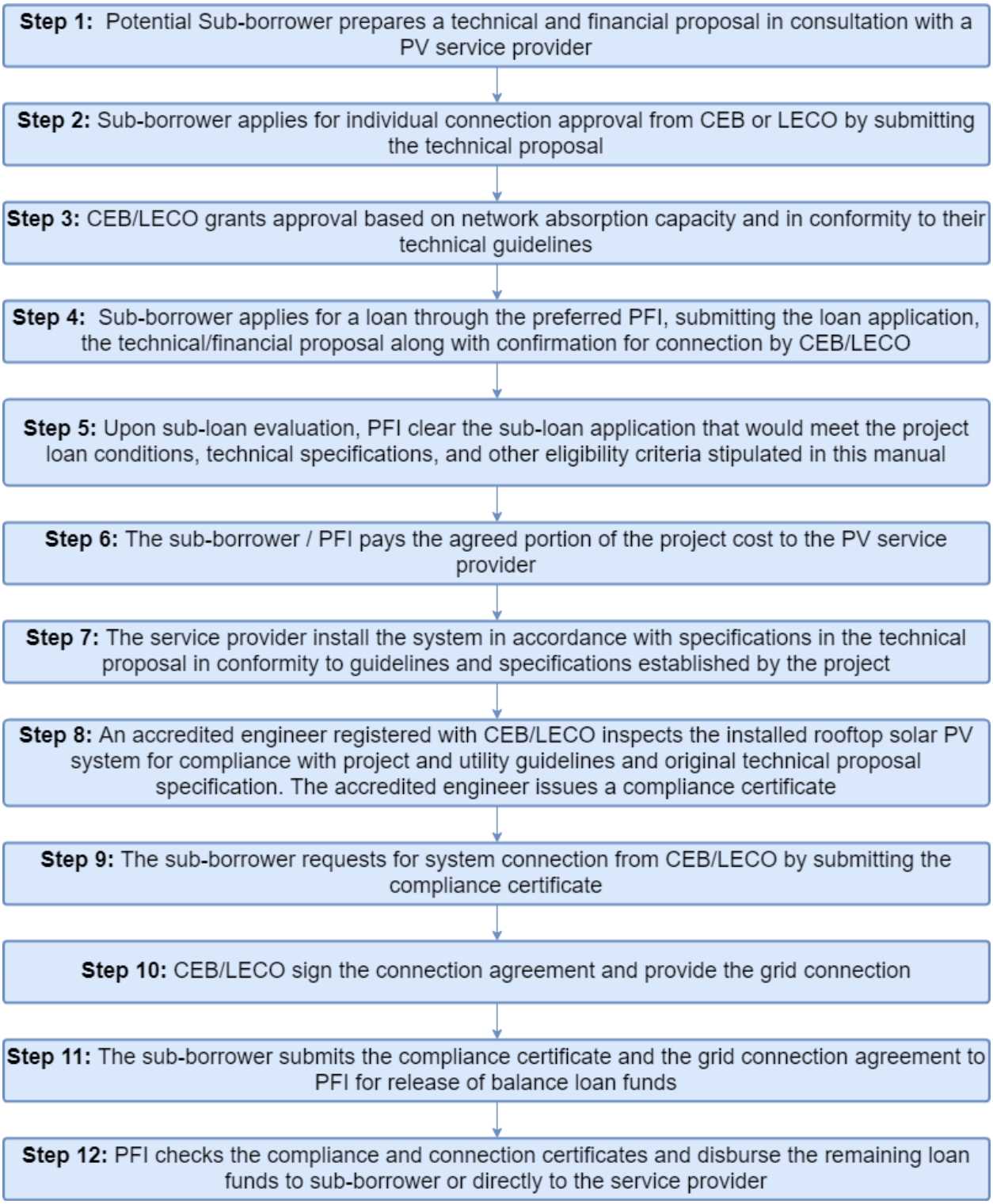

Figure 1.Flow Chart – Loan Application and Approval Process

Step 1: Project Proposal for a Rooftop Solar PV System

The potential sub-borrower shall prepare a technical and financial proposal in consultation with a solar PV service provider registered under Sri Lanka Sustainable Energy Authority (SLSEA). The list of registered solar PV Service Providers is detailed in the project web-site www.rooftopsolar.lk.

The recommended guidelines for solar PV roof top Vendors/Service Providers is detailed in Section 1, Annex1-I of this manual.

The following sub-projects are eligible under the Project.

- Residential rooftop: solar PV system installed on an existing permanent residential building rooftop
- Commercial-scale rooftop: solar PV systems installed on an existing permanent commercial-scale building rooftop

Capacity limitations under the Projects are as follows.

- Maximum solar power generation capacity installed on rooftop shall not exceed 50 kW
- Single sub-borrower may apply for multiple subprojects subject to a maximum cumulative capacity of 50 kW

ADB funding for subprojects are available as detailed below.

- Upto 100% of the subprojects cost for residential rooftop subprojects with a subproject cost not exceeding LKR 1.5 million
- Upto 80% of the subproject cost for, residential subprojects with a subproject cost exceeding LKR 1.5 million and all commercial rooftop subprojects

Tenor of the sub-loan shall be subject to the following

- Repayment period shall not exceed 10 years
- Both residential and commercial-scale rooftop subprojects may have a grace period not exceeding 6 months within the repayment period of 10 years

Sub-borrower should be the owner of the permanent residential/commercial-scale building proposed to be used to install the solar PV system

Step 2: Submission of application for grid connection approval from CEB/LECO

Sub-borrower shall apply for approval from CEB/LECO for individual rooftop solar PV system connection to the national electricity grid by submitting the technical proposal. The technical proposal should comply with SLS 62446-1 which stipulate the information requirements for testing, documentation and maintenance. A description of the required information and format of relevant data sheets are available in Section 2, Annex 2-III and Annex 2-IV.

Please refer website www.ceb.lk/www.leco.lk for standard application for individual connection approval of CEB/LECO. A copy of the application is available in Section 3 of this manual (Annex 3-I).

Step 3: CEB/LECO approval for grid connection

The procedure for interconnection of renewable energy systems established by the CEB/LECO shall be followed to obtain the clearance for grid connection. The grid connection clearance process is summarized in the following flow chart:

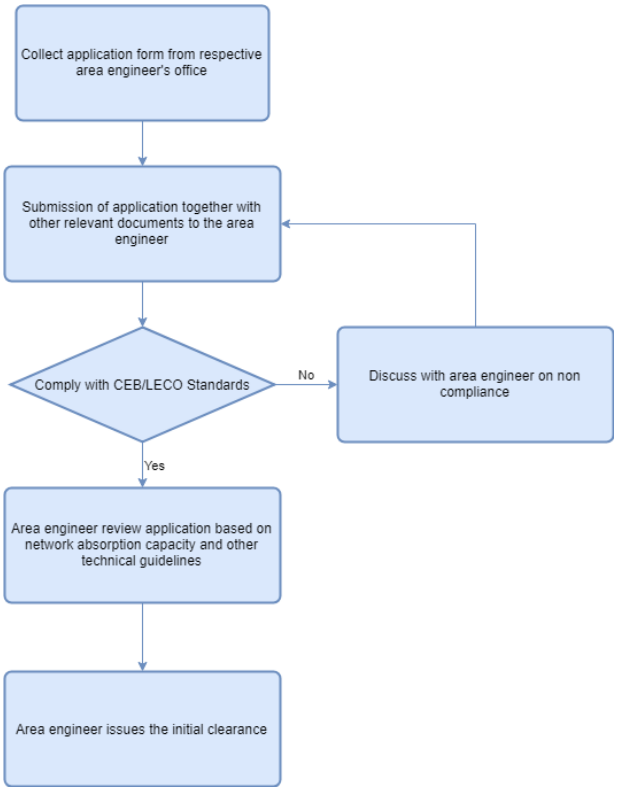

Figure 2.Flow Chart -Connection request

i. Potential sub-borrower shall submit an application and provide relevant additional information as stipulated in the manual for renewable energy grid interconnection, to the relevant area engineer's office of CEB or LECO.

ii. CEB/LECO area engineer performs an initial review based on network absorption capacity and compliance with its technical guidelines. A copy of the request letter for initial clearance is detailed in Section 2, Annex 2-V.

iii. If the proposal complies with the CEB/LECO standards and other technical requirements, the area engineer issues the initial clearance for grid interconnection.

iv. The grid connection application, Manual for Renewable Energy Interconnection, interconnection agreement and Technical Standard for grid interconnection including technical information, metering requirement etc. are given in website www.ceb.lk/www.leco.lk.

Step 4: Applying for Loan

Sub-borrower shall apply for loan through the preferred PFI by submitting a loan application, the technical& financial proposal along with the initial clearance for grid inter-connection by CEB/LECO.

The sub-borrower shall submit the loan application to any of the eligible PFI along with a project proposal providing the following project information:

- Project details:
  - Project description
  - Site GPS coordinates (Latitude / Longitude)
  - Site address
  - Information of the site / construction
- Customer details:
  - Name
  - Full postal address
  - Mobile phone number
  - Ground phone number
  - E-mail address
- Installation details:
  - Design Capacity
  - Date of completion of installation
  - Date of planned connection to grid
  - Nominal voltage
  - Rated fault current
  - Design System frequency
  - Method of Earthing
  - Guidelines for Rooftop PV.
- Performance Criteria

The PFIs are required to submit the following applications for refinancing to GoSL which are attached in section 2.

Project loan application commercial category (Annex 2 – I (a))
Project loan application residential category (Annex 2 – I (b))
Reimburse application (Annex 2 – I (c))

Applicant is required to provide the PFIs the necessary information to complete the above forms.PFI may request for information in addition to above.

The names of eligible PFIs are detailed in Annex 2-II.

