

**MINUTES OF THE TWENTY NINETH MEETING**  
**OF**  
**FORUM OF REGULATORS (FOR)**

**Venue : "CONFERENCE HALL"  
MAYFAIR SPA RESORT  
GANGTOK (SIKKIM).**

**Date : 19<sup>TH</sup> – 20<sup>TH</sup> APRIL, 2012**

The meeting was chaired by Dr. Pramod Deo, Chairperson, CERC/FOR.  
The list of participants is at **Annexure-I**.

Shri Sushanta K. Chatterjee, Deputy Chief (Regulatory Affairs), CERC  
extended a warm welcome to all members of the Forum.

The FOR thereafter took agenda items for consideration.

**Agenda Item No. 1: Confirmation of the Minutes of the 28<sup>th</sup> Meeting of  
“FOR” held on 03<sup>rd</sup> February, 2012 at Sambodhi  
Retreat, Bodh Gaya, Bihar.**

The Forum noted and endorsed the minutes of the 28<sup>th</sup> Meeting of FOR held at Bodh Gaya (Bihar) on 03<sup>rd</sup> February, 2012 as circulated. The Forum also noted the Action Taken Report as contained in Appendix-II of the Agenda Note.

**Agenda Item No. 2:      Proposed Budget of “FOR” for the year 2012-13.**

The budget for the year 2012-13 as circulated was discussed in detail. Salient features of the proposed budget as reflected in the income and expenditure statement (contained in Annexure-I of the Agenda Note were explained). After deliberations, the proposed budget was approved.

**Agenda Item No. 3 :                      Proposed Studies and Training Programmes during the year 2012-13.**

Ministry of Power grants Plan Assistance to FOR every year for Capacity Building Programme and for commissioning studies. It was informed that for the 12<sup>th</sup> Plan period, an amount of Rs.10 crore has been sanctioned by the Government of India. Plan Assistance to the extent of Rs.2 crore per year during the 12<sup>th</sup> Plan period would be released to FOR for studies as well as capacity building/training programme for Regulators and regulatory staff.

It was informed that the proposal for commissioning the studies and conducting the training programmes during the financial year 2012-13 was evolved keeping in view the need for detailed analysis of the emerging issues facing the sector and also with due regard to the need for capacity building for Regulators and regulatory staff. Some other suggestions for studies were also made.

After discussion, the proposal was approved.

**Agenda Item No. 4 : Electricity Act, 2003 – Implementation Experiences, Challenges and Way Forward.**

A presentation was made highlighting the proposed move of the Ministry of Power to bring about amendments in the Electricity Act, 2003 as also the proposal of the FOR Secretariat in the context. It was explained that the Secretariat proposals have been made keeping in view the experiences of implementation of the provisions of the Electricity Act, 2003 at the Centre and States. A copy of the presentation made is **enclosed** at **Annexure – II**.

After discussion, it was felt that the proposition of Ministry of Power about the framework for review of performance of regulators does not go with the spirit of separation of quasi-judicial and executive authorities. It was agreed that a Working Group be constituted by the Chairperson, FOR for making recommendations to the Government for suitable amendments, especially, with reference to review of the performance of Regulators.

**Agenda Item No. 5 : Rooftop / Small Ground Mounted Solar Projects and Framework for Integration through Import / Export Meters / Net Meters, and Commercial Arrangements thereof.**

Shri Chatterjee, explained the rationale behind the proposal and the need for bringing about clarity in terms of policy and regulations for integration of rooftop solar PV. It was informed that Ministry of New and Renewable Energy (MNRE) proposes to extend capital subsidy to the extent of 30% of the project cost for rooftop solar PV. The representative from MNRE also highlighted that the developers have been approaching them for regulatory clarity and certainty on mechanism for integration of rooftop solar PV and articulated that the proposal of

MNRE for capital subsidy if supplemented by proper regulatory framework would go a long way in mainstreaming rooftop solar PV.

A presentation was made by Shri Rakesh H. Shah, Adviser (RE), CERC explaining the proposal for regulatory intervention in connection with the rooftop solar PV. A copy of the presentation is **enclosed** at **Annexure – III**.

After discussion, the proposal as made out in the presentation was endorsed. The following action plan was agreed :-

- **Connectivity**
  - CERC and CEA may be requested to make suitable provisions in their regulations to enable connectivity of rooftop solar PV with the grid.
- **Metering**
  - CEA be requested to make suitable provisions in their metering Regulations to provide for metering arrangements like import/export meter for rooftop solar PV system.
- **Energy Accounting**
  - SERCs need to provide through Regulations responsibility of Discom on energy accounting.
- **Commercial Arrangement**
  - SERCs need to provide through Regulations the commercial arrangements like settlement and payment for energy generated and consumed.
- **Tariff for Rooftop PV**
  - Tariffs for power from rooftop solar PV need to be specified based on the principles discussed.

- **MNRE**
  - To provide 30% capital subsidy for grid connected rooftop PV projects.
- FOR to evolve model regulations on energy accounting, commercial arrangement, and tariffs for rooftop solar PV.

**Agenda Item No. 6 : Status of Implementation of APTEL Judgments on CGRF/Ombudsman, and Tariff Filing/Orders.**

After discussion, it was agreed that the information in the prescribed format would be sent to the FOR Secretariat at the earliest.

**Agenda Item No. 7 : Follow up Action on the Recommendations of Standing Committee on Energy on Role of CERC & SERCs in Protection of the Interest of Consumers.**

The issues raised by the Standing Committee were discussed and it was agreed that the Action Taken Report would be sent at the earliest.

**Other Issues –**

(i) **Open Access** :

The issue on Open Access for 1 MW and above consumers, especially, in the context of the clarification issued by the Ministry of Power was discussed. Different views were expressed. After discussion, it was agreed that SERCs may evolve a Discussion Paper or Staff Paper highlighting legal and techno-commercial issues around the proposition and have public consultation in the matter. It was

also agreed that a position paper in this regard may be prepared by the FOR Secretariat and circulated to the SERCs.

