

NET-METERING REFERENCE GUIDE FOR THE DISCOs



How the application process and the installation of Net Metering connection works



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Glossary

AEDB	Alternative Energy Development Board
CCE	Connection Charge Estimate
DG	Distributed Generator
DISCO	Distribution Company
EN	European Standard
IEC	International Electro-technical Commission
IEEE	Institute of Electrical and Electronics Engineers
KW	Kilowatts
kWh	Kilowatt hour
kWp	Kilowatt peak
MW	Megawatt
NEPRA	National Electric Power Regulatory Authority
NGO	Non-governmental organization
PKR	Pakistani Rupee
PV	Photovoltaic
RE	Renewable Energy
UL	Underwriters Laboratories

1. Introduction

This guide provides an overview of important points to consider when the consumer apply for the Net Metering as per NEPRA (Alternative and Renewable Energy) Distributed Generation and Net Metering Regulation 2015. This guide attempts to walk the DISCO office and DISCO's personnel through the different stages beginning from the application by the consumer up to the installation of Net Metering DG facility and the

1.A About Net Metering

Net metering is an electricity policy for consumers who own Renewable Energy facilities which allows them to use electricity whenever needed while getting credit for contributing their production to the grid.

Producing electricity partly for own consumption, and partly for sale to the DISCO, is now available in the Pakistan. Solar and Wind Energy is a long term power solution. The Solar PV Technology gives access to affordable electricity supply during system life. Residential and commercial customers can switch their electricity load to Solar/Wind energy and can slash their power bills.

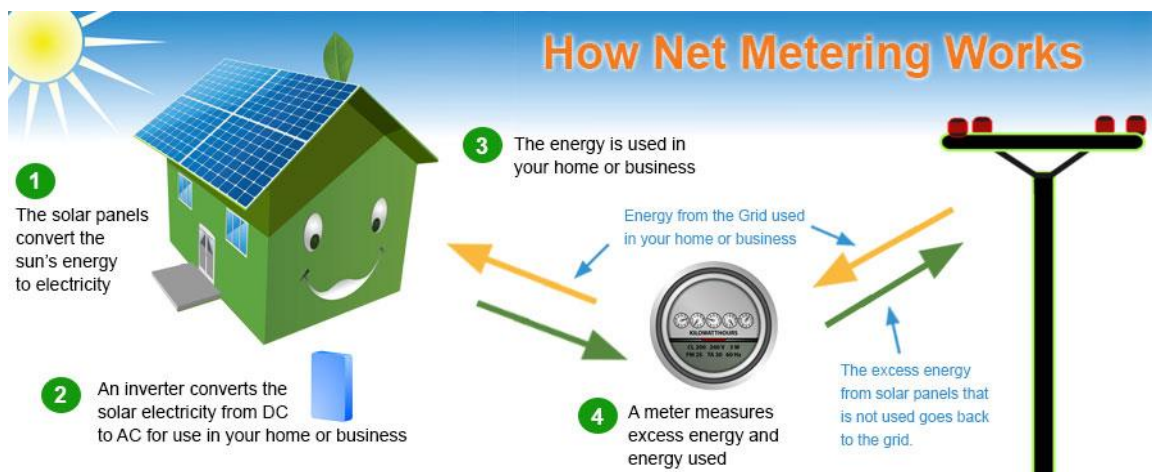


Figure 1.1 Net Metering process

This picture illustrates the flow of electricity from power generation via high voltage transmission and distribution utilities to the end-user who can now install a renewable energy facility and send the not needed electricity back to the distribution grid and earn credit for his export.

1.B Background

Pakistan has been facing energy crisis for the past few years as the demand and supply gap has widened. The country's current energy demand far exceeds its generation resources, and facing an energy shortfall of 4000 MW as a result load-shedding and power blackout have become severe issue.

Keeping in mind above issues The Government of Pakistan promotes investment in the generation of small scale distributed renewable energy, through the Alternative Energy Development Board (AEDB), on the basis of net-metering concept.

1.C Net Metering in Pakistan

The National Electric Regulatory Authority (NEPRA) announced the official Distributed Generation and Net Metering Regulations on September 1st, 2015. As per these regulations, any customer of the electric grid (three-phase connections) can avail the possibility of Net Metering for small-scale renewable energies installations.

In Pakistan, net-metering is the first policy mechanism of the Renewable Energy Act of 2006 which has been fully implemented. Section 8.4.2 of the Renewable Energy Act of 2006 provides that subject to technical considerations and without discrimination and upon request by distribution end-users, DISCOs shall enter into net-metering agreement with qualified end-users who will be installing the RE system.