Step 5: Loan Evaluation

The PFIs shall adopt the following criteria for evaluation of loan applications from sub-borrowers

a) Initial screening:

PFI shall ensure that the loan application fulfill following mandatory requirements prior to further processing

- CEB/LECO initial clearance for grid interconnection: the initial interconnection consent issued by CEB/LECO
- Service Provider/Vendor eligibility: The rooftop solar service provider shall be a company registered by SLSEA as a solar vendor/service provider eligible to participate in the project. Please refer Project website www.rooftopsolar.lk for the approved list of solar vendors eligible to participate in the Project and the recommended eligibility criteria.
- Component eligibility: The components of the solar PV systems installed under the project shall confirm to the prescribed Sri Lanka Standards for the relevant component. The relevant SLS standards applicable for the project include the following and a brief description of each of the standard is given in Section 05 of this manual:
    - SLS 1522 - Sri Lanka Standard Code of practice for grid connected Photovoltaic power systems –Requirements for system documentation, installation, testing and commissioning
    - SLS 1542 - Specification for electric cable for Photovoltaic system
    - SLS 1543 - Specification for safety of power convertors for use in Photovoltaic power systems
    - SLS 1544 - Specification for terrestrial photovoltaic module – design qualification and type approval
    - SLS 1545 - Specification for photovoltaic module – performance testing and energy rating
    - SLS 1546 - Specification for photovoltaic system power conditioners – Procedure for measuring efficiency
    - SLS 1547 - Specifications for PV systems – Characteristics of utility interface
    - SLS 1553 - Specifications for photovoltaic module safety qualifications
    - SLS 1554 - Specifications for low-voltage switchgear and control gear
    - SLS 1473 - Low-voltage surge protective devices – D.C side of photovoltaic installations
    - SLS YYYY - Connectors for DC-application in photovoltaic systems – Safety requirements and tests. **(will be published in 1st quarter of 2019)**
    - SLS-IEC 62446 - Specifications for PV systems – Requirement for testing, documentation and maintenance

- SLS IEC 60364 - Sri Lanka Standard Specification for Low Voltage Electrical Installation
- SLS IEC 62548 - Sri Lanka Standard Specification for Photovoltaic (PV) Arrays – Design Requirements

- Vendors/service providers shall submit necessary test certificates from accredited laboratories and obtain the conformity certificates from Sri Lanka Sustainable Energy Authority as appropriate.
- The Vendor/Service Provider shall provide insurance cover for following through a reputed Insurance Company
  i) Comprehensive General Liability for the components of PV system
  ii) Workers' Compensation for any accident during the installation/maintenance.
- Energy Metering: A Smart Meter as per the specification of CEB/LECO shall be included in the proposal for monitoring of the total energy generation. The meter shall be supplied by CEB/LECO and the cost of the meter shall be included in the connection charge.

b) PFI appraisal: PFI shall conduct its own due- diligence process to ensure conformity of the project to its respective internal lending criteria.

c) Pre-Installation Verification: PFI shall obtain a pre-installation certificate signed by the Solar PV Service Provider as per pre – installation requirements.

- Pre-installation Verification requirements: Pre-installation requirement would include site inspection for stability of the roof structure and shading, orientation. Pre-installation verification criteria and template to be completed by the service provider is detailed in Section 04, Annex 4-I of this manual. Please refer Project website www.rooftopsolar.lkfor latest updates.

  Recommendations of the pre-installation verification report may require amendments to the technical proposal and in such event, sub-borrower is required to reapply for initial interconnection approval from CEB/LECO

d) PMU Clearance: PFIs shall submit all loan applications to PMU, regardless of the subproject size, for final approval.

e) Loan approval and disbursement: Upon fulfilling of above conditions PFI may approve and disburse the loan as per the loan agreement between the PFI and sub-borrower.

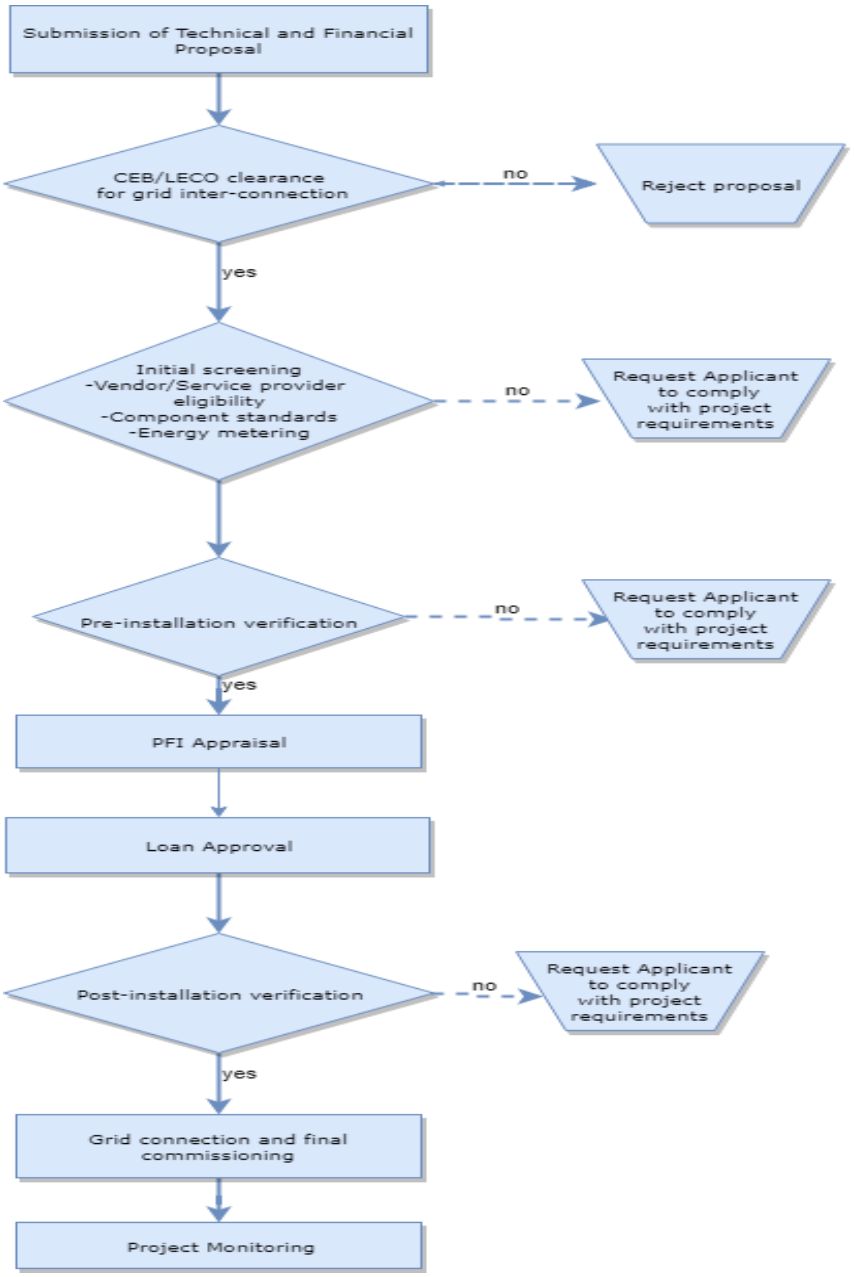

Figure 3. Flow Chart - Loan Approval Process

Step 6: Payments to the solar service provider

Sub-borrower is responsible for settling of all the payments of the solar PV service provider as per the agreement between solar PV service provider and the sub-borrower.

Step 7: Solar PV System Installation

The service provider shall install the system in accordance with specifications in the technical proposal in conformity to guidelines and specifications established by the project. The components of the solar PV systems installed under the project shall be in conformity to the prescribed Sri Lanka Standards for the relevant component and Project Technical Specification. Further, vendors/service providers shall follow

the SLS 1522Sri Lanka Standard Code of Practice for Grid Connected Photovoltaic Power Systems which stipulate the requirements for system documentation, installation and commissioning. Applicable Sri Lanka Standards are detailed in section 05 of this Manual. Please refer the Project website for the latest updates.

Step 8: Post-installation Verification

Prior to commissioning of the system, the PFI shall engage a chartered electrical engineer registered under CEB/LECO to perform post-installation verification. The objective of the verification is to review and confirm that the installed rooftop solar system has followed the project design and utility guidelines and specifications of the original technical proposal.

The inspection and verification process of PV systems shall be carried out with reference to IEC 62446-1 and Sri Lanka Standards 1522. The checklist and final verification certificates are detailed in Section 06 of this manual. Please refer the Project website for latest updates.

Templates for post installation verification certificates are detailed in section 06, Annex6-I, Annex 6-II, Annex 6-III, Annex 6-IV and Annex 6-V of this manual. Please refer Project website for latest updates.

If the subproject fulfils the criteria, chartered electrical engineer shall issue a Compliance Certificate. The format for Compliance Certificate is available in the Annex6-V, Section 06 of this manual. Please refer Project website for latest updates.

This certificate ensures that the project has been developed according to the Project technical specification and guidelines of CEB/LECO.

Step 9: Request for Grid Connection

The sub-borrower shall make a request to CEB/LECO for system connection by submitting the compliance certificate.

Step 10: Grid Connection and Commissioning

If the subproject complies with the Standards, CEB/LECO connects the system and issues a connection certificate. A copy of the connection certificate is detailed in Section 8, Annex I.

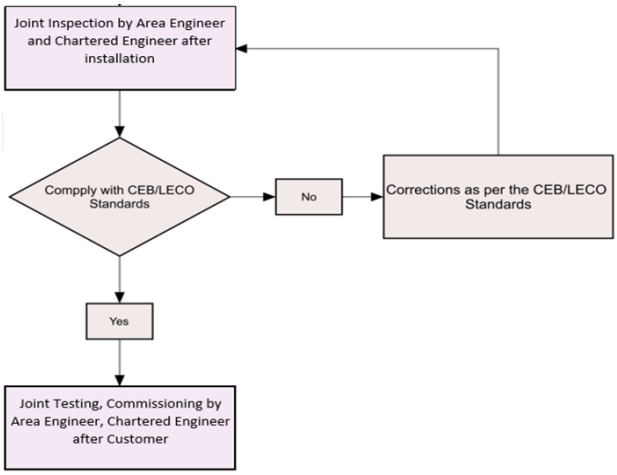

Figure 4.Flow Chart of System Interconnection Procedure

Step 11: Request for Final Payment

The sub-borrower shall submit the compliance certificate and the connection certificate to PFI for release of balance loan funds.

Step 12: Final Payment

PFI shall check the compliance and connection certificates and issue the remaining loan funds to sub-borrower or make direct payment to the service provider in consultation with the sub-borrower.

3.0 Warranty and insurance

A rooftop PV system has several components and each one of them have their own performance parameters. In order to increase the reliability of the system, the following warranty and insurance is required for each component:

Solar Panels:

- Manufacturer Warranty for Modules shall cover manufacturing defects for a period of 10 years.
- Minimum performance of 90% of the rated output for first 10 years, and 80% of the rated output for the next 10 years.
- 20-year performance warranty that guarantees a maximum degradation will not exceed 2.5% in the first year, and 0.5–0.7%/yr thereafter

Inverter:

- Inverters warranty shall cover minimum of 10 years of manufacturer warranty. This warranty shall cover the defects or damages that may occur to the inverter parts.

Mounting and Wirings:

- Warranty cover by the service provider for mounting structure and wiring for 5 years.

Vendors/service providers shall submit necessary test certificates from accredited laboratories and obtain the conformity certificate from Sri Lanka Sustainable Energy Authority for PV panels, invertors and DC Cables as appropriate.

