

Solar Power Generation

Net Metering



NET METERING

- 1) Net metering is the concept which records net energy between export of generated energy and import of Discom energy for a billing month. Alternatively, the meter, having the feature of recording both the import and export values, besides other parameters notified by CEA metering regulations and APTRANSCO / Discom procedures in vogue, shall also be allowed for arriving net energy for the billing period.

For implementing the above, the government of Andhra Pradesh has announced a policy on Net Metering for solar grid interactive rooftop and small SPV Power plants in the state vide G.O.Ms.No.22, dated 25.03.2013.

Solar PV Power Generation:

Sunlight is converted to electricity directly when made to fall on solar photovoltaic (SPV) modules. Systems/devices are made for various applications based on SPV modules connected with suitably designed power conditioning units for meeting electricity requirements

Grid connected roof top solar PV system:

In recent years solar PV systems became viable and attractive. Utility scale plants are being set up worldwide with promotional mechanisms which are set up on ground surface. Available roof-top area on the buildings can also be used for setting up solar PV power plants, and thus dispensing with the requirement of free land area. The electricity generated from SPV systems can also be fed to the distribution or transmission grid after conditioning to suit grid integration.

The roof-top solar PV systems

- Area easy to install and maintain
- Have long life of 25 years

Are modular in nature, capacity can be enhanced in future to meet increased requirement of electricity.

How does it work?

Based on available roof area solar PV panels will be installed on the roof of the building. The output of the panels (DC electricity) connect to the power conditioning unit / inverter which converts DC to AC. The inverter output will be connected to the control panel or distribution board of the building to utilise the power. The inverter synchronises with grid and also with any backup power source to produce smooth power to power the loads with preference of consuming solar power first. If the solar power is more than the load requirement, the excess power is automatically fed to the grid. For larger capacity systems connection through step up transformer and switch yard may be required to feed the power to grid.

Operation and Maintenance Requirements:

There are no moving parts in the system and it requires only minimal attention. Depending upon the dust level, the system requires periodic cleaning.

Advantages:

The grid connected roof top solar PV system would fulfil the partial / full power needs of large scale buildings. The following are some of the benefits of roof top SPV systems:

- Generation of environmentally clean energy.
- Consumer becomes generator for his own electricity requirements.
- Reduction in electricity consumption from the grid.
- Reduction in diesel consumption wherever DG backup is provided.
- Feeding excess power to the grid.

Implementation:

30% subsidy on the project cost is available from Ministry of New and Renewable Energy, Govt of India. The balance cost is to be met by the consumer.

2) The Government of AP directed to frame the guidelines for speedy implementation of the net metering policy to harness large scale solar power to meet the rising demand in the state. After having detailed discussions on the above said G.O, certain guidelines were framed and communicated for its implementation by the CMD/APTRANSCO in his letter dt.20.04.2013. After approval by the EPDCL management, all the SE's/Operation in this company have been requested to follow the following guidelines and make it success vide Memo.No.CGM/Comml&RA/EPDCL/VSP/GM/PP/D.No.2507/13,dt.25.05.13 duly enclosed the application form, acknowledgement slip and agreement.

- a) Implementation of net metering facility shall be made applicable for the consumers having 3-phase supply service connection.
- b) Protection system including its switch gear has to be certified by concerned DE/MRT Operation. Further, harmonic suppressive device has to be installed by such SPV generator to suppress the harmonics injection as harmonics is more in case of solar plants where conversion of DC to AC is taking place (Islanding protection requirements are enclosed).
- c) The SPV generator shall provide the indication of solar PV plant at the injection point for easy identification to the operating personnel.
- d) The SPV generator needs to get statutory approvals from appropriate authority (CEIG) for the connected equipment including its solar panels.
- e) The proposed generator shall submit the prescribed application to the concerned DE/Opn.
- f) The net meter / meter to be used for arriving net energy shall have the specifications prescribed.
- g) Concerned DE/Opn and DE/MRT will issue a technical feasibility certificate and witness the synchronization of SPV plant with distribution network.
- h) 0.2 class accuracy, tri-vector based energy meter, non ABT having the MRI downloading facility along with related accessories shall have to be installed by the SPV generator as per the specifications of APTRANSCO/APDISCOMS. Alternatively, DISCOM may provide the metering arrangement after receiving entire estimated cost from such generator.