(ii) **Distribution Franchisee Model** :

It was informed that Ministry of Power has taken up the Distribution Franchisee Model evolved by the FOR and after public consultation has decided to adopt the model with minor modifications. The broad modifications include inter alia (i) introduction of minimum benchmark input rate before inviting the bids; (ii) requirement of regulatory approval for capital expenditure at any time during the contract period (unlike the provisions in the FOR model of regulatory approval for capex during the first and last five years of the contract period); (iii) dispensing with the provision of AT & C loss trajectory in view of the provision for benchmark input rate; and (iv) other consequential changes.

The Forum noted and endorsed the initiatives for adopting the FOR Model on above lines.

(iii) **Next meeting** :

It was informed that the next meeting of FOR would be held in June, 2012 in New Delhi. APERC Chairperson offered to host the subsequent meeting in Andhra Pradesh in August/September, 2012.

The Forum appreciated the efforts of SSERC for the arrangements made for the meeting.

A vote of thanks was extended by Shri Sushanta K. Chatterjee, Deputy Chief (RA), CERC. He conveyed his sincere thanks to all the dignitaries present in the meeting. He also thanked the staff of “FOR” Secretariat for their arduous efforts at organizing the meeting.

The meeting ended with a vote of thanks to the Chair.

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**LIST OF PARTICIPANTS ATTENDED THE TWENTY NINTH MEETING**

**OF**

**FORUM OF REGULATORS ( FOR )**

**HELD DURING 19<sup>TH</sup> – 20<sup>TH</sup> APRIL, 2012**

**AT "MAYFAIR SPA RESORT" GANGTOK, (SIKKIM)**

S. No.	NAME	ERC
01.	Dr. Pramod Deo Chairperson	CERC – in Chair.
02.	Shri A. Raghotham Rao Chairperson	APERC
03.	Shri Digvijai Nath Chairperson	APSERC
04.	Shri Jayanta Barkakati Chairperson	AERC
05.	Shri Umesh Narayan Panjiar Chairperson	BERC
06.	Shri Manoj Dey Chairperson	CSERC
07.	Shri P.D. Sudhakar Chairperson	DERC
08.	Dr. P.K. Mishra Chairperson	GERC
09.	Shri R.N. Prasher Chairperson	HERC
10.	Shri S. Maria Desalphine Chairperson	J&KSERC
11.	Dr. V.K. Garg Chairperson	JERC for Goa & All UTs
12.	Shri Himam Bihar Singh Chairperson	JERC for Manipur & Mizoram
13.	Shri Mukhtiar Singh Chairperson	JSERC
14.	Shri V.P. Raja Chairperson	MERC



15.	Shri Anand Kumar Chairperson	MSERC
16.	Shri S.I. Longkumer Chairperson	NERC
17.	Shri S.P. Nanda Chairperson	OERC
18.	Shri D.C. Samant Chairperson	RERC
19.	Shri T.T. Dorji Chairperson	SSERC
20.	Shri Manoranjan Karmarkar Chairperson	TERC
21.	Shri Prasad Ranjan Ray Chairperson	WBERC
22.	Shri P. Parameswaran Member	KSERC
23.	Shri Virinder Singh Member	PSERC
24.	Shri K. Venugopal Member	TNERC
25.	Shri Sushanta K. Chatterjee Deputy Chief (RA)	CERC
	<b>SPECIAL INVITEE</b>	
26.	Dr. Arun K. Tripathi Director	MNRE



*AGENDA ITEM:  
ELECTRICITY ACT, 2003-  
IMPLEMENTATION  
EXPERIENCES, CHALLENGES  
AND WAY FORWARD*

*29th Meeting of Forum of Regulators  
19<sup>th</sup>-20<sup>th</sup> April 2012*



# In this Presentation

## Proposed Amendments in Electricity Act, 2003

- By Ministry of Power
- By FOR Secretariat



# Proposed Amendments in Electricity Act, 2003 By Ministry of Power

# Section 11 (1)



Existing Provision	Proposed Provision
<p>The Appropriate Government may specify that a generating company shall, in extraordinary circumstances operate and maintain any generating station in accordance with the direction of that Government</p> <p>Explanation. For the purpose of this section, the expression “extraordinary circumstances” means circumstances arising out of threat to security of the State, public order or a natural calamity or such other circumstances arising in the public interest.</p>	<p>The Appropriate Government may specify that a generating company shall, in extraordinary circumstances operate and maintain any generating station in accordance with the direction of that Government</p> <p>Explanation. For the purpose of this section, the expression “extraordinary circumstances” means circumstances arising out of threat to security of the State, public order or a natural calamity or such other circumstances arising in the public interest <u>except for the implementation of Open Access as envisaged in the Act.</u></p>

## Section 14



Existing Provision	Proposed Provision
.....Provided also that the Appropriate Commission may grant a licence to two or more persons for distribution of electricity through their own distribution system within the same area,.....	.....Provided also that the Appropriate Commission may grant a licence to two or more persons for distribution of electricity <del>through their own distribution system</del> within the same area <u>after defining their roles and responsibilities----</u>

# Section 62 (1)



## Proposed Provision

The Appropriate Commission shall determine the tariff in accordance with provisions of this Act for-

~~(a) supply of electricity by a generating company to a distribution licensee:~~

~~Provided that the Appropriate Commission may, in case of shortage of supply of electricity, fix the minimum and maximum ceiling of tariff for sale or purchase of electricity in pursuance of an agreement entered into between a generating company and licensee or between licensees, for a period not exceeding one year to ensure reasonable price of electricity;~~

~~(b)~~ (a) transmission of electricity;

~~(c)~~ (b) wheeling of electricity

~~(d)~~ (c) retail sale of electricity.

Provided that in case of distribution of electricity in the same area by two or more distribution licensees, the Appropriate Commission may, for promoting competition among distribution licensees, fix only maximum ceiling of tariff for retail sale of electricity.