The Vendor/Service Provider shall provide insurance cover for following through a reputed Insurance Company

- Comprehensive General Liability for the components of the PV system
- Workers' Compensation for any accident during the installation/maintenance

4.0 Project Monitoring

A comprehensive web-based IT Solution Package established by the PIU shall monitor project progress, fund movements, capacity installed and energy served to the grid by PV systems financed by the Project. Further a comprehensive database of all installations including on-line technical performance information of installations funded through the ADB Project shall be maintained. The database shall

facilitate the periodic report requirements of the ADB and GoSL (Department of Development Finance of the Ministry of Finance), while monitoring the project progress and generate analytics for various MIS and research purposes.

Additionally, periodic energy generation data shall be captured by CEB/LECO through Smart Meters installed by CEB/LECO at each location to facilitate performance monitoring. This data needs to be captured to the proposed database periodically.

The database shall comprehensively cover the following:

- Sub-borrower (beneficiary) details including geographic location, type of sub-borrower (domestic/commercial), demographics (domestic sub-borrowers) and industry classification (commercial sub-borrowers)
- Sub-loan facility details including name of PFI & branch, project cost, installed capacity, sub-loan amount, repayment period, disbursements details at each disbursement, irregularities of debt-servicing, if any and smart meter reference
- Vendor information including name, model nos. & country of origin of components, system configuration and Smart Meter references (installed by CEB/LECO)
- Periodic energy generation data of each PV installation through CEB/LECO databases. Real-time operational data on selected PV installations may also be required.
- Pre-installation and post-installation verification details captured by the verification engineer at site
- Reference Data shall include PFI/branch, vendor/equipment, geographic location, industry sector classification etc., that need to be maintained by PIU as and when the need arises

IT solution shall further ensure a cross platform supported Mobile Application to facilitate the on-line capture of verification data at site by verification engineers by the PIU.

4.1 Operation of the IT Solution Package

4.1.1 Data Entry and Report Generation

The twelve (12) digit reference number given in the loan application shall be used as the reference number for data inputs to the system. Breakdown of the twelve digits as follows

- First four digits - Represent the PFI
- Next four digits - Represent the Branch of the PFI
- Last four digits - Represent the application no

This reference number shall be linked with the 10-digit customer account no of CEB/LECO in order to capture the electricity generation data reported by CEB/LECO.

4.1.2 Loan Approval and Reporting

PFI shall send a report as detailed in the Section 7, Annex 7-I to PMU for all the approved loans. These details shall be submitted for each of the loan on quarterly basis to PMU.

Further PFI shall also send a report of loan disbursement details on quarterly basis as detailed in Section 7, Annex 7-II to PMU.

All data above shall be submitted in excel formats and such information shall be automatically uploaded to the data base by PIU.

4.1.3 Monitoring of Electricity Generation

All installations shall be provided with a remote monitoring energy meter installed by CEB/LECO. Electricity generation in each facility will be monitored online by CEB/LECO and an interface will be used to transmit data on monthly basis.

4.1.4 Reporting Frequency

PFIs shall submit quarterly reports to PMU as detailed in paragraph 4.1.2 above according to the following schedule

1st Quarter of the Year	before 15th April of the same year
2nd Quarter of the Year	before 15th July of the same year
3rd Quarter of the Year	before 15th October of the same year
4th Quarter of the Year	before 15th January of the following year

4.2 Roles and Responsibilities applicable to Project Monitoring Software Package

Role	Responsibility	Remarks
Data capture relating to Borrowers and approved Loans	PIU/PMU/PFI	This activity to be handled by PFI/PMU/PIU
Data capture on Pre/Post-installation verification	Site Engineers	Mobile App to be used
Energy Generation Data	CEB-LECO/PIU	Interface will be used to transmit data on a monthly basis.
Managing Reference data(Vendors, Banks, Branches, locations etc)	PIU	Periodic activity after initial data set-up during implementation
Report Generation	PIU	Routine and Ad Hoc basis as the need arises
System Administration and Maintenance	PIU/Solution Provider	PIU will manage this activity in coordination with the vendor who will develop and implement the package

Section 01

Recommended Guidelines for Solar PV Roof Top Vendors/Service Providers

Annex 1

Recommended Guidelines for Solar PV Roof Top Vendors/Service Providers

Vendors/service providers (applicant company), having capacity to deliver the complete package of services including survey, design, supply of equipment/materials, installation & commissioning and post installation back up support must register at the Sri Lanka Sustainable Energy Authority to engage in Solar PV Roof Top installation in Sri Lanka.

Registered vendors may be asked to update and/or provide additional information that may be required for determining the vendor's ability to participate in specific requests for proposals of major procurements, where additional qualification criteria specific to such projects would be required.

It is mandatory that Service provider/vendors conform to the following;

I. Service provider/Vendor shall be registered as a company under the Companies Act No 7 of 2007;

II. The service provider/vendor shall be registered as a solar PV service provider at Sri Lanka Sustainable Energy Authority;

III. The service provider/vendor shall provide the following minimum warranties;
   a. Solar PV panel – 10 years (manufacturer warranty);
   b. Inverter – 10 years (manufacturer warranty);
   c. Solar PV system – vendor warranty: mounting structure and wiring for 5 years
   d. Minimum performance – 20-year performance warranty that guarantees a maximum degradation will not exceed 2.5% in the first year, and 0.5–0.7%/yr thereafter

IV. PV panels and invertors of all systems installed by vendors shall consist of a valid certificate issued by Sri Lanka Sustainable Energy Authority for warranty and quality standards;

V. Vendors shall obtain comprehensive insurance cover for equipment damage and accidental workman compensation during installation; and

VI. Vendors shall have a regional office or an appointed agent acceptable to Sri Lanka Sustainable Energy Authority, within the Province of each installation prior to undertaking an installation.

Further, it is preferred that:

I. Vendor has a technical team with a;
   a. minimum of one Graduate Engineer, with minimum of 03 years of industrial experience or Diploma in Electrical/Mechanical Engineering at NVQ 6 level with 05 years of industrial experience of which 01 year in the solar industry; and
   b. minimum of 01 Technician, with NVQ 3 level or equivalent qualifications and with 03 years of industrial experience.

II. Vendors past track record includes;
   c. A Positive Net Worth during the last financial year (audited);
   d. A minimum of 20 rooftop solar installations during the last two years; and
   e. A minimum cumulative capacity of 150 kW of rooftop solar installations during the last two years.

Section 02

Loan Application and Guidelines for Preparation of the Project Proposal

Annex 2 - I (a)

PROJECT LOAN APPLICATION– RSPGLoCPROJECT
FOR SUB-LOANS UNDER THE COMMERCIAL CATEGORY

To be filled by PMU/MoFMM

1. General Information

PFI Name :
Branch Name/Code :

Sub-loan Amount (Rs.) :
Refinance Loan (Rs.) :

2. Sub-borrower

Business Name :
Business Registration No. :
Date Registered (MM/DD/YY) :

Business Address :
District located :
Contact Number (Tel/Mobile) :

Organization : Limited Company/Partnership/Proprietor

Details of Sponsor's : Directors/Partners/Proprietor

Full Name	Age	NIC

3. Proposed Project

Description of the Project:

Justification:

4. Project Cost

Total Estimated Project Cost (Rs.)	Equity Contribution (Rs.) (20% minimum)	Requested Loan Amount (Rs.)	Loan Approved (Rs.)

5. Solar Photovoltaic System Supplier

Name of Supplier :
Address of Supplier :
Registered No. in SLSEA :

6. Approvals from System Connector

Connecting Institution : CEB/LECO
Connection Model :

Net Metering	
Net Accounting	
Net Plus	

Network absorption capacity :

7. System Specifications

Country of Origin :
Country of Produced :
Capacity :
Guarantee :

Description	Period of guarantee	Remarks
Solar Panels		
Inverters		
System		
Others (if any, specify)		

8. Terms and Conditions of the sub-loan

Sub-loan Amount (Rs.) :
Repayment Period :
Rate of Interest :
Security :

…….. ……
Prepared by (Name & Designation) Authorized by (Name & Designation

Annex 2 – I (b)

PROJECT LOAN APPLICATION– RSPGLoCPROJECT
FOR SUB-LOANS UNDER THE RESIDENTIAL CATEGORY

To be filled by PMU/MoFMM

Loan Reference No:

1. General Information

PFI Name :
Branch Name/Code :

Sub-loan Amount (Rs.) :
Refinance Loan (Rs.) :

2. Sub-borrower

Applicant Name :
Residential Address :
Tax No :
District located :
Contact Number (Tel/Mobile) :

Details of Applicant :

Full Name	Age	NIC

3. Proposed Project

Description of the Project:

Justification:

4. Employment of the Applicant

   Profession :

   Office Address :

   Monthly Salary Income:

5. Solar Photovoltaic System Supplier
   Name of Supplier :
   Address of Supplier :
   Registered No. in SLSEA :

6. Approvals from System Connector

   Connecting Institution : CEB/LECO
   Connection Model :

Net Metering	
Net Accounting	
Net Plus	

   Network absorption capacity :

7. System Specifications

   Country of Origin :
   Country of Produced :
   Capacity :

   Guarantee :

Description	Period of guarantee	Remarks
Solar Panels		
Inverters		
System		
Others (if any, specify)		

8. Terms and Condition
   Sub-loan Amount (Rs.) :
   Repayment Period :
   Rate of Interest :
   Security :

   …….. ……
   Prepared by (Name & Designation) Authorized by (Name & Designation)
   Date: Date:

Annex 2 – I (c)

BANK LOGO

Date:

Rooftop Solar Power Generation Line of Credit Project
The Project Management Unit
The Department of Development Finance
Ministry of Finance & Mass Media
Colombo 01

Dear Sir/Madam,

Line of Credit Facility

1. In terms of the participating Credit Agreement entered in to by our bank and the MoFMM of Sri Lanka, we hereby apply for reserving funds as per the details given below

a) Amount of the facility :
b) Eligible Sub-project : Residential/Commercial
c) Name of the Applicant :
d) Name of the Bank branch :

2. The certified copies of the (i) Project Loan Application (ii) Credit Appraisal (iii) Business Registration(iv) Technical Proposal (v) CEB or LECO Connection Approval are attached here to,

…….
Signature of the Authorized person

…….
Name of the Authorized Person

…….
Designation

REIMBURSEMENT APPLICATION FOR ROOFTOP SOLAR POWER GENERATION PROJECT

Refinance Loan PMU Ref. No.

1.

Name of the PFI :

Branch Name/Code :

2.