- i) SPV generator needs to provide an insurance coverage of Rs.5.00 lakhs per annum to meet the expenditure that may be aroused due to electrocution in the event of failure of connected protective and switch gear.
- j) Spot billing is to be arranged by concerned ADE/Opn as per the billing period. DISCOM shall arrange to develop suitable software and incorporate in the billing instrument for such billing.

3) **Important issues:**

a) **Application:**

The proposed generator shall submit the prescribed application to the concerned DE/Opn along with registration fee of Rs.1000/- in the form of Demand Draft in favour of concerned DE/Opn. The DE/Opn will arrange acknowledgment for the same for the net metering as per the application billing period.

b) **Standards of Solar PV panels:**

The Solar PV panels proposed to be installed shall meet the requirements of Indian as well as IEC standards. Further, the documentary evidence proving the prescribed standards has to be furnished by SPV generator to the concerned authority (DE/Opn).

c) **Metering:**

0.2 class accuracy, tri-vector based energy meter, non ABT having the MRI downloading facility along with related accessories shall have to be installed by the SPV generator as per the specifications of APTransco / APDiscoms.

The SPV generator shall bear the entire cost of metering arrangement provided including its accessories.

d) **Billing:**

The SPV generator shall pay for the net energy in a billing month as per applicable retail supply tariff decided by regulatory commission to the concerned Discom, if the supplied energy by the licensee is more than the injected energy by the solar PV sources of the consumer(s).

Any excess/ surplus energy injected in to the grid in a billing month will be treated as inadvertent and no payment will be paid for such energy.

Spot billing is to be arranged by concerned ADE/Opn as per the billing period. Discom shall arrange to develop suitable software and incorporate in the billing instrument for such billing.

e) **Protection:**

The SPV generator is required to provide an appropriate protection system on their incoming side / consumer premises with the feature of "Islanding the SPV generator" when grid fails.

Protection system including its switch gear has to be certified by concerned DE/MRT.

Further, harmonic suppressive device has to be installed by such SPV generator to suppress the harmonics injection as harmonics is more in case of solar plants where conversion of DC to AC is taking place.

f) Statutory approvals:

The SPV generator needs to get statutory approvals from appropriate authority (CEIG) for the connected equipment including its solar panels.

g) Insurance:

In order to meet the connected protective and switch gear, the SPV generator is required to provide an insurance coverage of Rs.5,00,000 per annum.

h) Technical feasibility and synchronisation:

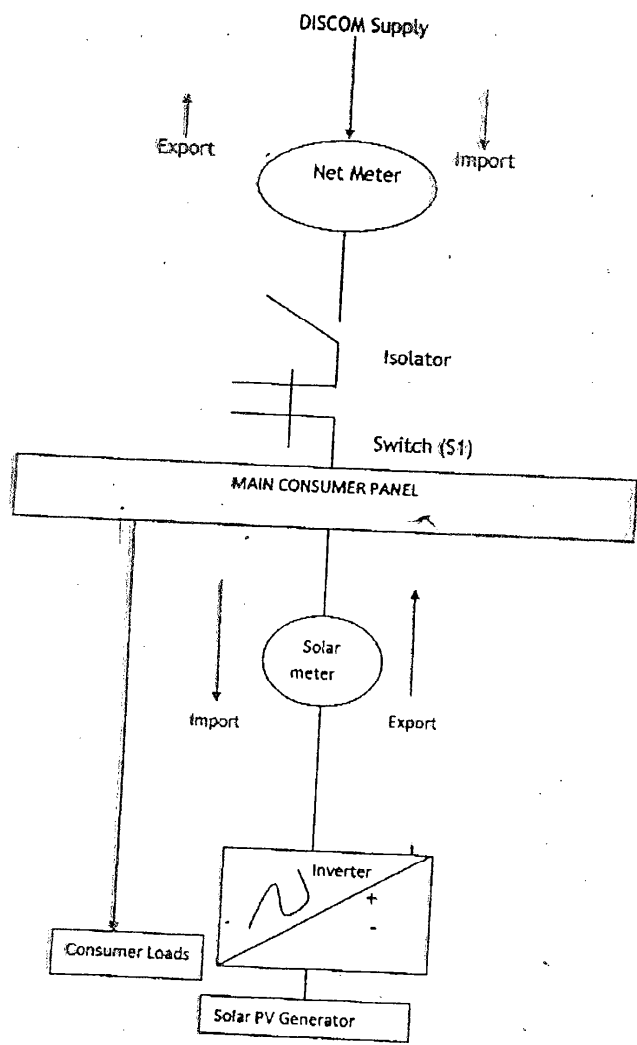
The proposed generator shall submit the prescribed application to the concerned DE/Opn.