NEPRA (Alternative & Renewable Energy) Distributed Generation and Net Metering Regulation 2015 is added in annexes

1.D Role of Distribution Code Review Panel (DCRP)

DCRP was established in October 21st 2014 for the integration RE plant to be connected with DISCOs. DCRP is a standing body to undertake the functions detailed in Distribution Code. The DISCOs are bound to follow the Distribution Code for all connections.

2. Steps involve in Net Metering

This chapter covers the detailed overview of the each step involved in the Net Metering procedure as per NEPRA's Regulation along with the timeline. Interconnection of consumer and DISCO and interconnection of DISCO and NEPRA covers in this section.

2.A Overview and timeline of the Procedure for Net Metering Connections

The Power Division, Ministry of Energy (MoE) is promoting net metering and intending to provide the services to the customers at their door step. Therefore, MoE has desired that the installers of systems for net metering (DG installers) as shortlisted by AEDB will be required to process the application for net metering on behalf of consumers applying for net metering connections up to 250 kW capacity. NEPRA has improved/shortened the timeperiod for processing net metering applications. Moreover, MoE has asked DISCOs to get applications approved and connections energized within one month of receipt of application from the consumers.

The Flow of steps involve in Net Metering Process along with the timeline for net metering connections are as follows.

2.A.1 Application for Net Metering

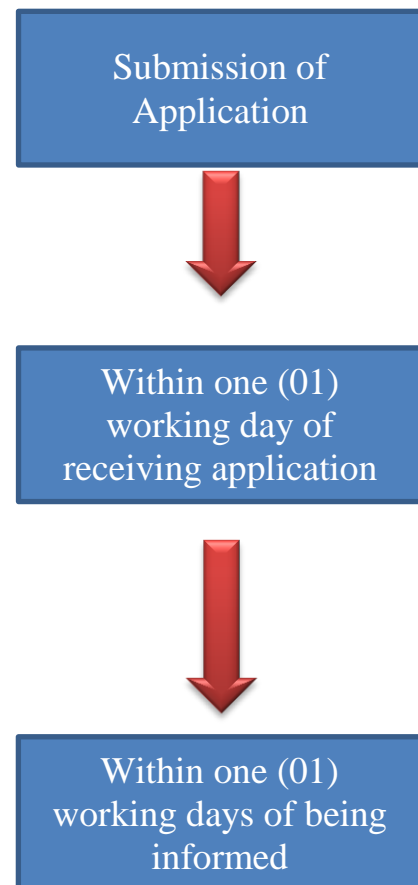
Any applicant who meets the requirement of DG as defined in NEPRA's regulation, submits their application along with the necessary documents to the focal person of the DISCO. Application form is attached at the Annexure and can also be downloaded from NEPRA's website.

2.A.2 Acknowledgement of application

The DISCO will acknowledge its receipt and inform the applicant whether the application is completed in all respect or not. For the purpose of net metering connections up to 250 kW capacity, NEPRA has relaxed requirement of inspection from Electric Inspector.

Incomplete application form

In case the application found incomplete, the DISCO will return the application the same day and will ask the applicant to complete the application and re-submit it. The applicant will have to submit the application in



complete form to the DISCO office.

Initial review

Upon being satisfied that the applicant is complete in all respect, The DISCO office will perform an initial review to determine whether applicant qualifies for interconnection facility and required additional requirements, like comparison between sanctioned load and the size of the system installed.

2.A.3 Technical feasibility in initial review

As per DISCOs, for connections up to 250 kW, no technical feasibility study is needed. Power Division, Ministry of Energy has directed the DISCOs to carry out technical studies and approve the connections at the Sub-Division level. In case the initial review reveals that the proposed facility is not technically feasible, the DISCO will return the application and communicate the reason to the applicant.

2.A.4 Agreement

If the DISCO office is satisfied that the applicant qualifies as a DG, then the DISCO and the applicant will enter into agreement. Agreement form (Schedule-I) is added in the annexure.