Business Name/Applicant Name:

Address of Sub-borrower :

3. Refinance Loan Amount (Rs.) :

4. Refinance Approved Date :

5. Details of Reimbursement

Amount of Sub-loan Approved (Rs.)	Amount of sub-loan Released by PFI (Rs.)	Date Released (MM/DD/YY)	Amount Claimed (Rs.)
	Tranch 1 – ……..	……	
	Tranch 2 – ……..	……	
	Tranch X -……..	……	

6. Proceeds of the loan released have been utilized to finance the following:

Description	Value (Rs.)	Remarks
Solar panels	……	
Inverters	……	
Others (specify)	……	
Installation charges	……	

We , (full Name of PFI)…….do certify that;

(1) A sum of Rs……..has so far been disbursed by us as a part/full of the sub-loan approved for the above named sub-borrower. We also confirm that the sponsor has brought in Rs……as his contribution to the sub-project as at (MM/DD/YY)……

(2) The conditions referred to in Operating Instructions, Part 12 (Selection criteria and approval process criteria) of the RSPGLoC has been met.

(3) The above amounts have been paid for the proper execution of project activities within the terms and conditions of the loan agreement.

……. ……..

Branch Manager Authorized Officer, Head office

Date…….. Date……..

ATTACHMENTS TO BE ENCLOSED WITH THE REIMBURSEMENT APPLICATION:

1. Bank Statement of proofing disbursement
2. Inspection Report/Compliance Certificate issued by a Charted Engineers who is registered with CEB and/or LECO
3. The Connection Confirmation/Certificate issued by CEB or LECO
4. PFI confirmation of adequate insurance of sub project assets
5. Copy of the Agreement with CEB/LECO
6. Latest Tax payment receipt
7. Last Electricity Payment Bill

Annex 2-II

The list of Eligible PFIs of the Project

- Bank of Ceylon
- Commercial Bank of Ceylon
- DFCC Bank
- Hatton National Bank
- National Development Bank
- Nations Trust Bank
- Peoples Bank
- Regional Development Bank
- Sampath Bank
- Seylan Bank

Annex 2-III

System Documentation requirements (Ref. SLS 1522)

1.0 General

The purpose of clause 4 is to list the minimum documentation that should be provided following the installation of a grid connected PV system. This information will ensure key system data is readily available to a customer, inspector or maintenance engineer. The documentation includes basic system data and the information expected to be provided in the operation and maintenance manual.

2.0 System data

2.1 Basic system information

As a minimum, the following basic system information shall be provided. This “nameplate” information would typically be presented on the cover page of the system documentation pack.

a) Project identification reference (where applicable).
b) Rated (nameplate) system power (kW DC or kVA AC).
c) PV modules and inverters – manufacturer, model and quantity.
d) Installation date.
e) Commissioning date.
f) Customer name.
g) Site address.

2.2 System designer information

As a minimum, the following information shall be provided for all bodies responsible for the design of the system. Where more than one company has responsibility for the design of the system, the following information should be provided for all companies together with a description of their role in the project.

a) System designer, company.
b) System designer, contact person.
c) System designer, postal address, telephone number and e-mail address.

2.3 System installer information

As a minimum, the following information shall be provided for all bodies responsible for the installation of the system. Where more than one company has responsibility for the installation of the system, the following information should be provided for all companies together with a description of their role in the project.

a) System installer, company.
b) System installer, contact person.
c) System installer postal address, telephone number and e-mail address.

3.0 Wiring diagram

3.1 General

As a minimum, a single line wiring diagram shall be provided. This diagram shall be annotated to include the information detailed in 4.3.2 to 4.3.6.

In general, it is expected that this information will be presented as annotations to the single line wiring diagram. In some circumstances, typically for larger systems where space on the diagram may be limited, this information may be presented in table form.

3.2 Array – General specifications

The wiring diagram or system specification shall include the following design information.

a) Module type(s).
b) Total number of modules.
c) Number of strings.
d) Number of modules per string.
e) Identify which strings connect to which inverter.

Where an array is split into sub-arrays, the wiring diagram shall show the array – sub- array design and include all of the above information for each sub-array.

3.3 PV string information

The wiring diagram or system specification shall include the following PV string information.

a) String cable specification – size and type.
b) String overcurrent protective device specifications (where fitted) - type and voltage/current ratings.
c) Blocking diode type (if relevant).

3.4 Array electrical details

The wiring diagram or system specification shall include the following array electrical information (where fitted).

a) Array main cable specifications – size and type.
b) Array junction box / combiner box location.
c) DC switch disconnector, location and rating (voltage/current).
d) Array overcurrent protective devices – type, location and rating (voltage/current)
e) Other array electronic protective circuitry (such as arc fault detection), if applicable – type, location and rating.

3.5 AC system

The wiring diagram or system specification shall include the following AC system information.

a) AC isolator location, type and rating.
b) AC overcurrent protective device location, type and rating.
c) Residual current device location, type and rating (where fitted).

3.6 Earthing and overvoltage protection

The wiring diagram or system specification shall include the following earthing and overvoltage protection information.

a) Details of all earth / bonding conductors – size and type. Including details of array frame equipotential bonding cable where fitted.
b) Details of any connections to an existing Lightning Protection System (LPS).
c) Details of any surge protection device installed (both on AC and DC lines) to include location, type and rating.

4 String Layout

For systems with three or more strings, a layout drawing of the PV system showing how the array is split and connected into strings shall be provided.

NOTE: This is particularly useful for finding faults in larger systems and on building mounted arrays where access to the rear of the modules is difficult.

5 Datasheets

As a minimum, datasheet shall be provided for the following system components.

a) Module datasheet for all types of modules used in system – to the requirements of IEC 61730 – 1.
b) Inverter datasheet for all types of inverters used in system.

The provision of datasheet for other significant system components should also be considered.

6 Mechanical design information

A data sheet for the array mounting system shall be provided. If the mounting structure was custom engineered, include the relevant documentation.

7 Shutdown procedure and labelling of system components

Shutdown procedure to ensure safe de-energization of the system shall be properly documented and displayed for an emergency situation. Solar PV system components shall be suitably labeled as stipulated in SLS 1522.

8 Operation and maintenance information

Operation and maintenance information shall be provided and shall include, as a minimum, the following items:

a) Procedures for verifying correct system operation.
b) A checklist of what to do in case of a system failure.
c) Emergency shutdown / isolation procedures.

d) Maintenance and cleaning recommendations (mechanical, civil & electrical) – if any.
e) Considerations for any future building works related to the PV array (e.g. roof works).
f) Warranty documentation for PV modules and inverters – to include starting date of warranty and period of warranty.
g) Documentation on any applicable workmanship or weather-tightness warranties.

9 Test results and commissioning data

Copies of all test and commissioning data shall be provided. As a minimum, these shall include the results from the verification tests detailed in Section 6 of this standard.

Annex 2-IV

Roof-Top Solar Power Systems- Compliance Inspection Report

Form 1: System documentation check list

Basic system information	
Customer Name	Contact No:
Installation address:	e-mail:
Rated system power (kW DC or kVA AC)	Project identification reference:
Installation date:	Commissioning date:
Inverter Manufacturer: Model: Quantity:	PV modules Manufacturer: Model: Quantity:
System Designer information	
System designer, company	Contact person
Postal address	Telephone number & e mail
System Installer information	
System designer, company	Contact person
Postal address	Telephone number & e mail
Wiring Diagram	
Single Line Diagram	Detailed SLD provided Yes ☐ No ☐
Array Specifications	Module type(s) Yes ☐ No ☐ Total number of modules Yes ☐ No ☐ Number of strings Yes ☐ No ☐ Number of modules per string Yes ☐ No ☐ String connection to inverter Yes ☐ No ☐
PV string information	Cable make & type Yes ☐ No ☐ Cable size Yes ☐ No ☐ OC protective device type Yes ☐ No ☐ OC protective device ratings Yes ☐ No ☐ Blocking diode type Yes ☐ No ☐

Array electrical details	Main cable type	Yes ☐ No ☐
	Main cable Size	Yes ☐ No ☐
	Junction/combiner box location	Yes ☐ No ☐
	DC switch disconnector location	Yes ☐ No ☐
	DC switch disconnector rating	Yes ☐ No ☐
	OC protective device type	Yes ☐ No ☐
	OC protective device ratings	Yes ☐ No ☐
	Other protective circuitry	Yes ☐ No ☐
AC system	Isolator location	Yes ☐ No ☐
	Isolator type	Yes ☐ No ☐
	Isolator rating	Yes ☐ No ☐
	AC OC protective device type	Yes ☐ No ☐
	AC OC protective device ratings	Yes ☐ No ☐
	RCD location	Yes ☐ No ☐
	RCD type	Yes ☐ No ☐
	RCD rating	Yes ☐ No ☐
Earthing and over voltage protection	Earth cable size and type	Yes ☐ No ☐
	Lightning protection system	Yes ☐ No ☐
	Surge protection device location	Yes ☐ No ☐
	Surge protection type & rating	Yes ☐ No ☐
System Layout diagram	Details are Satisfactory	Yes ☐ No ☐
Datasheets	Module data sheets	Yes ☐ No ☐
	Inverter data sheets	Yes ☐ No ☐
	Data sheets for other components	Yes☐ No ☐
Mechanical design information	Data sheets of mounting system	Yes ☐ No ☐
Emergency systems	Documentation	Yes ☐ No ☐
Operation & maintenance information	Procedures for system operation	Yes ☐ No ☐
	Check list in case of system failure	Yes☐ No☐
	Emergency shutdown procedure	Yes ☐ No ☐
	Maintenance procedures	Yes ☐ No ☐
	Consideration for future works	Yes ☐ No ☐
	Warranty documentation	Yes ☐ No ☐
Test results and commissioning data	Testing & commissioning formats	Yes ☐ No ☐

DETAIL INFORMATION			
Array Specifications			
1.	Make of the Modules	IEC 61215-1: 2016 IEC 61215-2 :2016 IEC 61853-1 : 2011	
2.	Module Type		
3.	Total Number of Modules		
4.	Number of Strings		
5.	Number of Modules per String		
PV String Information			
1.	Make & type of Cable	EN 50618 : 2014	
2.	Size of Cable		
3.	Make & Type of Overcurrent protection device		
4.	Voltage & Current rating of Overcurrent protection device		
5.	Make & Type of Blocking Diodes		
Array Electrical Details			
1.	Make & type of Main Cable	EN 50618 : 2014	
2	Size of Main Cable		
3	Make & type of Junction box/Combiner box		
4	Make & type of DC Switch Disconnector	IEC 60947-3 : 2015	
5	Voltage & Current Rating of DC Switch Disconnector		
6	Make & Type of Overcurrent protection device		
7	Voltage & Current rating of Overcurrent protection device		
8	Make, Type & Rating of other protective circuitry		
9.	Make & Type of Array Overcurrent protection device		

Form 2: System details

AC System			
1.	Make & type of AC Isolator	IEC 60947-3 : 2015	
2.	Voltage & Current Rating of AC Isolator		
3.	Make & Type of Overcurrent protection device		
4.	Voltage & Current rating of Overcurrent protection device		
5.	Make & Type of RCD	IEC 60775	
6.	Rating of RCD		
Earthing and Overvoltage Protection			
1.	Make & Type of Earth Bonding Conductors		
2.	Size of Earth Bonding Conductors		
3.	Details of Lightning Protection System		
4	Make, Type & Rating of DC Surge Protection Device		
5	Make, Type & Rating of AC Surge Protection Device		
Other			
Inverter			
1.	Make(s) of the Inverter(s)	IEC 62109-1 : 2010 IEC 62109-2 : 2011	
2	Model(s) of the Inverter(s)		
3.	Rated output power (kW)		
4.	Number of Inverters r(s)		
Main Circuit Breaker			
1.	Make &Model of the Circuit Breaker	IEC 60947-2 : 2016 IEEE 1547 – 4.1.8.3 IEEE 1547 – 4.1.8.2	
2.	Rating (Voltage & Current)		
3.	Short Circuit Current Rating		
4.	IP Class		
I certify that the above filled particulars are true and correct Name ..... Signature..... Date..... (Solar PV Service Provider)			

Annex 2-V

…….. 2019

Area Engineer (……)
…… [Ceylon Electricity Board / Lanka Electricity Company (Pvt) Ltd.]
……..
……..

