HYDERABAD ELECTRIC SUPPLY COMPANY

STANDARD OPERATING PROCEDURES (SOP)

FOR

ON GRID SOLAR / WIND SYSTEM
(NET METERING)

HAVING GENERATION CAPACITY UPTO 25KW

OFFICE OF PLANNING & ENGINEERING, HESCO HYDERABAD

TABLE OF CONTENTS

STANDING OPERATING PROCEDURE (SOP)
FOR PROCESSING DISTRIBUTED GENERATION APPLICATIONS

Pursuant to the National Electric Power Regulatory Authority (Alternative and Renewable Energy Distributed Generation and Net Metering Regulation 2015) issued vide SRO-892 (1)/2015 dated 1st September, 2015 for implementing of Solar / Wind Rooftop Net Metering policy to encourage large scale generation in the sector.

Subsequent to above, the SRO No.1448(1)/2021 dated November 9, 2021 notified by Ministry of Energy (Power Division) GoP, Islamabad & NEPRA's letter No.NEPRA/DG (Licensing)/LAN-100-41268 dated November 19, 2021 on "***CESSATION OF GENERATION LICENCES FOR NET METERING SYSTEM UPTO 25KW***".

In this regard, the following SOP for DG facility upto 25kW is hereby proposed for guidance of the field staff for expeditious implementation.

A. REGISTRATION OF APPLICATION:

1. Any person who meets the requirements of a Distributed Generator as defined by NEPRA vide letter bearing No.15321-32 dated October 2, 2018 i.e. "***Any 3 phase 400V of 11kV domestic, commercial, industrial, agricultural, general services, or single point bulk supply consumer of a Distribution Company is eligible for availing Net Metering facility***" is required to submit "***Distributed Generation Application Form (Schedule-II)***" duly filled along-with necessary documents through AEDB certified service providers / vendors in the office of "***Net Metering Unit (NMU)***" under Chief Engineer (P&E) HESCO, Hyderabad.
2. An Application shall be accompanied with one-time fee of one thousand rupees per kilowatt (Rs.1,000/kW) paid through pay order in favor of Chief Executive Officer HESCO, Hyderabad (subject to the approval of competent authority).
3. Application can be downloaded from HESCO's website www.hesco.gov.pk.

B. APPLICATION PROCESSING:

i. Registration.

ii. Evaluation

iii. Interconnection Agreement & Energization.

i. REGISTRATION (5-DAYS):

1. Within five (05) working days of receiving an application NMU shall acknowledge its receipt and inform the applicant whether the application is complete in all respects or not.
2. In case of any missing information or documents, the applicant shall provide the same to the NMU within seven (07) working days of being informed by the office.

ii. EVALUATION (18-DAYS):

1. If application is complete in all respect, the NMU shall perform an initial review to determine whether the applicant qualifies for interconnection facility (***subject to the following technical parameters checked / verified by concerned XEN Op. Div. HESCO***) or may qualify subject to additional requirements provided that the initial review shall be completed within seven (07) working days;
    a. The transformer shall be loaded (including proposed SRTPV system load) up to 80% of its capacity.
    b. Whether the proposed interconnection will require upgrading the capacity of existing distribution network.
    c. Phase balancing to avoid unbalancing of load in secondary circuit of distribution line.
2. In case the initial review reveals that the proposed facility is not technically feasible, the NMU shall return the application and communicate the reasons of rejection to the applicant within three (03) working days after the completion of initial review.
3. If the proposed facility is technical feasible (as confirmed by concerned XEN Op. Div. HESCO) the NMU will communicate the same to the applicant for joint verification (In-Charge NMU & concerned XEN Op. Div. HESCO) of proposed interconnection facility within eight (08) working days after completion of initial review.
4. In case any shortcomings are found in the proposed interconnection facility during the site visit, the applicant shall rectify the same and informed the NMU within seven (07) working days.
5. If the NMU & concerned XEN Op. Div. HESCO are satisfied that the applicant qualified as Distributed Generator, then NMU will submit the case to Chief Engineer (P&E) HESCO, Hyderabad within three (03) working days for approval.
6. As the approval has been granted, the complete file (in original) of proposed interconnection facility shall be forwarded from NMU to concerned XEN Op. Div. HESCO for signing of Distributed Generation Agreement as per Schedule-I.