Concerned DE/Opn and DE/MRT will issue a technical feasibility certificate and witness the synchronisation of SPV plant with distribution network.

i) Sketch: Simplified sketch of net metering is herewith enclosed.

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SIMPLIFIED SKETCH OF NET METERING



Normally, solar generating system is connected with grid. When grid fails, inverter controlled switch S1 will open. On grid restoration S1 will close. Solar meter may be installed, wherever applicable.

GRID TIE SOLAR INVERTER ISLANDING PROTECTIVE SYSTEM

An islanding mode is a condition in a distributed generation (D.G) which the energy resource continues to supply to the local load even though utility grid has been disconnected without allowing back up power of solar energy to the line.

There are two types of islanding modes namely

1. intentional (planned)
2. unintentional (unplanned)

It is important to note that when using distributed generation in an inter connected system, the distributed system should be capable of detecting an unintentional islanding condition.

Grid tie inverter (solar inverter or PV inverter) :

Grid tie inverter is that which matches phase utility with supplied sine wave. The inverter should be designed to shut down automatically upon loss of supply for safety reasons and they should not provide back up power during utility outages (however, line workers have safety procedure that must be followed before operating on electrical networks to eliminate hazards).

The inverter system should detect the islanding conditions by looking for some combination of the following:

1. a sudden change in system frequency,
2. a sudden voltage mismatch,
3. a sudden change in df / dt (rate of change of frequency)
4. a sudden increase in active output (KW) well beyond the expected normal level
5. a sudden change in reactive power (KVAR)

The inverter system shall be provided with protective relays of IEEE standard 1547 which covers the time in which islanding protection operates with in 2 seconds.

The distributed generation (D.G) should have the local intelligence to detect islanding events. The local intelligence includes monitoring the grid by local sensing (passive means), actively injecting signals to detect grid loss (active means) and the system should generate trip signal to the switch gear to open.

Distributed generation should be provided with islanding protection strategies by using relay for inter tie protections.

1. Fast detection of all faults (3-phase, phase to earth, phase to phase, two phase to earth) on the feeder.
2. fast imbalance detection (detecting open conductor)



Office of
The Chief General Manager,
Comml & RA, APEPDCL

Memo.No.CGM/ Comml &RAC /EPDCL/VSP/GM/PP/F./D.No 2507 / 13, Dt 25.05.13.

Sub: APEPDCL/VSP - Corporate Office - PP - Policy on net metering for solar grid interactive roof-top and small SPV power plants in the State - Orders issued vide G.O.Ms.No.22 dt. 25.03.13 - Guidelines for implementation of solar net metering policy in the state - Communicated - Reg

Ref:1) G.O.MS.22 , Dated 25.03.2013

2) Lr.No.CGM/Comml&RA/EPDCL/VSP/GM/Comml/F./D.No.1623/13,dt.15.04.13

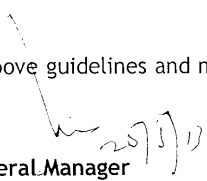
3) Lr.No.CMD/CE/IPC/F.solar/D.No.214/13.dt.20-04-13

The government of Andhra Pradesh has announced a policy on Net Metering for solar grid interactive rooftop and small SPV Power plants in the state vide G.O.Ms.No.22, dated 25.03.2013.

2. The Government of AP directed to frame the guidelines for speedy implementation of the net metering policy to harness large scale solar power to meet the rising demand in the state. A meeting was convened on 06.04.2013 with the concerned officials of all Discoms about the procedures to be followed for implementing solar net metering policy. Based on the outcome in the said meeting, the following modalities are framed for implementing solar net metering facility:
 - a) Implementation of net metering facility shall be made applicable for the consumers having 3-phase supply service connection.
 - b) Protection system including its switch gear has to be certified by concerned DE/MRT Operation. Further, harmonic suppressive device has to be installed by such SPV generator to suppress the harmonics injection as harmonics is more in case of solar plants where conversion of DC to AC is taking place (Islanding protection requirements are enclosed).
 - c) The SPV generator shall provide the indication of solar PV plant at the injection point for easy identification to the operating personnel.
 - d) The SPV generator needs to get statutory approvals from appropriate authority (CEIG) for the connected equipment including its solar panels.