Dear Sir / Madam

Initial Clearance Request for a Rooftop Solar Installation
under the ADB Rooftop Power Solar Generation Line of Credit (RSPGLoC) Project

We have received a request from the customer detailed below for a rooftop solar installation under the ……. [Net Metering / Net Accounting / Net Plus] scheme.

Customer Name: …….

Address: ……

CEB/LECO Account No.: ……

This installation is proposed to be considered for refinancing under the ADB funded RSPGLoC Project. Therefore, we kindly seek your initial clearance at your earliest, to proceed with the installation and meet the Project deadlines.

Your assistance in this respect is highly appreciated.

Thank you.

Yours faithfully

…… [To be signed by the solar service provider]
[Name]
[Designation]
[SLSEA Registration Number]

…… [To be signed by the customer]
[Customer Name]
[Customer Address]
[Business Registration (if applicable)]

Section 03

Application for Grid Connection Approval

Annex 3-I

Application No	

Form N1

Application for Net Metering (Scheme01)/ Net accounting (Scheme02) / Net Plus (Scheme03) of an On-Grid Small-Scale Renewable Energy Facility

1. **Project Type:** Please mark✓in the appropriate boxes below.

Scheme 01: Please select **one or a combination of many types**.

Solar Photovoltaic ☐ Wind ☐ Micro hydro ☐ Biomass (grown) ☐ Waste (agricultural, industrial, municipal, waste heat) ☐

Scheme 02

Solar Photovoltaic ☐

Scheme 03

Solar Photovoltaic ☐

2. Information about the Applicant:

Electricity Consumer's Account No :

Name :

NIC number :

Address as specified in the Account No:

Contract Demand of the Installation :

Single phase		Three phase		Ampere	

Note: The small-scale renewable energy facility shall be located at the premises served by the electricity account stated above

Telephone

Mobile										
Land										

Note: Bank detail should be submitted only for scheme 02 and 03

Bank Name		Account no		Branch	
Account type					

E-mail:

3. Facility Information–Please fill-in the information requested under the project type selected in item1 above.

4. Certification

- I attach the receipt number .....dated..... for the payment of Rs …… as the review fee for this application, charged by LECO.
- I certify that Net Metering Facility is required at the same premises where electricity account is already provided, and that the renewable energy resource is within the property served by the existing electricity supply.
- I have read the Agreement and the Interconnection Standards applicable for Net Metering Facility. I agree to install all the required equipment and to provide information whenever requested by LECO and the Sri Lanka Sustainable Energy Authority.

Name of person signing this application_____
(Should be the registered consumer)

5. Additional Information/Requirements

Installer detail

Installer	
Address	
Contact Person	
Telephones	Fixed
	Mobile
Fax	
Email	

6. Information to be submitted with the application

1. Final Copy of the Circuit Diagram (proposed)
2. Compliance Certificate obtained from accredited agency, type-test certificates, manuals, operating instructions, layout diagram, and single-line diagram including all devices and their respective setting, and any other relevant documents.
3. Schedule of protective devices and protection setting.
4. Proposal for Maximum generation of kWh unit per month.

7. Installers Declaration

All the installed equipment were purchased from Original Supplier or authorized dealer		Yes /No
The Installation fully complies with the LECO Standards		Yes /No
The Protection Setting are protected from unauthorized alterations and tamperproof		Yes /No
Operation manuals, safety guides and the relevant documentation were submitted and clearly explained to the end user		Yes /No
Additional Comments (Continue in separate sheet if necessary)		
Name of the Installer	Authorized seal and Signature	Date

Section 04

Pre-installation verification

Annex 4-I

Pre-Verification FORM 1 – INFORMATION ABOUT PROJECT	
Project details	
Name of financial institute	
Proposed project description	
Site GPS coordinats (Latitude / Longitude)	
Site address	
Date of inspection (dd_mm_yyyy)	

Customer details	
Name	
Postal address	
Mobile phone number	
Land phone number	
E-mail address	
Power rating, Type & Tariff of existing CEB/LECO supply	

PV Service Provider details		
Name		
SLSEA registration number		
Contact detail		
Proposed Capacity of the project		
PV System design document	Single line diagram	Yes/No
	System layout	Yes/No
Additional Information		
Signature of the Rooftop Solar PV Service Provider		

Pre-Verification FORM 2 – CHECKLIST FOR GENERAL INSPECTION			
Instruction	This form shall be filled-up based on the design documents of proposed PV system project, please tick ✓ in the box if satisfactory If not applicable, write 'NA' in the box.		Date of inspection: (dd_mm_yyyy)
i. General	i.	Access to site is satisfactory.	☐
	ii.	CEB/ LECO power supply is already connected and rating is confirmed.	☐
	iii.	Roof area is confirmed to layout drawing.	☐
	iv.	Roof lay out is confirmed to layout drawing.	☐
	v.	Roof angle is confirmed to layout drawing.	☐
	vi.	Directions (North) is confirmed to layout drawing.	☐
	vii.	Roof structure is in satisfactory condition for PV system installation.	☐
	viii.	Structural Engineer's approval required for roof structure?	☐
	ix.	Shading to the proposed PV panel layout is negligible.	☐
	x.	Power rating verified according to design	☐
	xi.	Proposed locations for inverter and other switchgear are accessible and suitable for the installation.	☐
	xii.	Proposed cable paths are acceptable	☐
Remarks			
Signature of the Rooftop Solar PV Service Provider			

Section 05

Sri Lanka Standards for Solar PV Systems

Annex 5

Sri Lanka Standards for Solar PV systems

Standards Code	Specification	Description	International Standards	Mandatory requirement
SLS 1522 (2016)	Sri Lanka Standards Code of Practice for Grid Connected PV Power Systems.	This Technical Standards defines the minimal information and documentation required to be handed over to a customer following the installation of a grid connected PV system. This standard also describes the installation, testing and commissioning procedure and documentation expected to verify the safe installations and correct operation of the system. It is for use by system designers and installers of grid connected net energy metered solar PV systems as a template to provide effective documentation to a customer. By detailing the expected installation, testing & commissioning procedure, it is also intended to assist in the verification / inspection of a grid connected PV system after installation and for subsequent re-inspection, maintenance or modifications. Additional, it is written for grid connected net energy metered solar PV systems only and not for AC module systems or systems that utilize energy storage (e.g. batteries) or hybrid systems.	None	Yes
SLS 1542 (2016)	Electric Cable for Photovoltaic System.	This Technical Standard specifies cables for use in PV System, for installation at the Direct Current (DC) side. These cables are suitable for permanent outdoor use for many years under variable demanding climate conditions. Relatively stringent requirements are set for these products in line with the expected harsh usage conditions. It is applies to low smoke halogen free, flexible, single core power cables with cross link insulation and sheath. In particular for use at the DC side of photovoltaic system, with a nominal DC voltage of 1.5kV between conductors and between conductor and earth. The cables are suitable to be used with Class II equipment. The cable are design to operate at a nominal maximum conductor temperature of 90 °C, but for a maximum of 20 000 hours a maximum conductor temperature of 120 °C at a maximum ambient temperature of 90 °C is permitted.	EN 50818 (2014)	Yes

Standards Code	Specification	Description	International Standards	Mandatory requirement
SLS 1543	Safety of Power Converts for Use in Photovoltaic Power System	This Sri Lanka Standard Specification is published in two parts.	IEC 62109	Yes
	Part 1 (2016) General Requirements	Applies to the power conversion equipment (PCE) for use in Photovoltaic (PV) systems where a uniform technical level with respect to safety is necessary. This standard defines the minimum requirements for the design and manufacture of PCE for protection against electric shock, energy, fire, mechanical and other hazards. This standard provides general requirements applicable to all types of PV PCE.	IEC 62109-1 (2010) Edition 1.0	Yes
	Part 2 (2016) Particular Requirements for Investors	Covers the particular safety requirements relevant to DC to AC (Alternating Current) inverter products as well as products that have or perform inverter functions in addition to other functions, where the inverter is intended for use in photovoltaic power systems. Inverters covered by this standard may be grid-interactive, stand-alone, or multiple mode inverters may be supplied by single or multiple photovoltaic modules grouped in various array configurations, and may be intended for use in conjunction with batteries or other forms of energy storage.	IEC 62109-2 (2011) Edition 1.0.	Yes
SLS 1544	Terrestrial Photovoltaic Design Qualification and Type Approval	This Sri Lanka Standard Specifications for is published in different parts although only part of it has been used	IEC 61215	Yes
	Part 1 (2016) Test Requirements	Lays down requirements for the design qualification and type approval of terrestrial photovoltaic (PV) modules suitable for long-term operation in general open-air climates, as defined in IEC 60721-2-1 (unwritten in this document).	IEC 61215-1 (2016) Edition 1.0	Yes
	Part 1-1 (2016) Special Requirements for Testing of Crystalline Silicon Photovoltaic Modules.	This part of IEC 61215 lays down IEC requirements for the design qualification and type approval of terrestrial photovoltaic (PV) modules suitable for long-term operation in general open-air climates, as defined in IEC 60721-2-1. This standard is intended to apply to all terrestrial flat plate module materials such as crystalline silicon module types as well as thin-film CdTe modules. This standard does not apply to modules used with concentrated sunlight although it may be utilized for low concentrator modules (1 to 3 suns). For low concentration modules, all tests are performed using the	IEC 61215-1-1 (2016) Edition 1.0.	Yes

