TATA POWER-DDL

TATA POWER DELHI DISTRIBUTION LIMITED

A Tata Power and Delhi Government Joint Venture

TATA POWER DELHI DISTRIBUTION LIMITED

Checklist for Net Meter Application

Feasibility assessment for renewable energy system

TPDDL Business Services Group
JUNE 2015

Checklist for consumers to comply with process and documentation needed for grid-connected rooftop solar PV plant with TPDDL Distribution System through Net Meter as per DERC Guidelines for Net Metering

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1. Checklist for grid-connected rooftop solar PV

1.1 Documents to be submitted by the Consumer

1. Application form (Section 1.2) *as per DERC*	Complete? YES/NO ☐
2. Registration form **(Section 1.3)** *as per DERC*	Complete? YES/NO ☐
3. List of approvals / clearances required from respective authorities / agencies for installation of Renewable Energy System including Electrical Inspection Clearance *as per CEA (Measures relating to Safety and Electric Supply) Regulations, 2010*	Complete? YES/NO ☐
4. Connection Agreement duly signed by consumer **(Annexure 1)** *as per DERC guidelines for Net Metering*	Complete? YES/NO ☐
5. Renewable Energy System line diagram for grid connectivity, the consumer will provide engineering drawings applicable to be verified by TPDDL	Complete? YES/NO ☐
6. All the components including panels, inverters will need to be listed clearly from the sourcing accompanied with requisite verifiable certification and test certificates	Complete? YES/NO ☐
7. Undertaking for compliance to stipulated technical specifications including the essential safety features	Complete? YES/NO ☐

1.2 Net Metering Application for Rooftop Grid-Connected Solar PV

The consumer shall submit an application, seeking connectivity under the Net Metering Regulations, 2014 in the specified format as shown below along with an application fee of Rs. 500/- (Rupees Five Hundred) to the concerned Distribution Licensee (in this case, TPDDL) for feasibility analysis.

Annexure-I

Application Form Number ....

APPLICATION FOR INTENT TO SEEK CONNECTIVITY OF RENEWABLE ENERGY SYSTEM
(Regulation 5.1)

1.	Name Full Address of Consumer		
2.	Consumer No. (CA. No.)		
3.	Category **(Domestic / Non Domestic/Commercial etc – SPECIFY)**		
4.	Telephone No	Res:	Mob:
5.	E.mail address		
6.	Sanctioned Load		
7.	Renewable Energy Source (Solar, wind , etc.)		
8.	Capacity of Renewable Energy System proposed to be connected		
9.	Whether the Consumer is under ToD billing system		Yes/No
10.	Type of Renewable Energy System proposed (Solar, Wind, Biomass etc – specify)		
11.	Location and address of Proposed Renewable Energy System (roof top, ground mounted, any other – specify)		
12.	Capacity of Renewable Energy System proposed to be connected		
13.	Preferred mode of Communication (Post/ By Hand/ Electronic etc – specify)		

Place:
Delhi: Signature of Consumer

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ACKNOWLEDGEMENT

Application Number.....

Received the application for connectivity of Renewable Energy System

Name ..... CA. No. .....
Date....., Time ....., Serial no. .....
Application Fee Paid or Not
Renewable Energy Plant Capacity..... Renewable Energy Type.....
Mode of payment (Cheque / DD/RTGS/NEFT).....
Details of Cheque/DD/RTGS/NEFT.....

Name of Officer **Signature**
Seal **(** Designation of Officer **)**
(To be Specified at the time of Signing)

1.3 Registration Form Post Feasibility Analysis by TPDDL

On successful completion of feasibility analysis by for the grid-connected rooftop solar PV under Net Metering regulation, the consumer shall furnish the following documents including registration

APPLICATION FOR REGISTRATION OF THE SCHEME FOR RENEWABLE ENERGY SYSTEM

1	Name	
2	Address for Communication	
3	Consumer No.,	
4	Telephone No.,	
5	E-mail	
6	Renewable Energy Source	
7	Application No.	
8	Serial No. of receipt of Application	
9	Contract Demand of Consumer	
10	Capacity of Renewable Energy System to be connected (Capacity not to exceed as approved by the Discom)	
11	Technical specifications and other particulars of Renewable Panel, Grid Tied Inverter and Interlocking System etc. proposed to be installed – whether attached (Yes/No)	
12	Technical specifications and other particulars of Renewable energy meter and Net Meter to be installed – whether attached (Yes/No)	
13	whether Consumer opts to purchase meter himself or from Distribution Licensee	
14	Drawings for installing the Renewable Energy System – whether attached (Yes/No)	
15	Proposed date of completion of the installation	

Place:
Delhi: Signature of Consumer

Acknowledgement

Received the application for registration of the scheme for Renewable Energy System

Name .....
Date .....
Registration Number.....
Consumer No. .....
Renewable Plant Capacity .....
Mode of payment (Cheque / DD/NEFT/RTGS).....
Details of Cheque/DD/RTGS/NEFT).....