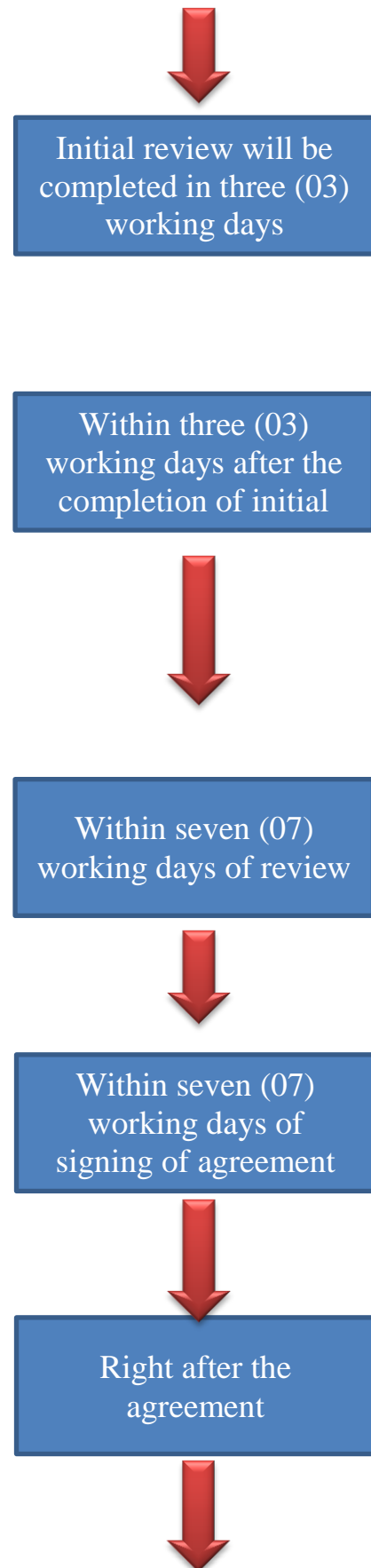
2.A.5 Generation license

The DISCO office will send the copy of the agreement between the applicant and the DISCO to the NEPRA along with the application for the issuance of Generation license. NEPRA will issue the Generation Licence within seven working days after receipt of requisite documents by DISCOs.

2.A.6 Connection Charge Estimate

After the agreement DISCO office will issue the Connection Charge Estimate (CCE), if any, to the applicant for the proposed interconnection facility up to the interconnection point including metering installation.

The applicant have the choice either it obtains the bi-



directional meter from DISCO or purchased it from private sector manufacturers and get it certified from the concerned DISCO as per technical requirements notified by NTDC.

2.A.7 Payment of CCE

If applicant choose to obtain the meter from concerned DISCO and DISCO has given the notice to the applicant to make the payment of Connection Charge Estimate (CCE), the applicant will pay the same and notify the DISCO office.

2.A.8 Installation of interconnection facility

When the charges will be paid the DISCO office will install and commission the proposed interconnection facility after the confirmation of Generation License to the DG by NEPRA.



Within three (03) days
of its issuance



Within three (03) days
of payment by
applicant

3. Interconnection Requirements

This chapter will cover the requirements that are needed to be checked by the DISCO office in proposed DG facility by the consumer.

3.A Initial requirements

At the beginning of application procedure DISCO office has to make sure that these initial requirements are to be fulfilled by the applicant.

3.A.1 Technical feasibility requirement

After receiving an application for the interconnection facility, technical feasibility report is to be prepared by the inspection committee keeping in view the following checks:

- a. The capacity / load on the transformer should be within the technical limits.
- b. Whether the proposed interconnection would require upgrading the capacity of existing distribution network.
- c. Ensure phase balancing to avoid unbalancing of the load in secondary circuit of distribution line.

3.A.2 NOC by Electrical Inspector

As per amendments proposed by MoE to NEPRA, the requirement of NOC by Electric Inspector for net metering connections up to 250 kW is omitted. NOC by Electrical inspector should be provided by those applicants along with their application form that are installing net metering connections above 250 kW.

Scope of the NOC includes grounding tests, insulation tests, wiring size suitability and general safety of complete internal wiring.

3.A.3 Grid Interconnection Standard: Electrical Parameters

The DG shall operate and inject power when the network is within the parameters mentioned hereafter. DG system shall disconnect itself from the utility network when the electrical parameter of the network falls out of the specified range.

3.A.3.1 *Range of Operation: Voltage*

The under voltage and over voltage levels and the corresponding triptimes shall be in accordance with IEC 61727 **or better**.

Voltage	Maximum Trip Time(Seconds)
$V < 50\%$	0.1
$50\% \leq V < 85\%$	2.0
$85\% \leq V < 110\%$	Continuous Operation
$110\% \leq V < 135\%$	2.0
$135\% \leq V$	0.05

3.A.3.2 *Range of Operation: Power Factor*

The power factor must comply with requirements as per IEC 61727. The DG system shall have power factor greater than 0.9 when the output is greater than 50% of System rating. The Power Factor requirements set for respective consumer type by the utility company will be will remain applicable and larger DG (such as industrial connections) may be required to install additional systems for power factor correction.