iii. INTERCONNECTION AGREEMENT & ENERGIZATION (51-DAYS):

1. The concerned XEN Op. Div. HESCO shall enter into an Agreement within three (03) working days.
2. Within five (05) working days of execution of the Agreement, the concerned XEN Op. Div. HESCO shall issue the connection charge estimate to the applicant for the proposed interconnection facility up to the interconnection point including the metering installation.

3. Within thirty (30) working days the applicant shall make the payment of connection charge estimate & install the DG Facility.
4. Prior to interconnection DG facility with HESCO network, the concerned XEN. Op. Div. HESCO shall review the DG facility within three (03) working days.
5. The concerned XEN Op. Div. HESCO shall install and commission the proposed interconnection facility within ten (10) working days.
6. After commissioning of proposed interconnection facility, the concerned XEN Op. Div. HESCO shall submit the commissioning report to NMU within three (03) working days.

C. **SOME IMPORTANT PRE-REQUISITES :**

1. Applicant having DG capacity more than 10kW may submit Load Flow Study on FDRANA.
2. When the accumulative capacity of (already allowed) Distributed Generators become 80% of loading capacity of installed distribution transformer, agreements with new Distributed Generator will be signed subject to the augmentation of existing distribution transformer on cost deposit basis by the new distributed generator.
3. The capacity of a proposed Distributed Generation Facility shall not exceed one and a half of the sanctioned load of the applicant's premises. If a consumer proposes to install a solar PV system with the capacity that exceeds the service connection sanctioned load, an application for EOL shall be submitted by the consumer in addition to the solar net metering application. EOL applications shall be processed as per the existing standard procedures.
4. Mandatory safety precautions/features which have to be taken into consideration as part of the grid connected solar PV system installations are:
    a. An inbuilt Inverter relay which trips on grid failure and thus prevents any solar power injection to the grid when there is no power in grid (anti-islanding protection shall be tested by the respective officers during routine service connection inspections), and necessary protection arrangements shall be made when there is no grid supply on single/two/three phases. The inspection authority shall ensure the protection before commissioning. The applicant's installation shall be disconnected in the event of such exigencies to prevent accident or damage to men and material.
    b. The Solar PV system should be separately grounded/ earthed. Lightning arrestors also to be provided for SPV. Manual isolator switch with locking facility shall be provided at "Ground Floor".
    c. The Applicant should installed an interconnection disconnect switch rated for its voltage and fault current requirements, which will cut the flow of energy back to the grid, if required. That disconnect switch should be locked and is accessible to both DG and the HESCO personnel and shall meet the applicable IEC and IEEE standards.

5. A single bi-directional service connection meter shall be installed to measure import and export (kWh) separately. For existing service connections, the uni-directional service connection meter shall be replaced with a bi-directional service connection meter. Bi-directional service connection meter's accuracy and facilities shall be the same as applicable to the standard uni-directional meters for the relevant type of service connection and tariff.

D. DISTRIBUTED GENERATION FACILITY DESIGN AND OPERATING REQUIREMENTS:

Pursuant to Clause-9 "Protection Requirements" of the Alternative and Renewable Energy Distributed Generation and Net Metering Regulations, 2015 for implementing solar roof-top net metering policy, following protection requirements are hereby proposed to be incorporated in design of the system.

1. **Single Line Diagram:**

   The protection and control diagrams for the interconnection of the Distributed Generator shall be in accordance with Single Line Diagram, to be approved by the HESCO prior to the commissioning of the system.

2. Distributed Generator shall be responsible for installation of all of the equipment and protective devices to be used for the interconnection.