# Section 63



## Proposed Provision

~~Notwithstanding anything contained in section 62~~ The Appropriate Commission shall adopt the tariff ~~if such tariff has been~~ determined through transparent process of bidding in accordance with the guidelines and policies issued by the Central Government for supply of electricity by a generating company to a ~~distribution~~ licensee;

**Provided that the tariff of the generating and transmission projects who have entered into agreement with the distribution companies for supply or transmission of electricity under the cost plus tariff prior to notification of the Tariff Policy or the projects exempted from tariff based bidding under the Tariff Policy shall continue to be determined by the Appropriate Commission.**

Provided that the Appropriate Commission may, in case of shortage of supply of electricity, fix the minimum and maximum ceiling of tariff for sale or purchase of electricity in pursuance of an agreement entered into between a generating company and licensee or between licensees, for a period not exceeding one year to ensure reasonable price of electricity;



# Section 64



## Proposed Provision

(1) An application for determination of tariff under section 62 shall be made by a generating company or licensee in such a manner and accompanied by such fee, as may be determined by regulations.

**Provided that Every State Commission has to ensure that Annual Performance Review, true-up of the past expenses and Annual Revenue Requirement (ARR) and tariff determination is conducted on annual basis as per the time schedule specified in the regulation. In the event of delay in filing of the ARR, truing and Annual Performance Review, one month beyond the scheduled date of submission of the petition, the Appropriate Commission must initiate suo-moto proceedings for tariff determination in accordance with section 64 of the Act and Tariff Policy. The Appropriate Commission shall ensure automatic pass through for any increase in the power purchase cost arising out of rise in cost of fuel.**

Applicant shall publish.....

## Section 66



### Proposed Provision

The Appropriate Commission shall endeavour to promote the development of a market (including trading and forward market) in power in such manner as may be specified and shall be guided by the National Electricity Policy referred to in section 3 in this regard and other directions issued by the public interest from time to time.



## Section 70 (4)

Existing Provision	Proposed Provision
The Central Government may appoint any person, eligible to be appointed as Member of the Authority, as the Chairperson of the Authority, or, designate one of the full time Members as the Chairperson of the Authority.	To be omitted.

## Section 70 (5)



### Proposed Provision

~~The Members of the Authority shall be appointed~~ **The Central Government may appoint the Chairperson and Members of the Authority** from amongst persons of ability, integrity and standing who have knowledge of, and adequate experience and capacity in, dealing with problems relating to engineering, finance, commerce, economics or industrial matters, and at least one Member shall be appointed from each of the following categories, namely:-

- a. engineering with specialization in design, construction, operation and maintenance of generating stations;
- b. engineering with specialization in transmission and supply of electricity;
- c. applied research in the field of electricity;
- d. applied economics, accounting, commerce or finance

## Section 70 (15)



### Proposed Provision

The eligibility conditions for appointment and other terms and conditions of service of the Chairperson and Members of the Authority including, subject to the provisions of subsection (6), their terms of office shall be such as the Central Government may prescribe.



# New Provision

## Section 79 (1)

### Proposed Provision

**(k) to regulate coal prices and its transportation.**

~~(k)~~ (l) to discharge such other functions as may be assigned under this Act



# New Provision

## Section 86 (1)

### Proposed Provision after Decision in the meeting

(e) Promote cogeneration and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for purchase of electricity from ~~such sources~~ renewable sources of energy, a percentage of the total consumption of electricity in the area of a distribution licensee.



# New Provision

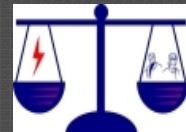
## Section 86 (1)

### Proposed Provision after Decision in the meeting

- (j) fix trading margin in the intra-State trading of electricity, ~~if considered, necessary;~~ and irrespective of final destination of the electricity;
- (k) to define the roles and responsibilities of the distribution licensees in case of multiple licensees in the same area; and
- ~~(k)~~ (I) to discharge such other functions as may be assigned under this Act.



# New Provision- Section 89 (6)



## Proposed Provision: Performance Review of Regulatory Commissions

The performance of the Regulatory Commissions shall be reviewed annually by a multi-disciplinary body on the basis of performance evaluation matrix and report to the Appropriate Government for necessary action. The Constitution of the body for the Central Commission shall be as under-

1. Member (energy), Planning Commission- Chairperson
2. Member Technical, APTEL- Member
3. Secretary (Power), GOI- Convener
4. Three outside experts to be nominated by the Central Government -Members

Constitution of the body for State Commission shall be as under-

1. Chief Secretary of the State Government/UTs – Chairperson
2. Chairperson, CEA – Member
3. Joint Secretary (Power) GOI or his representative – Member
4. Secretary, FOR- Member
5. Three outside experts to be nominated by the Central Government- Members

The Central Government shall devise the performance evaluation matrix and constitute a Monitoring Committee for the purpose through appropriate rule.



# New Provision

## Section 90 (2) (g)

### Proposed Provision

(g) has been rated below par/ unsatisfactory after annual review of performance by the multi -disciplinary body constituted for the purpose.



# New Provision

## Section 153

### Proposed Provision

The State Government may, for the purposed of providing speedy trial of offences referred to in sections 135 to 140 and section 150 by notification in the Official gazette, constitute as many Special courts and mobile Police Stations as may be necessary for such area or areas, as may be specified in the notification.

(2) A special court shall consist.....



# New Provision

## Section 176 (2)

### Proposed Provision

(h) Eligibility conditions for appointment and other terms and conditions of service of the Chairperson and Members of the Authority under sub-section (15) of section 70.

.....

(z) to devise a matrix and constitute Monitoring Committee for the performance evaluation of CERC and SERCs.

(za) conferment of powers of Department of the Central Government to the Chairperson, APTEL.

~~(z)~~ (zb) any other matter which is required to be, or may be, prescribed.



# New Provision

## Section 181 (2)

### Proposed Provision

(zp) to define the roles and responsibilities of the distribution licensees in case of multiple licensees in the same area.

~~(zp)~~ (zq) any other matter which is required to be, or may be, prescribed.



# New Provision regarding Energy Sector Regulator

## Amendment in all applicable Acts and Rules

### Proposed Provision

Creation of Energy Sector Regulator may be made through legislation to ensure CERC additional functions till the time energy sector regulator is set up.