3.A.3.3 *Range of Operation: Frequency*

The under frequency and over frequency levels and the corresponding trip times shall be as follows:

Frequency Range (Hz)	Maximum Trip Time (Seconds)
$f_{nominal} < 47.5$	0.1
$47.5 \leq f_{nominal} \leq 51.5$	Continuous Operation
$51.5 < f_{nominal}$	0.1

3.A.3.4 *Harmonics*

The inverter shall meet the Harmonic current injections in accordance with IEC 61727. The total harmonic distortion shall be less than 5% at 100% rated power of the inverter. Distortion limits for Even Harmonics and odd Harmonics are listed below:

<i>Odd Harmonics</i>	<i>Distortion Limit</i>
3^{rd} through 9^{th}	Less than 4.0%
11^{th} through 15^{th}	Less than 2.0%
17^{th} through 21^{st}	Less than 1.5%
23^{rd} through 33^{rd}	Less than 0.6%
$33^{rd}+$	Less than 0.3%

Even Harmonics in these ranges shall be less than 25% of the odd harmonics listed. THD should be less than 5%

3.A.3.5 *DC Current injection*

The DC Current injection must be in accordance with IEC 61727. The PV system shall not inject DC current greater than 1% of the rated inverter output current into the utility interface.

3.A.3.6 *Islanding Protection*

Islanding protection shall be in accordance with IEC 61727. A PV system that ceases to energize the utility line in case of a voltage and frequency situation outside of the ranges stated in IEC 61727 within the timeframes set in the IEC 61727 is considered to be sufficiently protected against islanding.

3.A.3.7 *Reconnection to the network*

In case of utility line outage, fault or out of range, the inverter shall remain disconnected and

provide Islanding Protection. The inverter shall not energize the utility line for at least 1 minute after the service voltage and frequency have recovered to the continuous operations range parameters as defined above.

3.A.4 Inverter standards

As per Regulation by NEPRA, the grid connected inverters shall comply with UL 1741 standard which addresses the electrical interconnection design of various form of generating equipment. Other standards that the DG facility should adopt to are:

- a. IEEE 1547 2003 (standard of interconnecting distributed resources with electric power system).
- b. IEC 61215 for crystalline PV modules
- c. IEC 61646 for thin film PV modules

3.A.5 Safety and EMC Standard

For system greater than 10kW, the inverter needs to comply with additional certifications and meet additional Electromagnetic compatibility and Safety Standards such as:

- 1) IEC EN 61000-6
- 2) UL1741
- 3) EN 62109-1/2
- 4) IEEE1547

3.A.6 Load flow study

For the Distributed Generators having an installed capacity of more than 500 kW, load flow study (on PSSE software) is compulsory and for the DG facility having capacity less than 500K load flow study can be achieved by FDRANA

Load flow study for the facility having capacity up to 250 kW is not required.

3.A.7 Upgrading the Transformer

In case if the load capacity due to already installed DG facilities at any transformer reaches 80%, the DISCO shall not grant approval for any new DG facility at that transformer unless the new DG Facility operator agrees and pay for the cost of augmenting the transformer capacity.

3.B Mandatory requirements

According to NEPRA Regulation, DISCO and applicant have to comply with some safety requirements as stated below:

3.B.1 Interconnection disconnect switch

DISCO personnel has to make sure that the applicant has 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 can be accessible by both DG and the DISCO personnel and shall meet the applicable IEC and IEEE

standards.

3.B.2 Anti-islanding

Anti-islanding is an in built feature in inverter which trips the flow of energy to the grid on grid failure. During the connection inspection, anti-islanding feature must be tested by the respective officers of the DISCO. The inspection authority shall ensure the anti-islanding and any other protection requirement before commissioning.

3.B.3 Single line diagram

The protection and control single line diagrams for the interconnection of the Distributed Generator is to be approved by the DISCO prior to the commissioning of the system.

3.B.4 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:

- a. Equipment earth (DC)
- b. System earth (AC)

Both equipment earth (DC) and system earth (AC) shall be checked for proper earthing.

Equipment earth (DC): All metallic parts of DG Facility such as PV modules, DCDB, generator, iron clad Switches will be connected to earth with two separate and distinct earth connections to Avoid any loss of property or Human being.

3.B.5 Lightning and surge protection

DISCO officials also have to make sure that the DG facility is separately grounded and the lightning arrestors are provided with the DG facility. The circuit breakers of rated voltage are also installed at the facility. Surge protection shall be provided on the DC and AC sides of DG facility.

Surge Protection:

- i. Surge protection shall be provided on the DC side and the AC side of the DG facility.
- ii. The DC surge protection devices (SPDs) shall be installed in the DC distribution box adjacent to the solar grid inverter and generator.
- iii. The AC SPDs shall be installed in the AC distribution box adjacent to the DG facility.
- iv. The SPDs earthing terminal shall be connected to earth through the above mentioned dedicated earthing system.
- v. The Lightning Arresters need to be provided for the buildings which are of more than 15 meters height only.

NOTE: The Single line diagram, Earthing and the lightning arrestors are all check and cleared in the NOC by the Electrical Inspector mentioned in the initial requirements.

4. Operating procedure

This chapter will cover all the process involved and the requirements of the DGs and the DISCOs after the installation of Net Metering at DG's premises.