Standards Code	Specification	Description	International Standards	Mandatory requirement
		current, voltage and power levels expected at the design concentration. This standard does not address the particularities of PV modules with integrated electronics, nit may however be used as a basis for testing such PV modules. The objective of this test sequence is to determine the electrical and thermal characteristics of the module and to show, as far as possible within reasonable constraints of cost and time, that the module is capable of withstanding prolonged exposure in climates described in the scope. The actual lifetime expectancy of modules so qualified will depend on their design, their environment and the conditions under which they are operated. The standard defines PV technology dependent modifications to the testing procedures and requirements per IEC 61215-1:2016 and IEC 61215-2:2016.		
	Part 2 (2016) Test Procedures	This is similar to the above standard, therefore is intended to apply to all terrestrial flat plate module materials such as crystalline silicon module types as well as thin-film modules. The objective of this test sequence is to determine the electrical and thermal characteristics of the module and to show, as far as possible within reasonable constraints of cost and time, that the module is capable of withstanding prolonged exposure in general open-air climates. The actual lifetime expectancy of modules so qualified will depend on their design, their environment and the conditions under which they are operated.	IEC 61215-2 (2016) Edition 1.0.	Yes
SLS 1545	Photovoltaic Modules Performance Testing and Energy Rating	This Sri Lanka Standard Specification for is published in two parts		
	Part 1 (2016) Irradiance and Temperature Performance Measurements and Power Rating.	This part of IEC 61853 describes requirements for evaluating PV module performance in terms of power (watts) rating over a range of irradiances and temperatures. IEC 61853-2 describes test procedures for measuring the performance effect of angle of incidence; the estimation of module temperature from irradiance, ambient temperature and wind speed; and impact of spectral response on energy production. IEC 61853-3 describes the calculations of PV module energy (watt-hours) ratings. IEC 61853-4 describes the standard time periods and weather conditions that can be utilized for calculating standardized energy ratings. The object of this part of IEC 61853 is to define a testing	IEC 61853-1 (2011) Edition 1.0.	Yes

Standards Code	Specification	Description	International Standards	Mandatory requirement
		and rating system, which provides the PV module power (watts) at maximum power operation for a set of defined conditions. A second purpose is to provide a full set of characterization parameters for the module under various values of irradiance and temperature. This set of measurements is required in order to perform the module energy rating described in IEC 61853-3.		
	Part 2 (2017) Spectral Responsivity, Incidence Angle and Module Operating Temperature Measurements.	The IEC 61853 series establishes IEC requirements for evaluating PV module performance based on power (watts), energy (watt-hours) and performance ratio (PR). It is written to be applicable to all PV technologies, but may not work well for any technology where the module performance changes with time (e.g. modules change their behaviour with light or thermal exposure), or which experience significant non-linearities in any of their characteristics used for the modelling. The purpose of this part of IEC 61853 is to define measurement procedures for measuring the effects of angle of incidence of the irradiance on the output power of the device, to determine the operating temperature of a module for a given set of ambient and mounting conditions and measure spectral responsivity of the module. A second purpose is to provide a characteristic set of parameters which will be useful for detailed energy predictions. The described measurements are required as inputs into the module energy rating procedure described in IEC 61853-3.	IEC 61853 (2016) Edition 1.0	Yes
SLS 1546	Photovoltaic System Power Conditioners – Procedure for Measuring Efficiency	Describes guidelines for measuring the efficiency of power conditioners used in stand-alone and utility-interactive photovoltaic systems, where the output of the power conditioner is a stable AC voltage of constant frequency or a stable DC voltage	IEC 61683 (1999) Edition 1.0	Yes
SLS 1547 (2016)	Photovoltaic System – Characteristic of the Utility Interface	Applies to utility-interconnected photovoltaic (PV) power systems operating in parallel with the utility and utilizing static (solid-state) non-islanding inverters for the conversion of DC to AC. Lays down requirements for interconnection of PV systems to the utility distribution system. It is describes specific recommendations for systems rated at 10 kVA or less, such as may be utilized on individual residences single or three phases. This standard applies to interconnection with the low voltage utility distribution system.	IEC 61727 (2004) Edition 1.0	Yes
SLS 1553	Photovoltaic Module Safety	This Sri Lanka Standard Specification for is published in		

Standards Code	Specification	Description	International Standards	Mandatory requirement
	Qualification	two parts		
	Part 1 (2017) Requirements for construction	Specifies and describes the fundamental construction requirements for photovoltaic (PV) modules in order to provide safe electrical and mechanical operation. Specific topics are provided to assess the prevention of electrical shock, fire hazards, and personal injury due to mechanical and environmental stresses. This part 1 of SLS 1553 (IEC 61730) pertains to the requirements of construction. PV modules covered by this standard are limited to a maximum DC system voltage of 1500 V.	IEC 61730-1 (2016) Edition 2.0.	Yes
	Part 2 (2017) Requirements for Testing	Defines the requirements of testing. This International Standard series lays down IEC requirements of terrestrial photovoltaic modules suitable for long-term operation in open-air climates. The sequence of tests required in this standard may not test for all possible safety aspects associated with the use of PV modules in all possible applications. This standard utilizes the best sequence of tests available at the time of its writing. There are some issues, such as the potential danger of electric shock posed by a broken PV module in a high voltage system, which should be addressed by the system design, location, restrictions on access and maintenance procedures. The objective of this standard is to provide the testing sequence intended to verify the safety of PV modules whose construction has been assessed by IEC 61730-1. The test sequence and pass criteria are designed to detect the potential breakdown of internal and external components of PV modules that would result in fire, electric shock, and/or personal injury. The standard defines the basic safety test requirements and additional tests that are a function of the PV module end-use applications. Test categories include general inspection, electrical shock hazard, fire hazard, mechanical stress, and environmental stress.	IEC 61730-2 (2016) Edition 2.0	Yes
SLS 1554	Low-Voltage Switchgear and Control gear	This Sri Lanka standard specification for is published in three parts:		
	Part 1 (2017) General Rules.	The purpose of this standard is to harmonize as far as practicable all rules and requirements of a general nature applicable to low-voltage switchgear and control gear to obtain uniformity of requirements and tests throughout the corresponding range of equipment and to avoid the need for testing to different standards.	IEC 60947-1 (2014) Edition 5.2	Yes

Standards Code	Specification	Description	International Standards	Mandatory requirement
		All those parts of the various equipment standards which can be considered as general have therefore been gathered in this standard together with specific subjects of wide interest and application, e.g. temperature-rise, dielectric properties, etc.		
	Part 2 (2017) Circuit-Breakers	This part of IEC 60947 series applies to circuit-breakers, the main contacts of which are intended to be connected to circuits, the rated voltage of which does not exceed 1000 V AC or 1500 V DC; it also contains additional requirements for integrally fused circuit-breakers. Circuit-breakers rated above 1000 V AC but not exceeding 1500 V AC may also be tested to this standard. It applies whatever the rated currents, the method of construction or the proposed applications of the circuit-breakers may be.	IEC 60947-2 (2016) Edition 5.0	Yes
	Part 3 (2017) Switches, Disconnectors, Switch-Disconnectors and Fuse-Combinations Units.	This part of IEC 60947 applies to switches, disconnectors, switch-disconnectors and fuse combination units to be used in distribution circuits and motor circuits of which the rated voltage does not exceed 1000 V AC or 1 500 V DC. The manufacturer shall specify the type, ratings and characteristics according to the relevant standard of any incorporated fuses. This part does not apply to equipment coming within the scope of IEC 60947-2, IEC 60947-4-1 and IEC 60947-5-1. However, when switches and fuse-combination units coming into the scope of this part are normally used to start, accelerate and/or stop an individual motor they shall also comply with other additional requirements,	IEC 60947-3 (2017) Edition 3.2. IEC 60947-4-1 IEC 60947-5-1	Yes
SLS-IEC 62446-1 (2017):	Photovoltaic System Requirements for Testing, Documentation and Maintenance.	This Technical Standards is published in one part for grid connected system, documentation, commissioning tests and inspection.	IEC 62446-1 (2017) Edition 1.0.	Yes
IEC 61701	Salt mist corrosion testing of photovoltaic (PV) modules	Describes test sequences useful to determine the resistance of different PV modules to corrosion from salt mist containing Cl- (NaCl, MgCl2, etc.).		No
IEC 60068-2	Environmental testing	This part of IEC 60068 deals with cold tests applicable to both non heat-dissipating and heat dissipating specimens. For non heat-dissipating specimens, Tests Ab and Ad do not deviate essentially from earlier issues. Test Ae has been		No

Standards Code	Specification	Description	International Standards	Mandatory requirement
		added primarily for testing equipment that requires being operational throughout the test, including the conditioning periods. The object of the cold test is limited to the determination of the ability of components, equipment or other articles to be used, transported or stored at low temperature.		
IEC 60227	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V - Part 1: General requirements	Applies to rigid and flexible cables with insulation, and sheath if any, based on polyvinyl chloride, of rated voltages Uo/U up to and including 450/750 V used in power installations of nominal voltage not exceeding 450/750 V a.c		No
SLS IEC 60364	Low Voltage Electrical Installation	This part of IEC 60364 provides requirements for initial and periodic verification of an electrical installation.		
	Part 6 (2018) verification	Clause 6.4 provides requirements for initial verification, by inspection and testing, of an electrical installation to determine, as far as reasonably practicable, whether the requirements of the other parts of IEC 60364 have been met and requirements for the reporting of the results of the initial verification. The initial verification takes place upon the completion of a new installation or completion of an addition or an alteration to an existing installation. Clause 6.5 provides requirements for periodic verification of an electrical installation to determine, as far as reasonably practicable, whether the installation and all its constituent equipment are in a satisfactory condition for use and requirements for the reporting of the results of the periodic verification	(IEC 60364-6 (2016) Edition 1.0.	Yes
SLS IEC 62548: 2018	Photovoltaic (PV) array-Design Requirements	This International Standard sets out design requirements for photovoltaic (PV) arrays including DC array wiring, electrical protection devices, switching and earthing provisions. The scope includes all parts of the PV array up to but not including energy storage devices, power conversion equipment or loads. The object of this document is to address the design safety requirements arising from the particular characteristics of photovoltaic systems. Direct current systems, and PV arrays in particular, pose some hazards in addition to those derived from conventional AC power systems, including the ability to produce and sustain electrical arcs with currents that are not greater than normal operating currents. In grid connected systems, the safety requirements of this	(IEC 62548(2016) Edition 1.0.	Yes