# Proposed Amendments in Electricity Act, 2003 By FOR Secretariat



# Competitive Bidding

## Background

- ⦿ Prices discovered through competitive bidding process are more efficient than cost plus tariff.
- ⦿ It may be desirable for the SERCs to encourage the distribution licensees to go for competitive bidding process.
- ⦿ APTEL Judgment: Interpreted Sections 62 and 63 of the Act providing for optional routes for the procurement of power which is against the provision of Tariff Policy.





# Competitive Bidding

## Proposed Way Forward

- Amendments in Section 62 and Section 63 to bring more clarity.
- Determination of Generation tariffs may be left to competition.
- Transmission and Wheeling tariffs to be regulated- Transmission tariff can also be competitively determined.
- Retail supply tariff to be regulated during a transition 5-8 years, after which it could be left to competition.



# Separation of Carriage and Content

## Background

- Section 14 - provision for multiple distribution licensees with parallel networks.
- Provision for parallel network
  - Incorporated for virgin areas.
  - Difficult to meet Universal Supply Obligation in the absence of their own network.
  - To avoid resistance from incumbent licensee who owns the network.
- Constraints for multiple licenses : Laying of parallel distribution network.



# Separation of Carriage and Content

## Proposed Way Forward

- ⦿ Separate distribution and retail supply business of the incumbent licensee.
- ⦿ Separate licenses for both the businesses.
- ⦿ Multiple retail supply licenses may be issued after separation.
- ⦿ Transition period 5-8 years.
- ⦿ After the transition period, the incumbent licensee shall be given to choose either distribution/wires business or retail supply business.

# Separation of Carriage and Content



## Proposed Way Forward

- ◎ Two separate licensees- for network and supply business.
  - Existing Discoms can have deemed licenses for both during transition of 5-8 years. Thereafter, need for separation
- ◎ A new applicant may be eligible to obtain a license only for one of the two businesses of retail supply or wires/network.
- ◎ Retail supply tariff may also be deregulated after 5-8 years.
- ◎ Require suitable amendments in the Act.

# Open Access



## Background

- Misuse of Section 11 or Section 108 by State Governments: prohibit the sale of surplus power from a generating unit to the entities outside the State.
- SLDCs have withheld standing clearance to many such generating companies on the plea of section 11.
- The section was meant to be invoked in extraordinary circumstances like security of the State, public order or a natural calamity.

# Open Access



## Proposed Way Forward

- ⦿ The Act may be amended to provide greater clarity on the meaning of 'extraordinary circumstances' mentioned in Section 11.

# Discontinuation of Single Buyer Model



## Background

- ◎ Single Buyer Model still perpetuating in some states.
- ◎ Power purchase agreements have not been reallocated to the distribution companies to enable them to enter into a direct contract with the generating companies as envisaged in the Act and the policy.
- ◎ This model camouflages inefficiencies of one discom against another.

# Discontinuation of Single Buyer Model



## Proposed Way Forward

- ⦿ Relevant provisions in the Act & policy should be amended to bring greater clarity and Single Buyer Model should not be allowed to perpetuate.
- ⦿ Clear timelines should be provided for States to expedite reassignment of the PPAs to Discoms and for winding up the single buyer model as early as possible.



# Development of Power Markets and Exchanges



## Background

- Section 66 of the Electricity Act 2003 states that ‘The Appropriate Commission shall endeavour to promote the development of a market (including trading) in power in such manner as may be specified and shall be guided by the National Electricity Policy referred to in section 3 in this regard.’
- Section 60 has suitable provisions allowing the Commissions to intervene in case of market domination.

# Development of Power Markets and Exchanges



## Proposed Way Forward

- ⦿ For further development of electricity markets, there is a need for clarity in the Act and the policy so that jurisdiction issues regarding forward and future market products may be sorted out at the earliest.

# Other Issues- Pre-paid Metering



## Background

- Section 56 requires the distribution utility to give a notice period of not less than 15 days before disconnecting his supply on default of payment.
- Multiple interpretations have arisen on applicability of this provision when the consumer is prepared to take supply through pre-paid meter.
- Section 47 also makes a passing reference on the issue.

# Other Issues- Pre-paid Metering



## Proposed Way Forward

- ⦿ Pre-paid metering being such an important concept, there is a need for a substantive provision in this regard.
- ⦿ Greater clarity is required on both the issues (concept of pre-paid metering and disconnection of supply) in the provisions of the Act.



# Renewal of License

- ⦿ There is no provision for renewal of a licence in the Act.
- ⦿ Legal opinion sought by MERC from Additional Solicitor General (ASG).

## Proposed Way Forward

- ⦿ There should be a clear provision for renewal of license in the Act.
- ⦿ Section 18 which talks about amendment of license may be considered for renewal or extension of distribution license which is about to expire.

# Cogeneration from Renewable Energy Source



## Background

- Section 86 (1) (e) mandates SERCs to promote co-generation and generation from renewable sources of energy.

## Proposed Way Forward

- The present definition of cogeneration plants does not prescribe the source of fuel (fossil or non-fossil)
- There is a need to bring clarity in this regard through amendment in Section 86 (1) (e).



# Power to Enforce Order

## Background

- Section 142: Punishment for non-compliance of directions by Appropriate Commission. Limited Scope.

## Proposed Way Forward

- Regulatory Commissions should be given power to enforce orders.
- The Act may be amended in line with State Reforms Act “**The Orissa Electricity Reform Act, 1995**”

**Ref- Section 30: Effect and enforcement of interim and final orders and emergency provisions.**

*“(1) .....all orders and directions, interim or final, passed by the Commission shall be enforceable in law as if it were a decree passed by a Civil Court.*

*(2) The Commission shall be entitled to take such assistance from, the police and other authorities, in the State required to effectively enforce the orders and directions given by it.”*