3. **Earthing Protection:**

   A minimum of two separate dedicated and interconnected earth electrodes must be used for the earthing of the solar PV system support structure with a total earth resistance not exceeding 5 ohms as below:

   i. Equipment earth (DC) &

   ii. System earth (AC)

   Both Equipment earth (DC) and System earth (AC) shall be checked for proper earthing.

   - **Equipment earth (DC)**

     All the non-current carrying metal parts such as PV modules, DCDB are bonded together and connected to earth to prevent shocks to the manpower and protection of the equipment.

   - **System earth (AC)**

     All the non-current carrying metal parts such as ACDB, Lightening Arresters are bonded together and connected to the existing earth.

4. **Surge & lightning Protection:**

   - Surge protection shall be provided on the DC side and the AC side of the solar system.
   - The DC surge protection devices (SPDs) shall be installed in the DC distribution box adjacent to the solar grid inverter.

- The AC SPDs shall be installed in the AC distribution box adjacent to the solar grid inverter.
- The SPDs earthing terminal shall be connected to earth through the above mentioned dedicated earthing system.
- The Lightening Arresters need to be provided for the SRTPV buildings which are of more than 15 meters height only.

5. Earthing shall be done in accordance with Standard Design Instructions issued by Chief Engineer (D&S) NTDCL.
6. The consumer shall be present at the time of synchronization of the installation.
7. The consumer shall provide suitable capacity of Porcelain Cutouts (100 Amps, or 200 Amps) to enable linemen to disconnect the installation so as to provide a safe zone for maintenance works.
8. At the time of commissioning, the installed meters shall be jointly inspected and sealed on behalf of both the parties and shall be tested or checked only in the presence of consumer or his/her representatives.

E. PERIODICAL INSPECTIONS:

- Both uni-directional and bi-directional energy meters are to be tested as per schedule by M&T staff once in 6 months.
- The inverter functionality of every installation is to be checked by M&T staff once in 6 months.
- Periodical test reports / inspection reports shall be submitted to the concerned SDO Op. Div HESCO, concerned XEN. Op. Div. HESCO and NMU.

F. BILLING PROCEDURE:

- Pursuant to Clause-14 “Billing for Net Metering” of the Alternative and Renewable Energy Distributed Generation and Net Metering Regulation 2015 & further amendments approved by NEPRA, for implementing solar roof-top net metering policy, following procedure is hereby proposed to be adopted:
- The consumer shall receive a monthly net import/export bill indicating either net export to the grid or net import from the grid.

  “Import”- means energy supplied by the HESCO grid.

  “Export”- means energy delivered to the HESCO grid.
- The meter reader has to capture import & export energy and other billing parameters recorded by the bi-directional meter.
- The kWh supplied by a Distributed Generator during peak hours shall be net off against the kWh hour supplied by HESCO during peak hours and the kWh supplied by a Distributed Generator during off peak hours shall be net off against the kWh supplied by HESCO during off peak hours.

- In case the kWh supplied by HESCO exceeds the kWh supplied by Distributed Generator, the Distributed Generator shall be billed for the next kWh in accordance with the Applicable tariff.
- In case, the export energy is more than the import, the net kWh shall be credited against Distributed Generator's next billing cycle for future consumption, or shall be paid by the HESCO to the Distributed Generator quarterly. Provided that where the Distributed Generator is to be paid, the kWh in a month will be charged at the tariff of that respective month.
- The price payable by HESCO for net kWh shall be national average power purchase price of the HESCO, as determined by the Authority and notified by the Federal Government.

G. **GENERAL GUIDELINES:**

- The applicant is required to install the SRTPV system through AEDB Approved Vendors who has experience in design, supply and installation of SRTPV system.
- The SRTPV system should comply with the relevant IEC technical standards.
- The installation work has to be carried out as per the approved drawing and as per standards.
- In case the installed (also read proposed) capacity of the SRTPV system is higher than the sanctioned load of the consumer, which consequently requires an up-gradation in the infrastructure (service line meter with CT (if required), transformer upgrading (if required), the consumer will have to upgrade at his / her / its own cost.
- The applicant shall provide check meters when the SRTPV system is more than 20 kWp.