Standards Code	Specification	Description	International Standards	Mandatory requirement
		document are however critically dependent on the inverters associated with PV arrays complying with the requirements of IEC 62109-1 and IEC 62109-2. Installation requirements are also critically dependent on compliance with the IEC 60364 series (see Clause 4).		
SLS 1473	Low voltage surge protective devices	This standard is applicable to Surge Protective Devices (SPDs), intended for surge protection against indirect and direct effects of lightning or other transient overvoltages.	IEC 61643	Yes
	Part 5 (2019) Requirements and test methods for SPDs for photovoltaic installations	These devices are designed to be connected to the DC side of photovoltaic installations rated up to 1 500 V DC. These devices contain at least one non-linear component and are intended to limit surge voltages and divert surge currents. Performance characteristics, safety requirements, standard methods for testing and ratings are established. SPDs complying with this standard are exclusively dedicated to be installed on the DC side of photovoltaic generators and the DC side of inverters. SPDs for PV systems with energy storage (e.g. batteries, capacitor banks) are not covered. SPDs with separate input and output terminals that contain specific series impedance between these terminal(s) (so called two-port SPDs according to IEC 61643-11:2011) are not covered. SPDs compliant with this standard are designed to be permanently connected where connection and disconnection of fixed SPDs can only be done using a tool. This standard does not apply to portable SPDs		Yes
	Part 6 (2019) Surge protective devices connected to the d.c. side of photovoltaic installations – Selection and application principles	This part of IEC 61643 describes the principles for selection, installation and coordination of SPDs intended for use in Photovoltaic (PV) systems up to 1 500 V DC and for the AC side of the PV system rated up to 1 000 V rms 50/60 Hz. The photovoltaic installation extends from a PV array or a set of interconnected PV-modules to include the associated cabling and protective devices and the inverter up to the connection point in the distribution board or the utility	IEC 61643	yes

Standards Code	Specification	Description	International Standards	Mandatory requirement
		supply point. This part of IEC 61643 considers SPDs used in different locations and in different kinds of PV systems: – PV systems located on the top of a building. – PV systems located on the ground like free field power plants characterized by multiple earthing and a meshed earthing system. The term PV installation is used to refer to both kinds of PV systems. The term PV power plant is only used for extended free-field multi-earthed power systems located on the ground. For PV installations including batteries additional requirements may be necessary.		
SLS YYYY (to be published in 2019)	Connectors for DC-application in photovoltaic systems – Safety requirements and tests	This International Standard applies to connectors for use in the d.c. circuits of photovoltaic systems according to class II of IEC 61140:2001 with rated voltages up to 1 500 V d.c. and rated currents up to 125 A per contact. This standard applies to connectors without breaking capacity but which might be engaged and disengaged under voltage. This standard also applies to connectors which are intended to be built-in or integrated in enclosures of devices for photovoltaic systems. This standard may be used as a guide for connectors in photovoltaic systems of classes 0 and III according to IEC 61140:2001 as well as for protection for Class II equipment intended for use at less than 50 V d.c.		yes

Section 06

Post-installation Verification (Forms)

Annex 6-I

PV array test report				☐Initial verification ☐Periodic verification	
Installation address				Reference	
				Date	
Description of work under test				Inspector	
				Test Instrument	
String	String Reference	1	2	3	4
	Module				
	Quantity				
Array Parameters as Specified	V oc (stc)				
	I sc (stc)				
String over current protection device	Type				
	Rating (A)				
	DC rating (V)				
	Capacity (kA)				
String Wiring	Type				
	Phase (mm^2)				
	Earth (mm^2)				
String Test	V os (V)				
	I sc (I)				
	Irradiance (W/m^2)				
Polarity Check					
String combiner box test					
Array Insulation resistance	Test Voltage (V)				
	Pos – Earth (MΩ)				
	Neg – Earth (MΩ)				
Earth Continuity					
Array isolator	Rating (A)				
	Rating (V)				
	Location				
	Functional check				

Inverter	Make & Model				
	Serial number				
	Functioning OK				
Comments					

I certify that the above filled particulars are true and correct

Tested by:

Name ..... **Signature** ..... **Date**.....

(Chartered Electrical Engineer registered at CEB/LECO)

Annex 6-II

PV array inspection report		☐Initial verification ☐Periodic verification
Installation address		Reference
		Date
Circuits inspected		Inspector
General	DC system has been designed, specified and installed to the requirements of IEC 60364 and IEC TS 62548:2013	☐
	The maximum PV array voltage is suitable for the location	☐
	All system components and mounting structures have been selected and erected to withstand the expected external influences such as wind, temperature and corrosion.	☐
	Roof fixing and cables entries are weatherproof	☐
Protection against electric shock	Protective measure provided by extra low voltage (SELV/PELV)	☐
	Protection by use of class ll or equivalent insulation adopted on DC side	☐
	PV string and array cables have been selected and erected so as to minimize the risk of earth faults and short circuits. Typically achieved by the use of cables with protective and reinforced insulation (often termed “double insulated”)	☐
Protection against the effects of insulation faults	Galvanic separation in place inside the inverter or on the AC side	☐
	Functional earthing of any DC conductor	☐
	PV array Earth Insulation Resistance detection and alarm system is installed -to the requirements of IEC TS 62548:2013	☐
	PV array Earth Residual Current Monitoring detection and alarm system is installed -to the requirements of IEC TS 62548:2013	☐
Protection against overcurrent	Systems <u>without</u> string over current protective device $I_{MOD\_MAX\_OCPR}$ (the module maximum series fuse rating) is greater than the possible reverse current String cables are sized to accommodate the maximum combined fault current from parallel strings	☐ ☐
	Systems <u>with</u> string overcurrent protective device String overcurrent protective devices are fitted and correctly specified to the requirements of IEC TS 62548:2013	☐
	Systems <u>with</u> array/sub array overcurrent protective device Overcurrent protective devices are fitted and correctly specified to the requirements of IEC TS 62548:2013	☐
	Systems where the inverter(s) can produce a DC back-feed into PV array circuits Any back-feed current is lower than both module maximum fuse rating and string cable ampere rating.	☐
Earthing and bonding arrangements	Where the PV system includes functional earthing of one of the DC conductors The functional earth connection has been specified and installed to the requirements of IEC TS 62548:2013	☐
	Where the PV system has direct connection to earth on the DC side A functional earth fault interrupter is provided to the requirements of IEC TS 62548:2013	☐
	Array frame bonding arrangements have been specified and installed to the requirements of IEC TS 62548:2013	☐
	Where protective earthing or equipotential bonding conductors are installed They are parallel to, and bounded with , the DC cables	☐

Protection against the effects of lightning and overvoltage	To minimize voltages induced by lightning, the area of all wiring loops has been kept as the small as possible.	☐
	Measures are in place to protect long cables (e.g. screening or the use of SPDs	☐
	Where the e fitted, they have been installed to the requirements of IEC TS 62548:2013	☐
Selection and erection of electrical equipment	PV modules are rated for the maximum possible DC system voltage.	☐
	All DC components are rated for continues operation at DC and at the maximum possible DC system voltage and current as defined in IEC TS 62548:2013	☐
	Wiring systems have been selected and erected to withstand the expected external influences such as wind, temperature, UV and solar radiation	☐
	Means of isolation and disconnection have been provided for the PV array strings and PV sub-arrays to the requirements of IEC TS 62548:2013	☐
	A DC switch disconnector is fitted to the DC side of the inverter to the requirements of IEC TS 62548:2013	☐
	If blocking diodes are fitted, their reverse voltage rating is at least 2 x V_{oc} (stc) of the PV string in which they are fitted (IEC TS 62548:2013)	☐
	Plug and socket connectors mated together are of the same type and form of the same manufacture and comply with the requirements of IEC TS 62548:2013	☐
AC system	A means of isolating the inverter has been provided on the AC side.	☐
	All isolation and switching devices have been connected such that PV installation is wired to the “load” side and the public supply to the “source” side.	☐
	Where a RCD is installed to the AC circuit feeding an inverter, the RCD type has been verified to ensure it has been selected according to the requirements of IEC TS 62548:2013.	☐
Labelling and identification	All circuits, protective devices, switches and terminals suitably labelled to the requirements of IEC 60364 and IEC TS 62548:2013	☐
	All DC junction boxes (PV generator and PV array boxes) carry a wiring label indicating that active parts inside the boxes are fed from a PV array and may still be live after isolation from the PV inverter and public supply.	☐
	Means of isolation on the AC side is clearly labelled.	☐
	Dual supply warning labels are fitted at point of interconnection.	☐
	A single line wiring diagram is displayed on site.	☐
	Installer details are displayed on site.	☐
	Shutdown procedures are displayed on site.	☐
	Emergency procedures are displayed on site (where relevant)	☐
	All signs and labels are suitably affixed and durable	☐

I certify that the above filled particulars are true and correct

Inspected by:

Name ..... **Signature** ..... **Date**.....

(Chartered Electrical Engineer registered at (CEB/LECO)

POST VERIFICATION EVIDENCES (DC SYSTEM)	
☐	Name Plate Data of PV module
☐	Picture: Insert picture of name plate of PV module
☐	Installation of PV modules
☐	Picture: Insert picture of installed PV modules on roof top
☐	DC Junction Box
☐	Picture: Insert Picture of DC junction box with open cover

☐	PV Module fixing Structure
☐	Picture: Insert picture which shows fixing arrangement of structure.
☐	Sealing of roof fixing points
☐	Picture: Insert picture which shows sealing condition of roof at structure mounting/cable entries
☐	DC Cable arrangement
☐	Picture: Insert Picture which shows how DC cables are arrange on the roof

Annex 6-III

IEC 60364-6 inspection report	☐Initial verification ☐Periodic verification
Installation address	Reference
	Date
Circuits inspected	Inspector
Installer name and address	Instruments

Utility Main Supply Details	Name of Utility	CEB/LECO
	Nominal voltage , U/U_0	…… V
	Nominal frequency, f	…… HZ
	Prospective highest short-circuit current, I_{cc}	…… kV
	External earth fault loop impedance, Z_e	…… Ω
	Utility supply	1-phase/3-phase
	Rating	…… A
	Earthing system type	……
	Incoming supply protective device type protective	……
	device nominal current rating	…… A
	RCD sensitivity where applicable	…… mA
Earthing	Earthing conductor material	……
	Conductor cross sectional area	…… mm^2
	Earth electrode type	……
	Earth electrode material	……
	Resistance to earth	…… Ω

Protection against direct contact		
Item	*Compliance*	*Comments*
Insulation of live parts		
Barriers		
Enclosures		

Equipment			
Equipment	*Selection*	*Erection*	*Comments*
Energy meter			
Utility side breaker			
Utility coupler			
Surge arrestors			
Inverter			
Cables			
Wiring accessories			
Conduits			
Protective devices RCD, CBs, etc			
Other			