*Thank You*

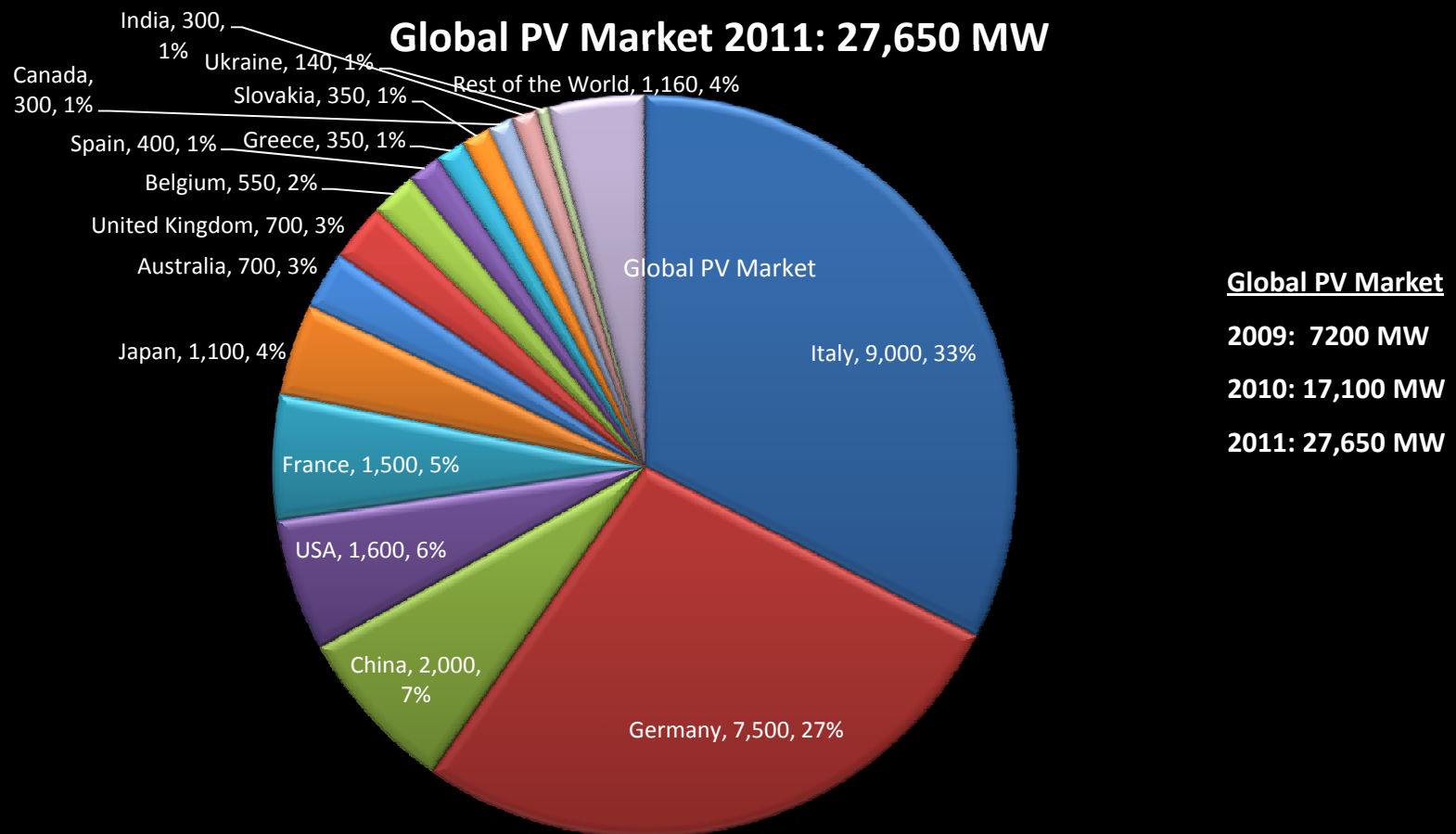


# Rooftop Solar PV Power : Connectivity, Metering, Energy Accounting and Tariff Related Issues

# Contents of this presentation...

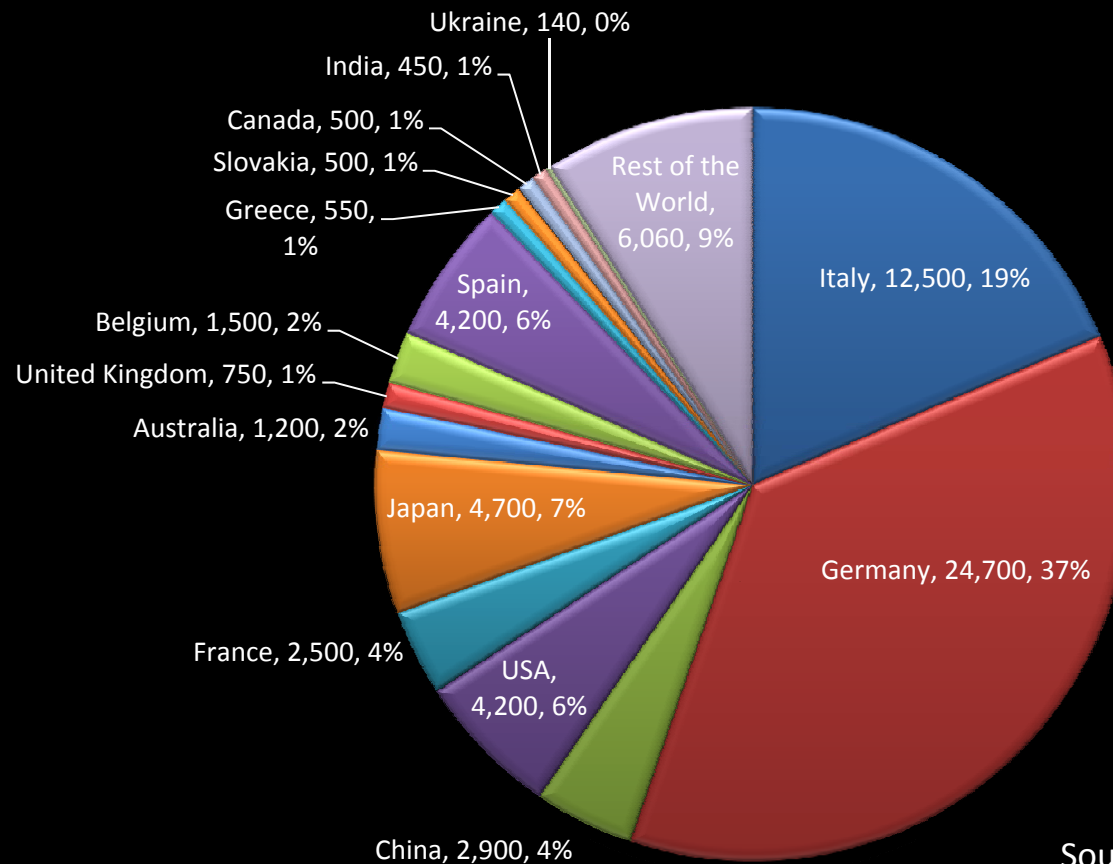
1. Background
2. Connectivity
3. Metering
4. Energy Accounting
5. Commercial Arrangement
  - Net Metering
  - Feed in Tariff
  - Renewable Energy Certificates (RECs)
6. Rooftop Tariff : Principles
7. Viability of Grid Connected Rooftop PV with MNRE Subsidy
8. Way Forward