4.A Billing procedure

According to NEPRA's Regulation following procedure are to be adopted for the billing process:

- a. The costumer shall receive a monthly net import or net export bill indicating net import or net export to the grid.
- b. The meter reader has to capture import & export energy and other billing parameters recorded by the bi-directional meter.
- c. In case of net import bill, the Distributed Generator shall be billed for the net kWh in accordance with applicable tariff.
- d. In case, the export energy is more than the import, the net kWh shall be credited against Distributed Generator next billing cycle.
- e. And on next month if the exported energy is again more than the imported energy, the net kWh shall be credited against next billing cycle unless the net energy exported is more quarterly (in 3 months), the off peak net kWh shall be paid to the Distributed Generator by the DISCO
- f. NEPRA's regulations for net metering clearly state netting of electricity units on off-peak rates. Whether the consumer supplies units during off-peak or peak time, the units and rates the DISCOs will use for netting the units and electricity bill will be the off-peak time units and rates.
- g. Calculation of Sales Tax on sale of electricity is to be done on net electricity units. This is because that consumer and DISCOs are trading the electricity units. In accounting terms, both are liable for Sales Tax. One way of settling Sales Tax is that both parties may settle their Sales Tax at their own, which is cumbersome and much difficult for the consumers to handle. Easy way is that the net of electricity units be calculated and the party having supplied surplus units may charge be liable for Sales Tax settlement. In most cases (because of solar PV/micro wind system sizes and consumption of electricity by the consumers), it would be the DISCOs who would have supplied more units, and therefore would have to collect Sales Tax from the consumers, based on net electricity units. The Sales Tax would be calculated for off-peak and peak units separately, calculations for Sales Tax of only off-peak billed units will be used for netting off.
- h. Calculations of other surcharges or tariff rationalization charges etc. should be done on the basis of total electricity units supplied by the DISCO. This is because, NEPRA regulations allows netting of electricity units on off-peak rates only. Surcharges or tariff rationalization charges etc. does not fall in calculations of netting of off-peak electricity units.

4.B Periodical inspection

- a. Both uni-directional and the bi-directional energy meters are to be tested once in 6 months.
- b. The inverter functionality of every installation is to be checked once in 6 months.
- c. Periodical test reports shall be made by DISCO's personnel and submitted to the respected officer

4.C General

- 1) The DG Facility installed by the consumer must comply with the standards and specifications as specified by AEDB and NEPRA time to time.
- 2) The applicant of net metering connections up to 250 kW capacity are required to install their DG Facility through the AEDB certified installers/vendors/service providers only. The applicants of net metering connections above 250 kW capacity shall ensure that the installers/vendors/service providers shall have adequate experience, expertise and knowledge in design, supply and installation of DG Facility.
- 3) In case the installed (also read proposed) capacity of the DG Facility 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.

5. Useful links

5.A National Electric Power Regulatory Authority (NEPRA)

Director Customer Affair

Address: NEPRA Tower Attaturk Avenue (East), Sector G-5/1,
Islamabad, Pakistan

Website: www.nepra.org.pk

Tel: +92 51 2013200 Fax: +92 51 2600021

Email: cad@nepra.org.pk

5.B Alternative Energy Development Board (AEDB)

Director (CDM/Solar)

Address: 2nd Floor, OPF Building, Sector G-5/2,
Islamabad, Pakistan

Website: www.aedb.org

Tel: +92 51 9202085 Fax: +92 51 9222364

Email: irfanyousuf@aedb.org

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National Electric Power Regulatory Authority (NEPRA)



NOTIFICATION

Islamabad, the 1st day of September, 2015

S.R.O 892 (1)/2015.— In exercise of the powers conferred by section 47 read with section 7 (1) of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 (XL of 1997), the National Electric Power Regulatory Authority, is pleased to make the following Regulations to establish a framework for the regulation of Distributed Generation by using alternative and renewable energy and net metering, namely: -

1. Short title, commencement and application. — (1) These Regulations may be called the National Electric Power Regulatory Authority (Alternative & Renewable Energy) Distributed Generation and Net Metering Regulations, 2015.

(2) They shall come into force at once.

2. Definitions. - (1) In these Regulations unless there is anything repugnant in the subject or context,—

- (a) "Act" means the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 (XL of 1997)
- (b) "Agreement" means the agreement between the Distribution Company and the Distributed Generator on the Authority's approved format as per **Schedule I**;
- (c) "Applicable Documents" means the rules and regulation issued in pursuance of the Act by the Authority, from time to time, the generation, distribution and transmission licences, the Grid and Distribution Codes and any documents, instruments, approvals, directions or authorizations issued or granted by the Authority in exercise of its powers under the Act and any document in each case of a binding nature applicable to the licensee;
- (d) "Applicable Tariff" means tariff approved by the Authority for the relevant period and category of consumers of the Distribution Company;
- (e) "Applicant" means a consumer of a Distribution Company which submits an Application to interconnect its Distributed Generation Facility to the Distribution System of the Distribution Company and who applies for grant of the license to operate a Distributed Generation Facility as a Distributed Generator;