P.T.O

- e) The proposed generator shall submit the prescribed application to the concerned DE/Opn.
 - f) The net meter / meter to be used for arriving net energy shall have the specifications prescribed.
 - g) Concerned DE/Opn and DE/MRT will issue a technical feasibility certificate and witness the synchronization of SPV plant with distribution network.
 - h) 0.2 class accuracy, tri-vector based energy meter, non ABT having the MRI downloading facility along with related accessories shall have to be installed by the SPV generator as per the specifications of APTRANSCO/APDISCOMS. Alternatively, DISCOM may provide the metering arrangement after receiving entire estimated cost from such generator.
 - i) SPV generator needs to provide an insurance coverage of Rs.5.00 lakhs per annum to meet the expenditure that may be arose due to electrocution in the event of failure of connected protective and switch gear.
 - j) Spot billing is to be arranged by concerned ADE/Opn as per the billing period. DISCOM shall arrange to develop suitable software and incorporate in the billing instrument for such billing.
3. The draft agreement, application form and acknowledgment slip approved by APPCC are here with enclosed so as to take speedy steps in implementing solar net metering policy.
 4. Hence all the SE's/O are hereby requested to follow the above guidelines and make it success.


Chief General Manager
Comml & RA
APEPDCL::Visakhapatnam

To
All Superintending Engineer's / Operation /
Copy to all Divisional Engineer's/Operation/.....
Copy to all Divisional Engineer's / M&P/.....
Copy to the Chief Engineer /Comml/APPCC/VS/HYD
Copy to the Chief Engineer /IPC/APPCC/VS/HYD
Copy to the Chief Engineer /SLDC/APTRANSCO/VS/HYD
Copy to the Chief General Manager / Expenditure / EPDCL
Copy to the Chief General Manager /O&CS/EPDCL
Copy to the Chief General Manager /P&MM/EPDCL
Copy to the General Manager / IT/EPDCL/VSP
Copy Submitted to the Director /Operation/EPDCL/VSP

Draft**(on non-judicial stamp paper of Rs. 100/-)****Agreement for installation of Solar grid interactive rooftop and small SPV Power Plants under Net Metering Facility.**

Agreement executed on this _____ day of _____ month _____ year _____ between M/s./Mr. /Mrs. _____ S/o./D/o/W/o _____ which means their / his/its /heirs, successors as ONE PART herein after called as "SPV Generator" and the _____ Power Distribution DISCOM of AP Limited, a DISCOM incorporated under the provisions of Companies Act 1956 consequent to the AP Electricity Reforms Act, 1998 (which means its authorized representatives, assigns, executors and its successors) as OTHER PART, herein after called the "DISCOM".

1. Installation of Solar Grid interactive rooftop and small SPV power plant:

In accordance with policy announced by GoAP vide G.O.Ms. No.22, dt.25.03.2013, DISCOM has introduced the scheme of "Solar Net Metering" for those consumers who intend to encourage solar green energy and set up solar PV plants at unutilized places on rooftops, waste lands, buildings of individual households, industries, offices, institutions, residential complexes etc.

Keeping in view of the good potential for harnessing solar power in the region, DISCOM felt that net metering facility can be implementable to generate solar power by the SPV generator for self-consumption in the premises and to feed excess power into DISCOM network when it is not being consumed totally.

2. Capacity of the SPV plant and Maximum contracted load of the premises.

SPV Generator is proposing to install rooftop solar power plant of ____ MW capacity under Solar net metering facility at D.No._____, street, _____ (V), _____ (M), having electrical Service Connection. No _____ for a contracted load of _____ KW/HP/KVA. The SPV Generator have requested DISCOM to provide grid connectivity/necessary permissions to connect rooftop solar power plant and supply solar energy into the distribution network of DISCOM at _____KV voltage level.

3.Strategy of implementation.