# Global PV Market 2011



Source: EPIA Market Report-2011

# 2011 Cumulative installed capacity : 67,350 MW

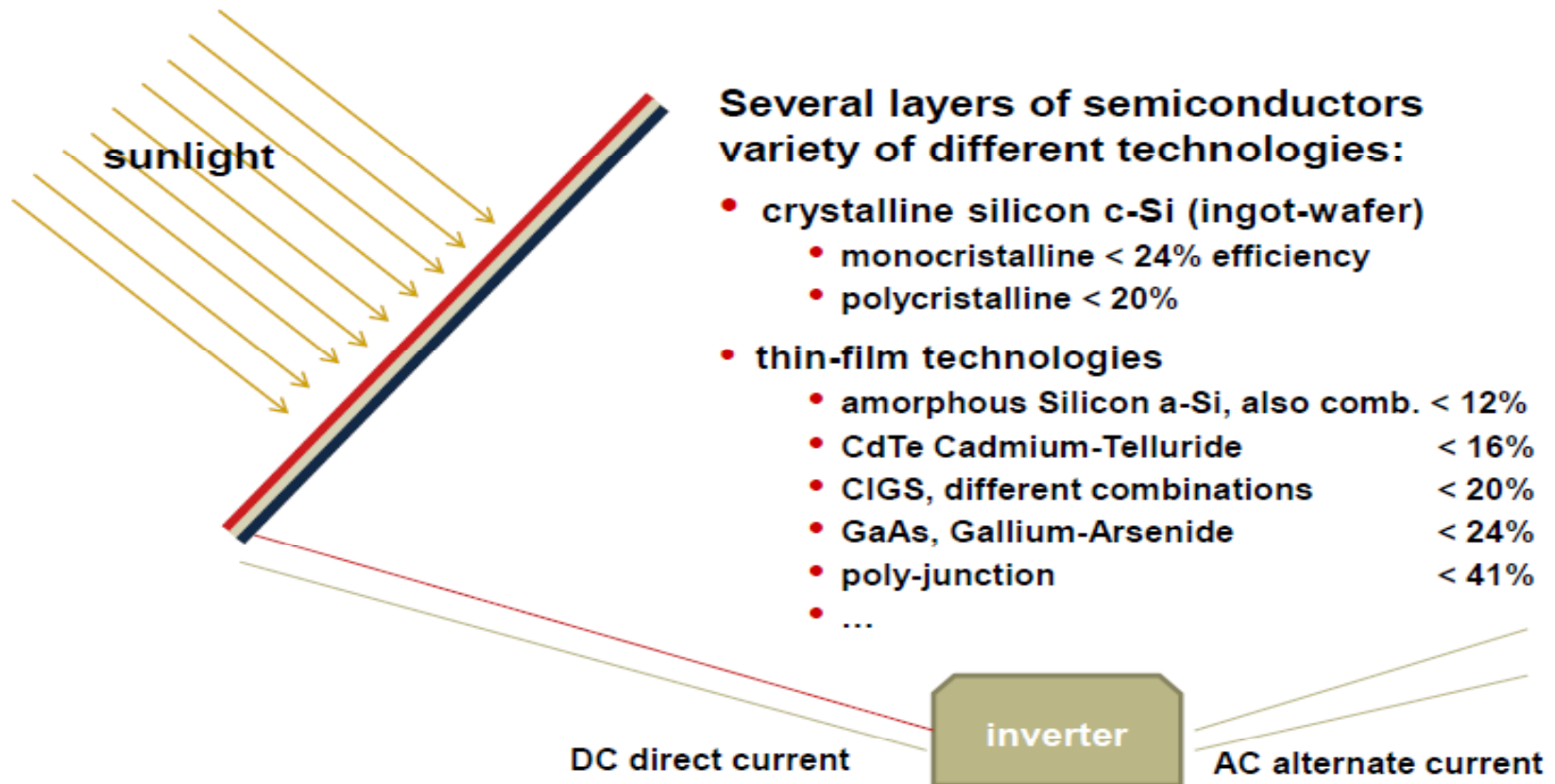


Source: EPIA Market Report-2011

India: Solar Power (SPV) as on 31.01.2012 481.48 MW

# PV is a Semiconductor Technology

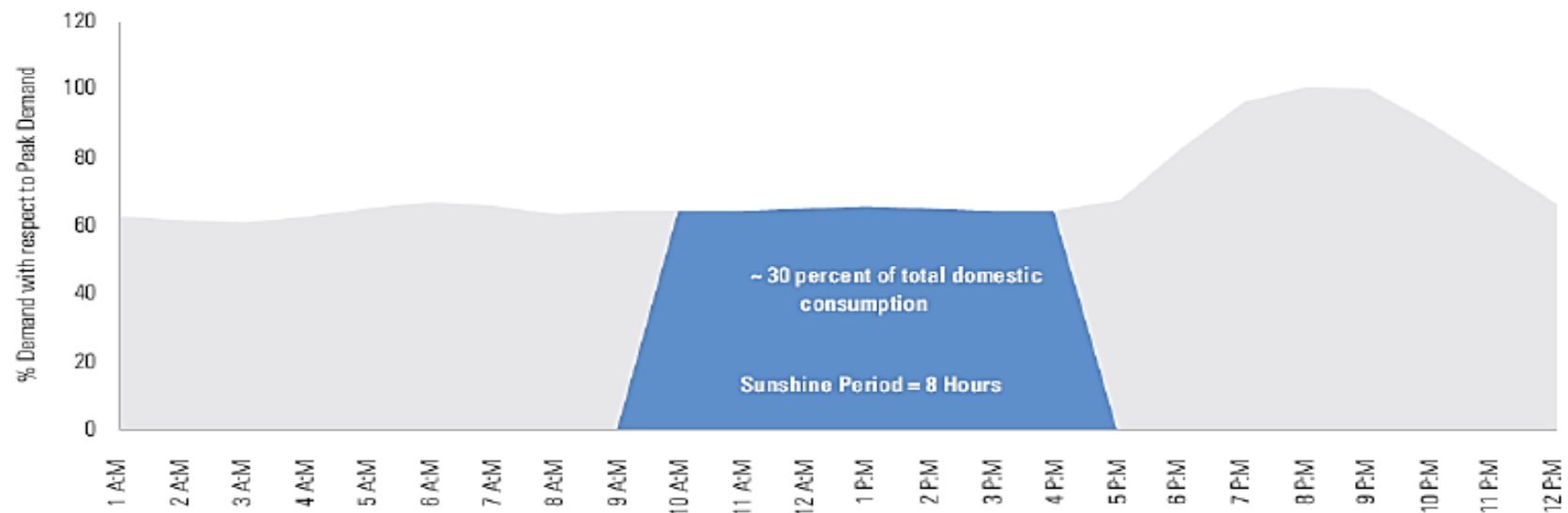
**PV provides several benefits to investors: No moving parts, fast deployment, low maintenance efforts and no fuel is required.**



# Benefits of Rooftop PV

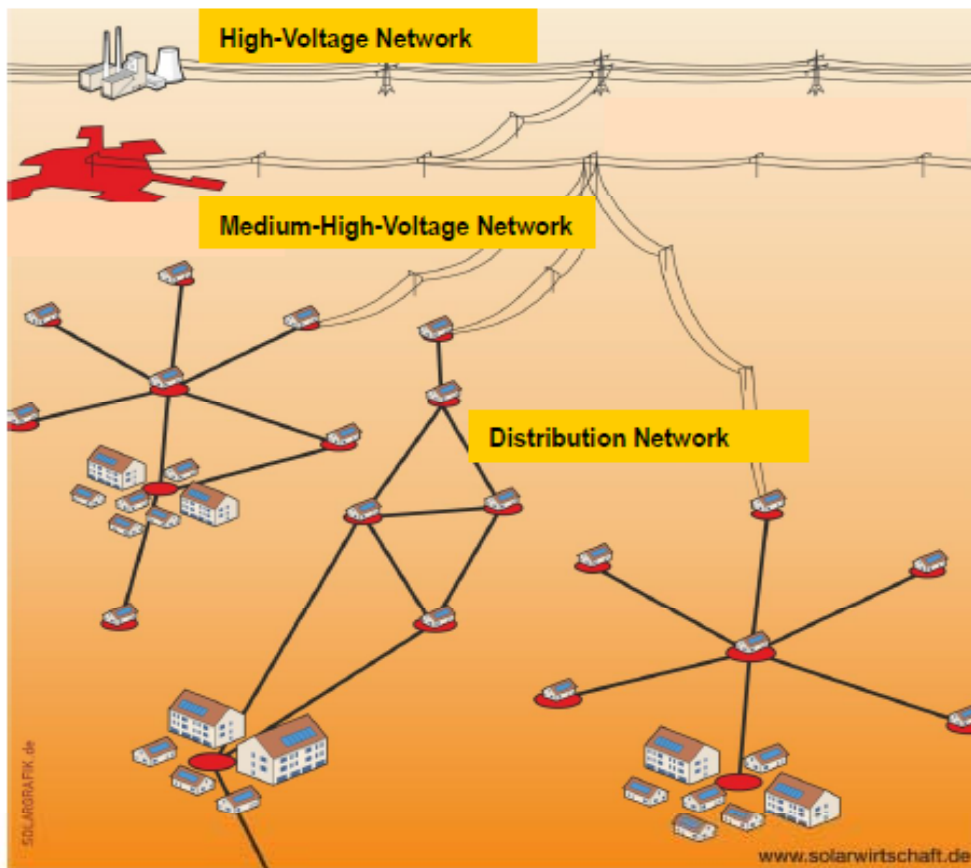
**Photovoltaic roof-top installations at the tail-end of the grid increase grid-stability, especially at distribution level.**

- The market potential for grid connected photovoltaic rooftop is estimated to be at a minimum of 20 GW for the next 10 years (independent from the JNNM's target and the off-grid market).
- Residential consumers contribute 29% of power demand, expected to increase to 34% by 2021-22.



# Benefits of Rooftop PV

In addition, photovoltaic systems avoid network losses.