- (f) "Application" means the application submitted by an Applicant to Distribution Company, for interconnection of a Distributed Generation Facility to the Distribution System of a Distribution Company and includes application for grant of license to the Authority;
- (g) "Authority" means the National Electric Power Regulatory Authority established under the Act;
- (h) "Billing Cycle" means energy recorded by the meters in a period of thirty days;
- (i) "Distributed Generation Facility" means a facility set up by a Distributed Generator using Solar or Wind energy resource for generation of electricity up to 1 MW;
- (j) "Distributed Generation" means electrical power generation by solar or wind that is interconnected to the Distribution System of the Distribution Company at Interconnection Point;
- (k) "Distributed Generator" means a Distribution Company's 3 phase 400V or 11kV consumer i.e. domestic, commercial or industrial and who owns and/or operates the Distributed Generation Facility, and is responsible for the rights and obligations related to the Agreement and licensed by the Authority under these Regulations;
- (l) "Distribution System" means the distribution facilities situated within the Service Territory owned or operated by the licensee for distribution of electric power including, without limitation, electric lines or circuits, electric plant, meters, interconnection facilities or other facilities operating at the distribution voltage, and shall also include any other electric lines, circuits, transformers, sub-stations, electric plant, interconnection facilities or other facilities determined by the Authority as forming part of the distribution system, whether or not operating at the distribution voltage;
- (m) "Fault" means an equipment failure, conductor failure, short circuit, or other condition resulting from abnormally high or low amounts of current from the power system;
- (n) "Grid Code" means the guidelines, standards and procedures of technical and commercial aspects for the access, use and operation of transmission system and transmission facilities of NTDC as modified and approved by Authority from time to time;
- (o) "Interconnection Facilities" means the equipment, including, without limitation, electrical lines or circuits, transformers, switch gear, safety and protective devices, meters or electrical plant, used for interconnection services;
- (p) "Interconnection Point" means the point where the metering, installation and protection apparatus of the Distributed Generator is connected to the Distribution System of the Distribution Company;

- (q) "kWh" means kilowatt hour;
- (r) "MW" means megawatt;
- (s) "Net Energy Billing" means a billing and metering practice under which a Distributed Generator is billed on the basis of net energy over the billing cycle;
- (t) "Net Energy" means a balance (positive or negative) of the kWh generated by Distributed Generator against the kWh supplied by Distribution Company at the end of Billing Cycle;
- (u) "Net Metering Facility" means a facility comprising of one or two meters for measuring the kWh generated by Distributed Generator and supplied by Distribution Company for determining the net energy;
- (v) "Registrar" means a person designated by the Authority to register and record the receipt of communications, applications and petitions filed with the Authority and to perform such other duties under these Regulations as may from time to time be assigned by the Authority; and
- (w) "Tariff" means the rates, charges, terms and conditions for sale of electric power to consumers as approved by the Authority and duly notified by the Federal Government from time to time.

2) The words and expressions used but not defined in these Regulations shall have the same meaning as are assigned to them in the Act.

APPLICATION AND INTERCONNECTION PROCESS

3. Application Process for Interconnecting Distributed Generation Facility.—

(1) Any person who meets the requirements of a Distributed Generator as defined under the regulations 2(k) is eligible for submitting application as specified in **Schedule-II** to a Distribution Company.

Provided that the Distribution Company shall be bound to provide information and Authority's approved documents in response to the request from Applicant free of cost within two working days.

(2) Application to Distribution Company along with necessary documents shall be submitted by intending Distributed Generator to Distribution Company.

(3) Within five working days of receiving an Application, the Distribution Company shall acknowledge its receipt and inform the Applicant whether the Application is completed in all respect.

Provided that in case of any missing information or documents the Applicant shall provide the same to Distribution Company within seven working days of being informed by

Distribution Company.

(4) Upon being satisfied that the Application is complete in all respect, the Distribution Company shall perform an initial review to determine whether the Applicant qualifies for Interconnection Facility, or may qualify subject to additional requirements.

Provided that the initial review shall be completed within twenty working days.

(5) In case the initial review reveals that the proposed facility is not technically feasible, the Distribution Company shall return the Application and communicate the reasons to the Applicant within three working days after the completion of initial review.

(6) If the Distribution Company is satisfied that the Applicant qualifies as Distributed Generator, then the Distribution Company and the Applicant shall enter into an Agreement within ten working days and Distribution Company shall send a copy of the Agreement to the Authority within seven working days of the signing of the Agreement.