Implementation of net metering facility will be as per the following guidelines:

- I. Under this facility, consumer will generate solar power for self consumption and feed excess power into DISCOM network.
- II. Net metering is the concept, which records net energy between export of generated energy and import of DISCOM energy for a billing month. Alternatively, the meter, having the feature of recording both the import and export values, besides other parameters notified by CEA metering regulations and APTRANSCO /DISCOM procedures in vogue, shall also be allowed for arriving net energy for the billing period.

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3.1 Settlement of energy charges:

The SPV generator shall pay for the net energy in a billing month as per applicable retail supply tariff decided by regulatory commission to the concerned DISCOM, if the supplied energy by the DISCOM is more than the injected energy by the solar PV sources of the consumer(s). Any excess/ surplus energy injected in to DISCOM network in a billing month will be treated as inadvertent and no payment will be paid for such energy.

- 3.1.1 Any modification/ amendment in the Policy and change in law would be made applicable and corresponding amendment(s) will be made in the agreement from time to time with the approval of APERC.

3.2 Safety, Security & Insurance:

The SPV generator is required to provide an appropriate protection system on their incoming side/ consumer premises with the feature of "Islanding the SPV generator" when incoming supply fails or any interruption on the connected line due to failure of equipment/line or LC taken for carrying any maintenance work. As a part of security check, the feature of "Islanding the SPV generator" shall have to be checked up for its healthiness twice in a year. In order to meet the expenditure that may be arised due to electrocution in the event of failure of the connected protective and switch gear, the SPV generator is required to provide an insurance coverage of Rs 5,00,000 per annum.

3.3 Metering Arrangement:

The SPV generator shall bear the entire cost of metering arrangement provided including its accessories.. The installation of meters including CTs & PTs, wherever applicable, shall be carried out as per the departmental procedures in vogue with prior permission of DISCOMs. Alternatively, DISCOM will provide the metering arrangement at the SPV generator premises after receipt of entire estimated cost from the SPV generator.

3.4 Request for Connectivity:

The SPV generator will submit the required information in the prescribed format to the DISCOM and get the proper acknowledgement.

3.5 Standards for Solar PV panels:

The Solar PV panels proposed to be installed shall meet the requirements of Indian as well as IEC standards. Further, the documentary evidence proving the prescribed standards has to be furnished by SPV Generator to the concerned authority (DE/Opn.) of the DISCOM before commencing the plant into operation. The SPV generator shall get the statutory approvals from appropriate safety authority (CEIG) of the connected electrical equipment and solar panels before plant enervation.

4. Injection of Solar Power

The Solar energy produced shall be injected in to the DISCOM network only after obtaining prior approval from DE/Operation _____ / PDCL/ _____

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and meeting all the requirements of departmental standards, viz, protection, switch gear, metering, feasibility approval etc.

5. Obligation to comply with Requirements of Act, and General Terms and Conditions of Supply.

SPV generator and DISCOM are hereby undertake to comply with all the requirements of the Electricity act, 2003, the Rules and Regulations framed there under, provisions of the tariffs, applicable Charges and the General Terms and Conditions of Supply prescribed by the DISCOM with the approval of the AP Electricity Regulatory commission herein after called as "Commission" from time to time and agree not to dispute the same.

6. Date of enforceability of the Agreement.

This agreement will be in a force for a period of 20 years from the date of supply of power in to DISCOM network after meeting all the requirements by the SPV generator under the conditions of this Agreement in accordance with the policy on Solar net metering and its future amendments, if any.

7. Dispute Resolution.

Any dispute arises under this agreement shall be resolved promptly in good faith and in an equitable manner by both the parties. Failing resolution of the dispute, any party may approach the commission under section 86(1)(f) of EA 2003.

8. Termination of the Agreement

The Agreement will be terminated only after its completion period. There is no midcourse termination.

9. Obligation of Consumer to pay all charges levied by DISCOM

The SPV generator shall abide by the rules and shall pay the Maximum Demand Charges, energy charges, surcharges, meter rents and other charges, if any, to the DISCOM in accordance with the notified tariff besides the applicability of the General Terms and Conditions of Supply prescribed by APERC from time to time.

10. Right of DISCOM to amend the Agreement.

DISCOM shall have the right to amend any of the section of the agreement according to the exigencies. Further, the DISCOM shall have the right to enhance the rates chargeable for supply of electricity as per retail supply tariff announced by commission from time to time.