NOTE:

- Separate Register shall be maintained by each concerned Sub-Divisional Office for net-metering applications covering all necessary details in addition of maintaining of record.
- All those applications having Distributed Generation capacity more than 25kW will continue to be processed in accordance with the procedure laid down in HESCO departmental SOP circulated vide letter No.8748-62 dated 14.11.2017.
- The approval of CE(P&E) shall stand revoked in case Applicant fails to commence Distributed Generation Facilities within six months of grant of approval.

Appendix –A

SOLAR NET METERING TECHNICAL FEASIBILITY REPORT

A. **PARTICULARS OF THE APPLICANT**:

i. Name of the Applicant:
ii. Address:
iii. Telephone No/Mobile No:
iv. Email address:
v. Reference No. of existing connection
vi. Sanctioned Load in kW (A):
vii. Applicable tariff:
viii. Detail of existing energy meter

a. Make and type.
b. Single / three phase:
c. Capacity in ampere:
d. Direct reading or CT operated:

B. **NAME OF:**

a. Operation Sub-Division
b. Feeder/code
c. 132/11 KV Grid Station:

C. **DETAILS OF DISTRIBUTION TRANSFORMER:**

i. Capacity of Distribution Transformer in KVA (B)
ii. Voltage ratio of Distribution Transformer
iii. Solar PV capacity already connected to this Distribution Transformer in KW (C):
iv. Proposed Solar PV capacity in KW (D):
v. Total Solar PV capacity including the proposed new capacity: (E = C + D):

Note: The proposed solar PV capacity addition is technically feasible if;

a. The total solar PV capacity (E) in kW is not more than 30% of the Distribution Transformer capacity in KVA (B) [E <= B x 30%] and
b. The proposed solar PV capacity in kW (D) does not exceed one and a half of the sanctioned load of the service connection in kW (A) [D <= A].

D. **FEEDER DETAILS (APPLICABLE FOR THE HT CONSUMERS APPLIED FOR LT CONNECTIVITY).**

i. Name of the feeder/code
ii. Name of Grid Station from which the feeder is emanating with voltage ratio
iii. Type and size of the conductor
iv. Current carrying capacity of the feeder
v. Maximum load reached on the feeder in KW
vi. Total connected Distribution Transformer capacity on this 11KV feeder (KVA)
vii. SPV generators connected on this feeder, if any, and their capacity in KW.

E. **CONCLUSION**:

Whether it is technically feasible to connect the proposed solar PV system to the service connection (Yes or No):

XEN (Op.) Div. HESCO, _____

Appendix –B

INSPECTION / TEST CHECK PERFORMA

A. **SERVICE CONNECTION DETAILS**:

i. Name of the Consumer:
ii. Address:
iii. Telephone No/Mobile No:
iv. Email address:
v. Reference No. of existing connection
vi. Applicable tariff:
vii. Details of already existing (removed energy meter)

a. Make and type
b. Meter Readings
c. Serial number
d. Month / year of manufacture

B. **DETAILS OF THE NEWLY INSTALLED BIDIRECTIONAL METER**

i. Make and type
ii. Serial number
iii. Month / year of manufacture
iv. Capacity:
v. Meter constant (for CT-operated meters):
vi. Import register reading (kWh):
vii. Export register reading (kWh):
viii. Accuracy …….

C. **SOLAR GENERATION CHECK**

i. Make and type
ii. Serial number
iii. Month / year of manufacture
iv. KWH Reading
v. Meter constant (for CT-operated meters):
vi. Accuracy……

D. **SOLAR GRID INVERTER**

i. Make:
ii. Serial number:
iii. Capacity:
iv. Input DC voltage range:
v. Output AC voltage range:
vi. Anti-Islanding Protection Check - if the grid fails the status of the contactor (on or off)

E. **SOLAR PV MODULES**

Total capacity of solar modules (kW):