Name of Officer **Designation of Officer**
Seal **Signature**

1.4 Requirements as per DERC guidelines under Net Meter regulation:

TECHNICAL AND INTERCONNECTION REQUIREMENTS		
Parameter	**Reference**	**Requirement**
Overall conditions of Service	State Distribution/Supply Code	Reference to State Distribution Code
Overall Grid Standards	Central Electricity Authority (Grid Standard) Regulations 2010	Reference to regulations
Equipment	BIS / IEC / IEEE	Reference to standards (Ref to Section 1.4 and 1.5)
Meters	Central Electricity authority (Installation & operation of meters) Regulation 2006	Reference to regulations and additional conditions issued by the Commission.
Safety and supply	Central Electricity Authority(measures of safety and electricity supply) Regultions,2010	Reference to regulations
Harmonic Current	IEEE 519 CEA (Technical Standards for Connectivity of the Distributed Generation Resources) Regulations 2013	Harmonic current injections from a generating station shall not exceed the limits specified in IEEE 519
Synchronization	IEEE 519 CEA (Technical Standards for Connectivity of the Distributed Generation Resources) Regulations 2013	Renewable Energy System must be equipped with a grid frequency synchronization device. Every time the generating station is synchronized to the electricity system. It shall not cause voltage fluctuation greater than +/- 5% at point of connection.

2. Compliance to Technical Specifications

The consumer will provide undertaking to comply with below mentioned Technical specifications as per below format

"I_____/We hereby undertake to comply with below mentioned Standards for Technical Compliance for the Solar Plant to be installed and to be connected with TPDDL Distribution System through Net Meter as per DERC Guidelines.

I/We also undertake to comply with any subsequent amendment to these standards of Technical Compliance as notified by competent authority and any other technical standards relevant for compliance in respect to Solar Project to be connected to TPDDL Distribution System."

Consumer signature: **Date:**

2.1 Standards for photovoltaic systems and other components

SOLAR MULTI-CRYSTALLINE PHOTOVOLTAIC PANELS	
CERTIFICATION	CERTIFICATION DESCRIPTION
IEC 61215/IS14286	Crystalline Silicon Terrestrial PV modules
IEC 61730 (P1 - P2)	Solar PV module safety qualification Requirements
IEC 61701/ IS 61701	PV modules to be used in a highly corrosive atmosphere (Coastal area etc,) must qualify Salt Mist corrosion Testing
IEC 61727	Photovoltaic (PV) systems - Characteristics of the utility interface
IEC 60068-2 (1, 2,14,30) / Equivalent BIS Std.	Environment testing
IEC 61683	Photovoltaic systems - Power conditioners - Procedure for measuring efficiency
IEEE 929	Recommended practice for utility interface of residential and intermediate PV systems

SOLAR MULTI-CRYSTALLINE PHOTOVOLTAIC PANELS	
CERTIFICATION	CERTIFICATION DESCRIPTION
IEC - 62109-1 (2010/4) IEC - 62109-2 (2011/6)	Product safety standard
IEC 61000-6-3>16 Amps IEC 61000-6-4	Electromagnetic compatibility & Electro Magnetic Interference
IP 65 (for outdoor)/ IP 21 (for indoor) As per IEC 529	Ingress protection
**If the Charge controller is not built in the inverter, IEC 62093 test is required separately for Charge controller.*	
OTHER COMPONENTS SUCH AS CABLES, EARTHING AND JUNCTION BOXES	
CERTIFICATION	CERTIFICATION DESCRIPTION
IEC 60227 / IS 694 IEC 60502 / IS 1554 (Part. I & II)	CABLES: General Test and Measuring Method PVC insulated cables for working voltage up to and including 1100 V and UV resistant for outdoor installation
IEC 60947 part I,II, III / IS 60947 Part I,II,III / EN 50521	SWITCHES/ CIRCUIT BREAKERS/ CONNECTORS: General Requirements Connectors - safety A.C. /D.C.
OTHER COMPONENTS SUCH AS CABLES, EARTHING AND JUNCTION BOXES	
CERTIFICATION	CERTIFICATION DESCRIPTION
IP 65 (for outdoor)/ IP 21 (for indoor) As per IEC 529	JUNCTION BOXES/ ENCLOSURES FOR CHARGE CONTROLLERS/ LUMINARIES: General Requirements
IEC 69947	Standard test and measuring methods for PVC insulated cables for working voltages up to and including 1100V, UV resistant for outdoor applications
IEEE 519-1992	Recommended practices and requirements for harmonic control in electric power systems
IEC 62446	Grid connected PV systems - minimum requirements for system documentation, commissioning tests and inspection
IEC 62116	Test procedure of islanding prevention measures for utility-interconnected PV inverters

2.2 Specifications of Inverter/Power Conditioning Unit (PCU)

[Ref CEA (Technical Standards for Connectivity of the Distributed Generation Resources) Regulations 2013]