11. Monthly Minimum Charges.

The SPV Generator shall pay the minimum charges every month as prescribed in retail supply tariff and as per General Terms and Conditions of supply, even if no electricity is consumed for any reason whatsoever. The minimum charges shall also be payable by SPV generator even if electricity is not consumed.

12. Theft of Electricity or Unauthorized use of Electricity.

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SPV generator, found indulging in theft of electricity or unauthorized use of electricity, shall pay the additional charges as may be levied by the DISCOM. Also, DISCOM have right to levy the additional charge besides disconnection of electricity supply to the premises as may be decided by the DISCOM.

13. SPV generator is agreed to pay the monthly meter rentals besides other charges as may be fixed by the Commission from time to time.

Signature of the SPV generator

Signature of the SPV generator

Date:

Date:

Signed in my presence:

Witness 1

Witness 2

Signature:

Signature:

Name and Address:


Name and Address:

Date:

Date:

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 Eastern Power Distribution Company of AP Limited <small>regd. office, power and building</small>	EASTERN POWER DISTRIBUTION COMPANY OF AP LIMITED Corporate Office/P&T Colony/seethammadhara/visakhapatnam -530 013 www.apeasternpower.com
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Application Form for solar grid interactive roof-top and small SPV power plants (in terms of G.O.Ms.No.22 dt.25.03.2013)

Affix recent Passport Size Photo of the Applicant	For Office Use Reg. No. : Dt. : <u>Application fee details:</u> DD No.: Dt. : Bank :
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1	Name of applicant		
2	Address in Full	PIN:	
3	Mobile Phone No		
4	STD Code / Land line No.		
5	Email ID		
6	Category (SC/ST/General)		
7	Beneficiary has to submit self attested copy of voters ID cards / Passport/PAN card / any other photo ID card		
		Type of ID card submitted	
	ID Card No		
Site Details			
8	Address of the site for installation	PIN:	
9	Nearest Land mark		
10	Name of District		
11	Grama Panchayat / Municipality / Corporation		
12	Ward No./Building No.		

13	Type of Application a) LT/HT b) Category of supply	
14	If non-domestic, Specify type of building (shop/industry/Govt/educational/others(specify))	
15	a) Shade free area available for installation of solar panel (Minimum requirement is nearly 15 m ²). b) Proposed Capacity under the Policy m ²KW
Electricity consumption Details:		
16	Do you have electricity connection Yes / No (if Yes, mention service connection No. and attach a copy of recent electricity bill)	
17	Average monthly consumption of electricityunits
18	Details of application fee of Rs.1,000/-	
	DD.No	Date
	Bank	

Declaration

I here by declare that the information furnished above is true to the best of my knowledge and belief. If found false, DISCOM have the right to reject the application/cancel the agreement if already entered. Further, I hereby agree with the specifications, terms and conditions stipulated by DISCOM for the selection and installation of roof-top solar power plant in a stipulated time.

Place :
Date :

Signature :
Name:

CHECK LIST:

- | | |
|---|-----------------|
| 1.Copy of photo ID card | (YES/NO): |
| 2.Copy of recent electricity bill | (YES/NO): |
| 3.DD for Rs.1,000/- | (YES/NO): |
| 4. Self-addressed Rs.5/- stamped envelope | (YES/NO): |
| 5. Filled in acknowledgment slip | (YES/NO): |

	EASTERN POWER DISTRIBUTION COMPANY OF AP LIMITED Corporate Office/P&T Colony/seethammadhara/visakhapatnam -530 013 www.apeasternpower.com
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ACKNOWLEDGEMENT SLIP

Your application for setting up of solar grid interactive rooftop and small SPV power plants under policy on net metering in accordance with of G.O.Ms.No.22 dt.25.03.2013 has been received along with registration fee of Rs.1,000/-. The details of DD are as below:

Drawn in favour of	Divisional Engineer/ Operation/_____
DD No.	
DD Date	
Issuing Bank	
Amount	Rs.1,000/-

(To be filled in by the applicant)

The following Registration Number has been allotted to your application. Please quote this Registration Number in all your future correspondences.

Registration Number	
Date of Registration	

(To be filled in by Division Office)

Divisional Engineer
Operation, _____
AP_DCL

To

PIN

(Applicant has to write the full postal address with PIN in BLOCK letters in the box above)