In-charge NMU HESCO, Hyderabad_____

Appendix-C

SAMPLE SPECIFICATIONS OF SOLAR GRID INVERTER FOR GUIDANCE PURPOSE

Total Output Power (AC)	To match Solar PV Plant Capacity while achieving optimum System Efficiency
Input DC Voltage Range	As required for the Solar Grid Inverter DC Input
Maximum Power Point (MPPT) Tracking	Shall be Incorporated
Number of Independent MPPT Inputs	1 or more
Operation AC Voltage	Three Phase 415V (±5%)
Operation Frequency Range	±1% Hz
Nominal Frequency	50Hz
Power Factor of the Inverter	>0.98 at nominal
Total Harmonic Distortion	Less than 3%
Built-in Protection	AC High / Low Voltage; AC High / Low Frequency
Anti-Islanding Protection	As per VDE 0126-1-1, IEC 60255.5 / IEC 60255.27
Operating Ambient Temperature Range	-10 °C to +60 °C
Humidity	0-95% Rh
Inverter Efficiency Inverter Weighted Efficiency	>=95%
Protection Degree	>=94%
Communication Interface	IP 65 for outdoor mounting, IP 54 for
Safety Compliance	Underwriter Laboratories, IEEE 1547 2003, IEC 61215, EN / RS 485 / RS 232 / RJ45
Environmental Testing	IEC 62109-1, IEC 62109-2
Efficiency Measurement Procedure	IEC 60068-2 (1,2,14,30)
Cooling	Convection
Display type	LCD for data display. LCD / LED for status display
Display Parameters to include	Output power (W), Cumulative energy (Wh), DC Voltage (V), DC Current (A), AC Voltage (V), AC frequency (Hz), AC Current (A), Cumulative hours of operation (h)

Note:

Inverter Standards

Inverter should comply with IEC 61683 for efficiency and measurement and should comply IEC 60068-2 (1,2,14,30) Standard for environmental testing. It should also comply with Underwriter Laboratories, IEEE 1547 2003, IEC 61215, EN or other for Electrical Interconnection System for generating Equipment.

Inverter should supervise the grid condition continuously and in the event of grid failure (or) under voltage (or) over voltage, Solar system should be disconnected by the circuit breaker / auto switch provided in the inverter.

Appendix-D

HYDERABAD ELECTRIC SUPPLY COMPANY LIMITED

CHECKLIST FOR SOLAR ROOFTOP PV GRID SAFETY QUALIFICATION

1.0 Solar RTPV – Customer and Location Data

1	Customer Name	
2	Address	
3	Customer Contact – Email	
4	Customer Contact – Mobile No.	
5	SRTPV Installer – Name & Address	
6	HESCO Officer In-Charge	

2.0 Component Inspection Checklist

Sr. No.	Item Type	Yes	No
1	Installation Layout – is it as per Drawing?		
2	Inverter IEC Standards Qualified		
3	PV Panel IEC Standards Qualified		
4	PV Isolators / PV Cables IEC Standards Qualified		
5	AC Disconnect manual switch provided		
6	Meters checked by M&T		
7	Any other critical component IEC Standards Certified		