Identification					
item		*presence*	*Correct location*	*Correct wording*	*comments*
Labelling of protective devices, switches and terminals					
Warning notices					
Danger notices					
Identification of conductors					
Isolation devices					
Switching devices					
Diagrams and schedules					
General	Good workmanship and proper materials have been used				☐
	Circuits to be separate (no interconnection of neutrals between circuits)				☐
	Circuits to be identified (neutral and protective conductors in same sequence as line conductors)				☐
	Disconnection times likely to be met by installed protective devices				☐
	All circuits suitably identified				☐
	Main isolator to break all live conductors, where applicable				☐
	Main earthing terminal provided, readily accessible and identified				☐
	Conductors correctly identified				☐
	All connections secure				☐
	All live parts are either insulated or contained within enclosures				☐
Protection against direct contact	Insulation of live parts				☐
	Barriers (check for adequacy and security)				☐
	Enclosures have suitable degree of protection appropriate to external influences.				☐
	Enclosures have cable entries correctly sealed				☐
	Enclosures have unused cable entries blanked off where necessary				☐
Non-flexible cables and cords	Correct type				☐
	Correct current rating				☐
	Non-sheathed cables protected by enclosure in conduit or trunking				☐
	Where exposed to direct sunlight, of a suitable type				☐
	Correctly selected and installed for use (buried/exterior walls/roof)				☐
	Internal radii of bends in accordance with relevant standard				☐
	Correctly supported				☐
	Joints and connections electrically and mechanically sound and adequately insulated.				☐
	All wires securely contained in terminals etc. without strain				☐
	Enclosure of terminals				☐
	Installation to permit easy replacement in case of damaged conductors				☐
	Installation of cables to avoid excessive strain on conductors and terminations				☐
	Protection against thermal effects				☐
	One conduit allowed for conductors of the same circuit				☐
	Connection of conductors (size of terminals adapted to cross-sectional area of the conductors) sufficient pressure contact shall be guaranteed				☐
	Selection of conductors for current carrying capacity and voltage drop considering the method of laying				☐
	Identification of N,PEN and PE conductors				☐
Flexible cables and cords	Selected for resistance to damage by heat				☐
	Prohibited core colours not used				☐
	Joints to be made using cable couplers				☐
	Final connections to other current-using equipment properly secured or arranged to prevent strain on connections				☐
	Mass supported by pendants not exceeding correct values				☐
Protective conductors	Protective conductors provided to every point and accessory.				☐
	Flexible conduit to be supplemented by a protective conductor				☐

	Minimum cross-sectional area of copper conductors	☐
	Insulation, sleeving and terminations identified by colour combination green-and-yellow.	☐
	Joints sound	☐
	Main and supplementary bonding conductors of correct size	☐
Wiring accessories	Visible indication of compliance with the appropriate product standard, where required in the relevant product standard.	☐
	Box or other enclosure securely fixed	☐
	Edge of flush boxes not projecting beyond wall surface	☐
	No Sharp edges on cable entries, screw heads, etc. which could cause damage to cables.	☐
	Non-sheathed cables, and cores of cable from which the sheath has been removed, not exposed outside the enclosure.	☐
	Correct connection	☐
	Conductors correctly identified.	☐
	Bare protective conductors sleeved green/yellow	☐
	Terminals tight and containing all strands of the conductors	☐
	Cord grip correctly used, or clips fitted to cables to prevent strain on the terminals	☐
	Adequate current rating	☐
	Suitable for the conditions likely to be encountered.	☐
conduits	Visible Indication of compliance with the appropriate product standard, where required in the relevant product standard.	☐
	Security fixed, covers in place and adequately protected against mechanical damage	☐
	Number of cables for easy draw-in not exceeded.	☐
	Adequate boxes for drawing in cables	☐
	Radius of bends such that cables are not damaged.	☐
Rigid metal conduit	Connected to the main earthing terminal.	☐
	Line and neutral cables enclosed in the same conduit.	☐
	Conduit suitable for damp and corrosive situations.	☐
Flexible metal conduit	Separate protective conductor provided.	☐
	Adequately supported and terminated.	☐
Rigid non-metallic conduit	Provision for expansion and contraction.	☐
	Boxes and fixings suitable for mass of luminaire suspended at expected temperature	☐
	Protective conductor provided.	☐
Trunking general	Visible indication of compliance with the appropriate product standard, where required in the relevant product standard.	☐
	Securely fixed and adequately protected against mechanical damage.	☐
	Selected, erected and routed so that no damage is caused by the ingress of water	☐
	Cables supported for vertical runs	☐
	Suitable degree of protection appropriate to external influences and locations	☐
Metal trunking	Phase and neutral cables enclosed in the same metal trunking	☐
	Protected against damp or corrosion	☐
	Correctly earthed	☐
	Joints mechanically sound, and of adequate continuity with links fitted.	☐
Distribution equipment	Visible indication of compliance with the appropriate product standard, where required in the relevant product standard.	☐
	Suitable for the purpose intended	☐
	Securely fixed and suitably labelled.	☐
	Non-conductive finishes on switchgear removed at protective conductor connections and if necessary made good after connecting.	☐
	Correctly earthed	☐
	Conditions likely to be encountered taken account of, i.e. suitable for the foreseen environment.	☐
	Correct IP rating applied	☐
	Suitable as means of isolation, where applicable	☐

	Need for isolation, mechanical maintenance, emergency and functional switching met	☐
	All connections secure	☐
	Cables correctly terminated and identified.	☐
	No sharp edges on the cable entries, screw heads etc. Which could cause damage to cables	☐
	All covers and equipment in place and secure	☐
	Adequate access and working space	☐
	Enclosure suitable for mechanical protection and, where applicable, for fire protection	☐
	Protection against direct contact.	☐
	Correct connection of equipment	☐
	Choice and setting of protective devices (protection against overcurrent)	☐
	Wiring correctly fixed in distribution board.	☐
	Visible indication of compliance with the appropriate product standard, where required in the relevant product standard.	☐
Protective devices	Visible indication of compliance with the appropriate product standard, where required in the relevant product standard.	☐
	RCDs provided where required	☐
	Discrimination between RCDs considered	☐
Identification & Labelling	Warning Notices	☐
	Danger notices	☐
	Identification of conductors	☐
	Isolation devices	☐
	Switching devices	☐
	Diagrams and schedules	☐
	Protective devices	☐

I certify that the above filled particulars are true and correct

Inspected by:

Name ..... **Signature** ..... **Date**.....

(Chartered Electrical Engineer registered at CEB/LECO)

POST VERIFICATIONEVIDENCES (AC SYSTEM)	
☐	Inverter
☐	Picture: Picture with Inverter Name Plate details
☐	Fixing Arrangement of Inverter
☐	Picture: Insert picture which shows inverter fixing arrangement
☐	Metering Point
☐	Picture: Insert picture showing arrangement at meter point.

Annex 6-IV

IEC 60364-6 test report	☐Initial verification ☐Periodic verification
Installation address	Reference
	Date
Circuits inspected	Inspector
Installer name and address	Instruments

Inverter	Inverter Reference	1	2	3	4
	Make				
	Model				
	Serial Number				
	Functional test				
Over current protection device	Type				
	Rating (A)				
	Rating (V)				
	Capacity (kA)				
Cable	Type				
	Phase (mm^2)				
	Earth (mm^2)				
Continuity	Live conductors				
	Protective conductors				
Insulation resistance (MΩ)	Test voltage (V)				
	Phase to neutral				
	Phase to earth				
	Neutral to earth				
Earth resistance (Ω)					
RDC Test	Sensitivity				
	Check for 0.5 I_r				

	Time to trip fault current I_r(ms)				
	Time to trip $5I_r$ (ms)				
	Push button test				
Additional protection					
Polarity test					
Phase sequence test					
Functional and operational teats					
Voltage drop on cables					

I certify that the above filled particulars are true and correct

Tested by:

Name ..... **Signature** ..... **Date**.....

(Chartered Electrical Engineer registered at CEB/LECO)

Inverter	Make & Model				
	Serial number				
	Functioning OK				
Comments					

I certify that the above filled particulars are true and correct

Tested by:

Name ..... **Signature** ..... **Date**.....

(Chartered Electrical Engineer registered at CEB/LECO)

Annex 6-V

Roof-Top Solar Power Electrical Installation - Compliance Inspection Report

PV system verification certificate			☐Initial verification ☐Periodic verification
Client		Description of installation	
Installation address		Rated power – kW DC	
		Location	
Test date		Circuits tested	
Contractor's name and address		IEC 60364-6 inspection report reference.	
		IEC 60364-6 test report reference	
		PV array inspection report reference.	
		PV array test report reference	

DESIGN, CONSTRUICTION, INSPECTION AND TESTING		
I/we being the person(s) responsible for the design, construction, inspection and testing of the electrical installation (as indicated by the signature(s) below), particulars of which are described above, having exercised reasonable skill and care when carrying out the design, construction, inspection and testing herby certify that the said work for which I/we have been responsible is, to the best of my /our knowledge and belief, in accordance with …… ……		
Signature(s): Name(s): Date: (**To be signed by the both Engineer of the Service Provider responsible for the designed and construction and the Chartered Electrical Engineer responsible for inspection)** (The extent of liability of the signatory(s) is limited to the work described above)	Next inspection recommended after not more than:	
	COMMENTS:	

Section 07

PFI Reporting Formats

Annex 7-I

Borrower/Loan/Project details				
Bank Code				
Branch Code				
Loan Reference No	Approval Reference given by PMU			
CEB/LECO Account No				
Total Loan amont Rs				
Equity Contribution Rs				
Date of Refinance approval of loan				
Total Repayment Period (Months)	Grace(M)		Repayent (M)	
Site Details : DS Division: District				
Utility Provider	CEB/LECO			
Nature of Installation	Household/Commercial/Industrial			
Type of PV interconnection	Net Metering/Net Accounting/Net Plus			
Capacity of the PV System (kW)				
Vendor's SEA Registration no.				
Solar Panel – Country of Origin				
Solar Panel – Country Produced				
Inverter - Country of Origin				
Inverter – Country Produced				

Annex 7-II

Loan Disbursement /Performance Details for 20--(Year)		**Quarter Ending**		**DD/MM/YYYY**		**Bank Code**		**----**					**Performance** -No Arrears -Arr<=3M -Arr>3 <=6M -Arr>6M
		Quarter 1- Rs.			Quarter 2-Rs.			Quarter 3-Rs.			Quarter 4- Rs.		
Loan No	Date of Final Disbursement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Section 08

Grid Connection Certificate

Annex 8

…….. [Date]

……..
……
……
[Name & Address of Consumer]

Confirmation of Connection of the Rooftop Solar Power Generation System

Dear Sir/Madam

We are pleased to inform you that rooftop solar power generation system of ….. kW installed at the above address is now connected to the national grid under Net Metering / Net Accounting / Net Plus scheme.

Yours faithfully

……. [Signature]

……..
……
[Name & Designation]