DETAILED SPECIFICATIONS OF INVERTER/POWER CONDITIIONING UNIT	
OUTPUT VOLTAGE	230V / 415V +10 percent/-15 percent VAC (/ +15 percent/-10 percent)
OUTPUT FREQUENCY	50 Hz +1.5Hz / -3.5Hz (/ +/- 0.5percent) (/+/-5 percent)
POWER FACTOR	0.95 inductive to 0.95 capacitive
WAVEFORM	Sine Wave
HARMONICS	AC side total harmonic current distortion < 5 percent AC side single frequency current distortion < 3 percent
RIPPLE	DC voltage ripple content shall be not more than 3 percent
CASING PROTECTION LEVELS	• Degree of protection: Minimum IP-20 for internal units and IP 65 for outdoor units • Should withstand temperatures from -10 to +60 Celsius • Should withstand humidity up to 95 percent • Completely automatic including wake up, synchronization (phase-locking) and shut down
PROTECTIONS	• Over voltage; both input & output • Over current; both input & output • Over/Under grid frequency • Over temperature • Short circuit • Lightening • Surge voltage induced at output due to external source • Islanding • Manual intervention must be possible through an accessible emergency switch-off button
• For 3-Phase output supply, Power Conditioning Unit (PCU) shall include a facility to convert the DC energy produced by solar array to AC voltage, through DC bus, using its Maximum Power Point Tracking (MPPT) control to extract maximum energy from solar array and produce AC power at 415V AC, 3 phase, 50 Hz.	

DETAILED SPECIFICATIONS OF INVERTER/POWER CONDITIIONING UNIT
• Each individual inverter will have all necessary protections against disturbances in frequency, voltage and current of the grid due to internal or external faults, abnormal temperatures and islanding. Its prime function will be to protect itself and solar array from any factors as well as avoid unintentional islanding. • Once the PCU has been shut off as a protective measure it must automatically re-connect once the normal conditions are restored for minimum of two minutes.

2.3 Interconnection Guidelines to comply to:

1. All work must be carried out as per the following:
   - A. Indian Electricity Act and rules therein
   - B. Indian Electricity Grid Code
   - C. Regulations of Chief Electrical Inspector
2. The other major components of the proposed interconnection arrangements are:
   - D. Unidirectional inverter/power conditioning unit
   - E. Cables
   - F. Earthing
   - G. Lightening arrestors
   - H. Energy meter
   - I. Data logger
3. One copy each of the approved drawings and diagrams showing important equipment, protection and control features shall be signed by representative of the consumer and TPDDL and shall be in possession of the consumer and TPDDL.
4. Certain precautions prescribed by the CEA shall also be incorporated into the solar PV system (CEA *Technical standards for connectivity of DG resources, 2010*). The equipment of the generating station shall meet following requirements, namely:
   (a) Circuit breakers or other interrupting equipment shall be suitable for their intended application with the capability of interrupting the maximum available fault current expected at their location.
   (b) Distributed generation resource and associated equipment shall be designed so that the failure of any single device or component shall not potentially compromise the safety and reliability of the electricity system.
   (c) Paralleling-device of distributed generation resource shall be capable of withstanding, 220% of the nominal voltage at the interconnection point.

2.4 Energy Meter

For each power plant, TPDDL will be provided with an energy meter for accurate periodical readings of AC energy generated and fed to the grid. This meter shall be of approved make of the off-taker and shall conform to the requirements laid down by the CEA's (Installation and Operation of Meters) Regulation, 2006. This shall be inspected, tested and calibrated by TPDDL

2.5 Statutory clearances to be arranged by the consumer

1. Building and architectural drawings approval
2. Approval on drawings, wherever necessary
3. Electrical system approval (Electrical inspector Clearance)
4. Fire system approval
5. All statutory requirements for working at the site etc.

3 Appendix

3.1 Connection agreement

Within thirty (30) days from the date of registration, the Distribution Licensee and the Consumer shall execute a Connection Agreement. The Connection Agreement shall include clauses relating to interconnectivity, billing and settlement, dispute resolution and Standards as per Net Metering Regulations, 2014, relevant Guidelines, Orders thereof, as amended from time to time.

Draft Connection Agreement is attached as Annexure I.

3.2 Regulatory Context

Following are the complete list of guidelines and regulation that the consumer can refer to for questions and procedures to be applied for grid connected solar PV rooftop in TPDDL territory

1) DERC (Net Metering for Renewable Energy) Regulations, 2014 & associated Guidelines.
2) DERC (Renewable Purchase Obligation and Renewable Energy Certificate Framework Implementation) Regulations, 2012.
3) CEA (Measures relating to Safety and Electric Supply) Regulations, 2010.
4) CEA (Technical standard for connectivity of Distribution Generation resources) Regulations, 2013.
5) CEA (Installation and Operation of meter) Regulations, 2006 and Amendment Regulations, 2010.
6) CERC (Deviation Settlement Mechanism and related matters) Regulations, 2014 and subsequent amendments.
7) CERC (Terms and Conditions for recognition and issuance of Renewable Energy Certificate for Renewable Energy Generation) Regulations, 2010 and subsequent amendments.
8) MNRE Off-Grid and Decentralized Solar Application Scheme: Operational Guidelines for Grid Connected Rooftop and Small Solar Power Plants Programme.
9) Delhi Electricity Supply Code and Performance Standards Regulations 2007.

The aforesaid documents are attached as Annexure II.