(7) Within seven working days of execution of the Agreement, the Distribution Company shall issue the Connection Charge Estimate to the Applicant for the proposed interconnection facility up to the Interconnection Point including the metering installation.

(8) The Applicant shall make the payment of Connection Charge Estimate within twenty days of its issuance.

(9) The Distribution Company shall install and commission the proposed interconnection facility within thirty days of the payment of demand notice by the Applicant.

Provided that the net metering arrangement shall commence upon grant of license to the Distributed Generator in accordance with Regulation 4 of these Regulations.

4. Licensing.— (1) Notwithstanding anything contained in NEPRA Licensing (Application and Modification Procedure) Regulations, 1999 any consumer who enters into an Agreement with the Distribution Company under net metering arrangement qualifies for grant of a Distributed Generator License.

(2) Distribution Company shall forward the Application for grant of License as specified in **Schedule -III** to the Authority along with following;

- (a) Agreement
- (b) Application for exemption from the requirement of section 24 of the Act as specified in **Schedule-IV**,
- (c) Evidence of deposit of fee as may be specified by the Authority as specified in **Schedule-V**
- (d) Affidavit by Distributed Generator as specified in **Schedule-VI**

(3) The Authority may, on receipt of the Application and the documents specified in sub-regulation (2), grant a license as specified in **Schedule VII** to the Applicant.

5. General Powers, Rights and Obligations of the Distribution Company.— (1) A Distribution Company shall.—

- (a) allow any of its consumers to establish Distributed Generating facilities to be interconnected with its Distribution System using either (a) a standard meter capable of registering the flow of electricity in two directions, or (b) two separate meters one for selling electricity to the Distribution Company and other for purchasing electricity from the Distribution Company.
- (b) enter into an Agreement with the Distributed Generator, and shall grant interconnection approval under Regulation 3 (6) after following due process

Provided that the approval of interconnection facility shall not be unreasonably withheld.

- (c) have the right to review the design of a Distributed Generation Facility and Interconnection Facilities and to inspect the same prior to the commencement of parallel operation with its Distribution System and may require the Distributed Generator to make modifications as necessary to comply with the requirements of these Regulations.
- (2) A Distribution Company may limit the operation and/or disconnect or require the disconnection of a Distributed Generation Facility from its Distribution System at any time, with or without notice, in the event of Fault.
 - (3) A Distribution Company may also limit the operation and/or disconnect or require the disconnection of Distributed Generation Facility from its Distribution System upon the provision of thirty days written notice for the conditions which include as follows:
 - a) To allow for routine maintenance, repairs or modifications to the Distribution System of the Distribution Company;
 - b) Upon Distribution Company's determination that Distributed Generation Facility is not in compliance with these Regulations;
 - c) Upon termination of the Agreement.

6. Rights and Obligations of the Distributed Generator.— (1) A Distributed Generator shall operate and maintain its Distributed Generation Facility and Interconnection Facilities in accordance with prudent electrical practices.

(2) The Distributed Generator shall not have any right to utilize Distribution Company's Interconnection Facilities for the sale of electricity to any other person.

Terms of Agreement, Termination of Agreement and Dispute Resolution

7. Term of Agreement.— (1) The term of the Agreement between Distributed Generator and Distribution Company shall be three years with effect from commissioning of Distributed Generator Facility.

(2) At the expiry of initial term, the Agreement may be automatically renewed by the mutual understanding between the Distributed Generator and the Distribution Company for another term of three years and so on.

8. Termination of Agreement.— (1) The Distributed Generator may terminate the

Agreement upon thirty days written notice if the Distributed Generator decides to discontinue the sale of electricity to the Distribution Company.

(2) The Distribution Company shall not terminate the Agreement in any event without prior approval of the Authority.

(3) All rights and obligations accrued up to termination shall continue in force upon termination.

DISTRIBUTED GENERATION FACILITY DESIGN AND OPERATING REQUIREMENTS

9. Protection Requirements.— (1) The protection and control diagrams for the interconnection of the Distributed Generator shall be in accordance with the provisions of the Grid and Distribution Codes and approved by the Distribution Company prior to commissioning of the proposed Interconnection Facilities and a typical single line diagram as specified in **Schedule-VIII**.

(2) The Distributed Generator shall be responsible for the installation of equipment, including, without limitation, electrical lines or circuits, transformers, switch gear, safety and protective devices, meters or electrical plant, to be used for interconnection.

Provided that, if the Distributed Generator is unable to install equipment, including, without limitation, electrical lines or circuits, transformers, switch gear, safety and protective devices, meters or electrical plant, used for interconnection, the Distribution Company may execute the requisite work in case the Distributed Generator offers to deposit the cost to be incurred on the requisite work at mutually agreed terms.

(3) The protective functions shall be equipped with automatic means to prevent reconnection of the Distributed Generation Facility with the Distribution facilities of the Distribution Company;

Provided that the service voltage and frequency is of specified setting and is stable and mutually agreed between the Distribution Company and the Distributed Generator.