3.0 Grid Functional Safety Checklist

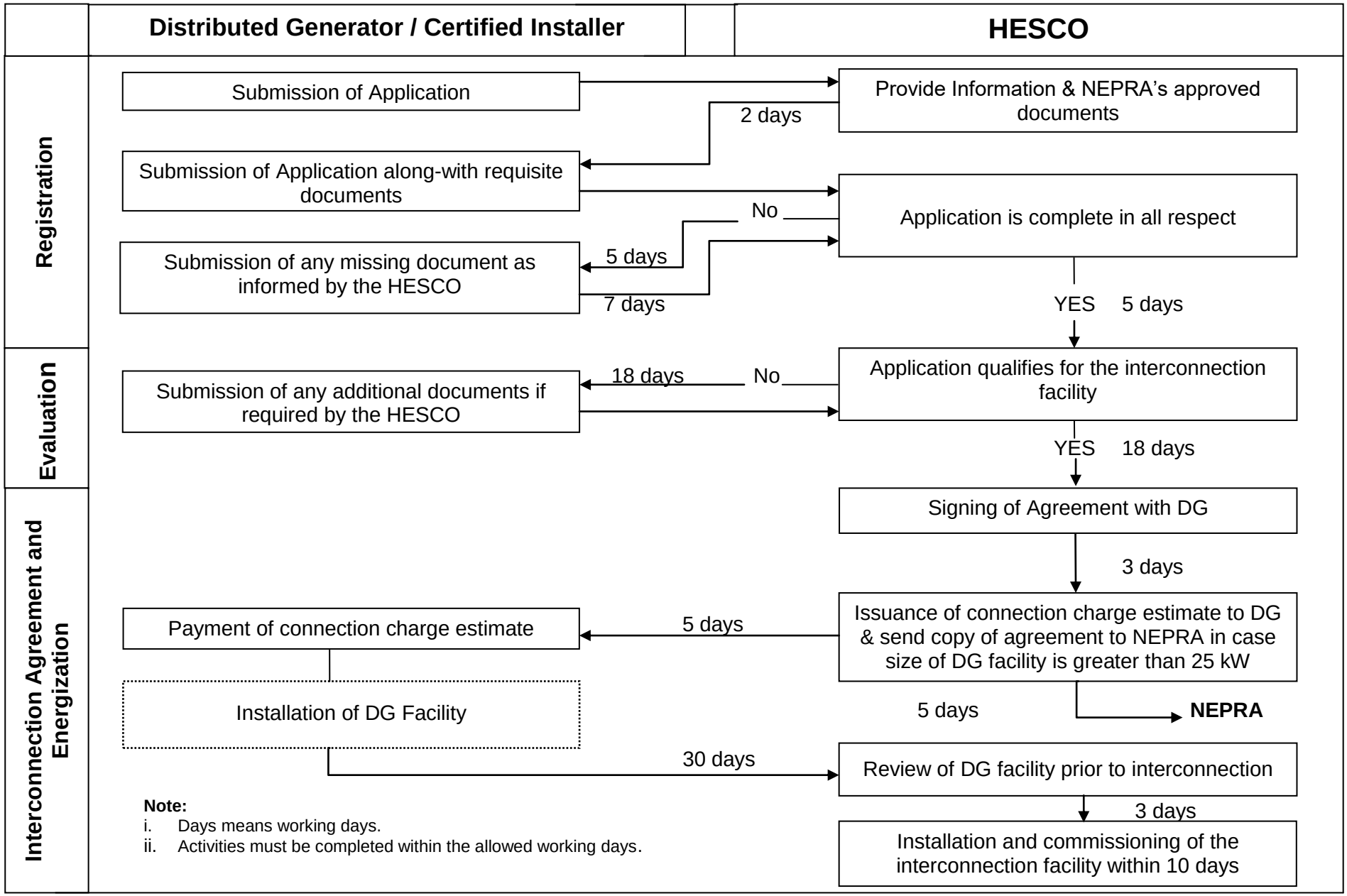
Sr. No.	Item Type	Yes	No
1	Check-PV Inverter and Islanding (Utility Side) Disconnect Grid and Check whether PV generator seizes generation immediately.		
2	Check reconnect time by reconnecting the Grid PV Generator reconnects minimum 60 seconds later (Single Phase) or minimum 300 seconds later (three phase connectivity).		
3	Bi-Directional flow recorded on HESCO Meter		
4	Consumption (Import) only mode OK?		
5	PV Inverter anti Islanding tested at array side		
6	Solar Generation meter OK?		
7	Check all earthings provided at ACDB / DCDB / LA		

It is Certified that the PV Installation is qualified to be connected to HESCO Grid.

In-Charge NMU,
o/o CE(P&E) HESCO

Appendix-E

FLOW CHART OF INTERCONNECTION PROCESS



Note:

i. Days means working days.
ii. Activities must be completed within the allowed working days.

Appendix-F

Single Line Diagram of On Grid Roof Top PV System for Net Metering Interconnection