(4) The Distributed Generator will furnish and install a manual disconnect device that has a visual break to isolate the Distributed Generation Facility from the Distribution facilities.

(5) The grid connected inverters and generators shall comply with Underwriter Laboratories UL 1741 standard (Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources) which addresses the electrical interconnection design of various forms of generating equipment, IEEE 1547 2003, IEC 61215, EN or other international standards.

10. Prevention of Interference.- (1) The Distributed Generator shall not operate such equipment that superimposes upon the Distribution System a voltage or current that interferes

with Distribution Company's operations, service to its consumers, or communication facilities.

(2) In the event of such interference, the Distributed Generator must diligently pursue and take corrective action at its own expense after being given notice and reasonable time to do so by the Distribution Company.

(3) On account of any failure on part of the Distributed Generator to take timely corrective action, the Distribution Company may, without liability, disconnect the Distribution Generation facility from the Distribution System, in accordance with these Regulations.

11. Voltage and Frequency Range.- A variation of $\pm 5\%$ and $\pm 1\%$ is permissible to the nominal voltage and frequency respectively.

INTERCONNECTION FACILITY FINANCING

12. Responsibility for Costs of Interconnecting a Distributed Generation Facility.—

(1) A Distributed Generator shall be responsible for all costs associated with Interconnection Facilities up to the Interconnection Point including metering installation.

(2) The Distributed Generator shall also be responsible for any costs reasonably incurred by Distribution Company in providing, operating, or maintaining Interconnection Facilities and Distribution System improvements required solely for the interconnection of the Distributed Generation Facility with Distribution Company's Distribution System.

(3) In case of non-availability of meter(s) with Distribution Company, the Distributed Generator may procure such meter(s) directly subject to testing by Distribution Company, before installation.

NET ENERGY METERING SERVICES

13. Metering Requirements.— (1) The equipment installed for net metering shall be capable of accurately measuring the flow of electricity in two directions.

Provided that in case two separate meters are installed, the net energy metering calculation shall yield the same result as when a single meter is used.

(2) The Net Energy Metering Facility, shall meet all safety and protection requirements that are necessary to assure safe and reliable operation of the Distributed Generation Facility when connected to the Distribution System of the Distribution Company and that have been approved by the Authority.

14. Billing for Net Metering.— (1) At the end of each Billing Cycle following the date of final interconnection of Distributed Generation Facility to the Distribution System of the Distribution Company, the Distribution Company shall net off the kWh supplied by Distributed Generator against the kWh supplied by it.

Provided that the meter readings shall be carried out preferably through Hand Held Units (HHU) and through automated means as directed by the Authority from time to time.

(2) In case the kWh supplied by Distribution Company exceed the kWh supplied by Distributed Generator, the Distributed Generator shall be billed for the net kWh in accordance with the Applicable Tariff.

(3) In case the kWh supplied by Distributed Generator exceed the kWh supplied by Distribution Company, the net kWh shall be credited against Distributed Generator's next billing cycle for future consumption, or shall be paid by the Distribution Company 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.

(4) The tariff payable by the Distribution Company shall only be the off-peak rate of the respective consumer category of the respective month and other rates such as variable charges for peak time, fixed charges, fuel price adjustment, duties/levies will not be payable by Distribution Company.

15. Power of the Authority to give directions, instructions and guidelines.— (1) For carrying out the purposes of these Regulations, the Authority may issue directions, instructions and guidelines to the Distributed Generator and the Distribution Company in the form and manner determined by the Authority, which shall be complied with by the Distributed Generator and the Distribution Company.

(2) The Authority may, on representation made to it or on its own motion modify or cancel any direction, instruction or guidelines issued under sub-rule (1), and in so modifying or cancelling any direction, instruction or guidelines may impose such conditions as it thinks fit.

16. Power to require information.—The Authority may, at any time, by notice in writing require any director, officer and member of the Distribution Company and/or the Distributed Generator, generally or in particular to furnish it within the time specified therein or such further time as the Authority may allow, with any statement or information and without prejudice to the generality of the foregoing power, may call for information, at such intervals as the Authority may deem necessary.

17. Resolution of disputes.— Any dispute or disagreement between Distributed Generator and Distribution Company relating to any matter arising out of, or in connection with, the activities covered under the Regulations shall be submitted for decision to the Authority.

18. Penalty for failure, refusal to comply with, or contravention with any provision of the Regulations.— If any person fails or refuses to comply with, or contravenes any of the provisions of these Regulations or any direction or order passed by the Authority under these Regulations or knowingly or willfully authorizes or permit such failure, refusal or contravention, he shall, be punishable with a fine which may extend to 100 million rupees.