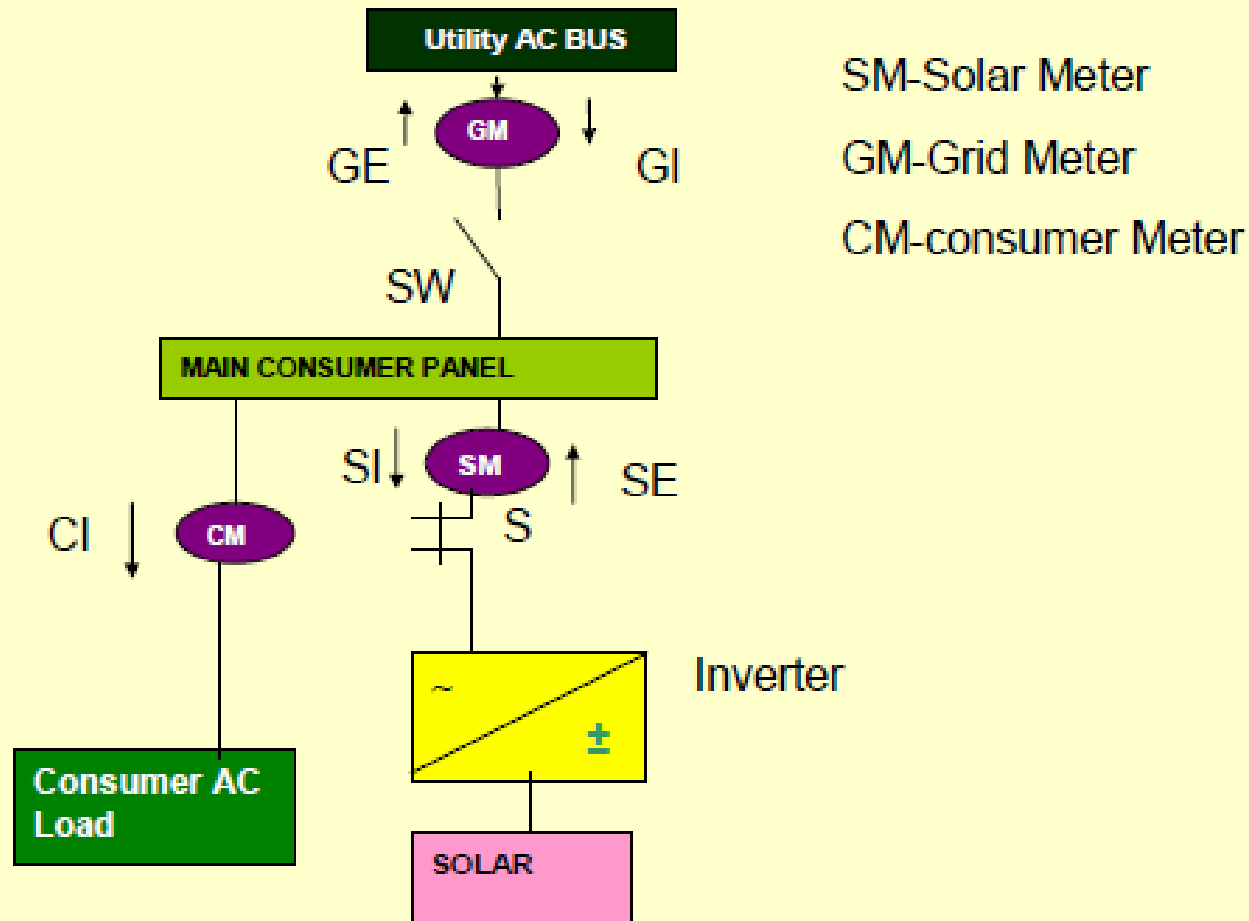
**Losses along the transmission network:**

- High-voltage network
- Medium-high-voltage network
- Distribution network

**=> Total losses estimated to reach up to 25%**

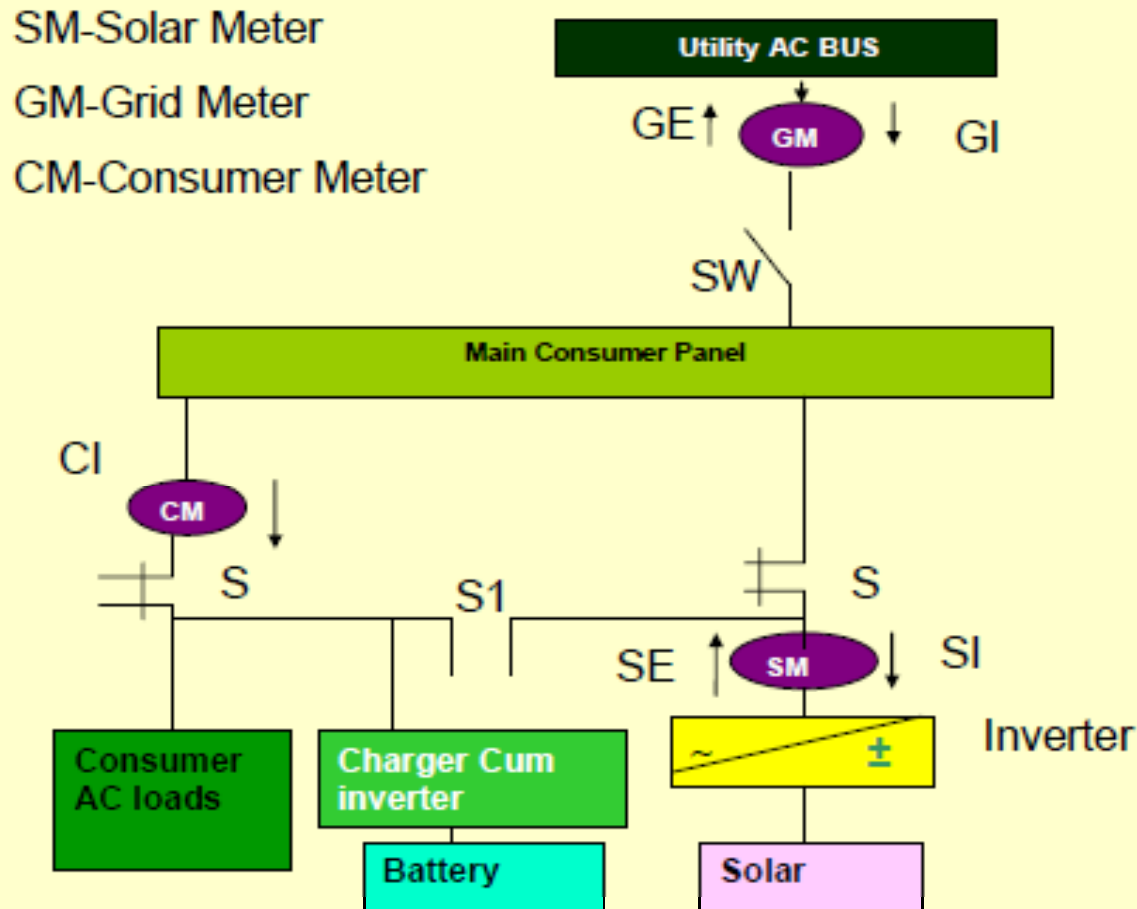
**=> Each 1 kWh from photovoltaic avoid 1,25 kWh conventional (coal) power**

# Grid Interactive Solar PV System Without Battery

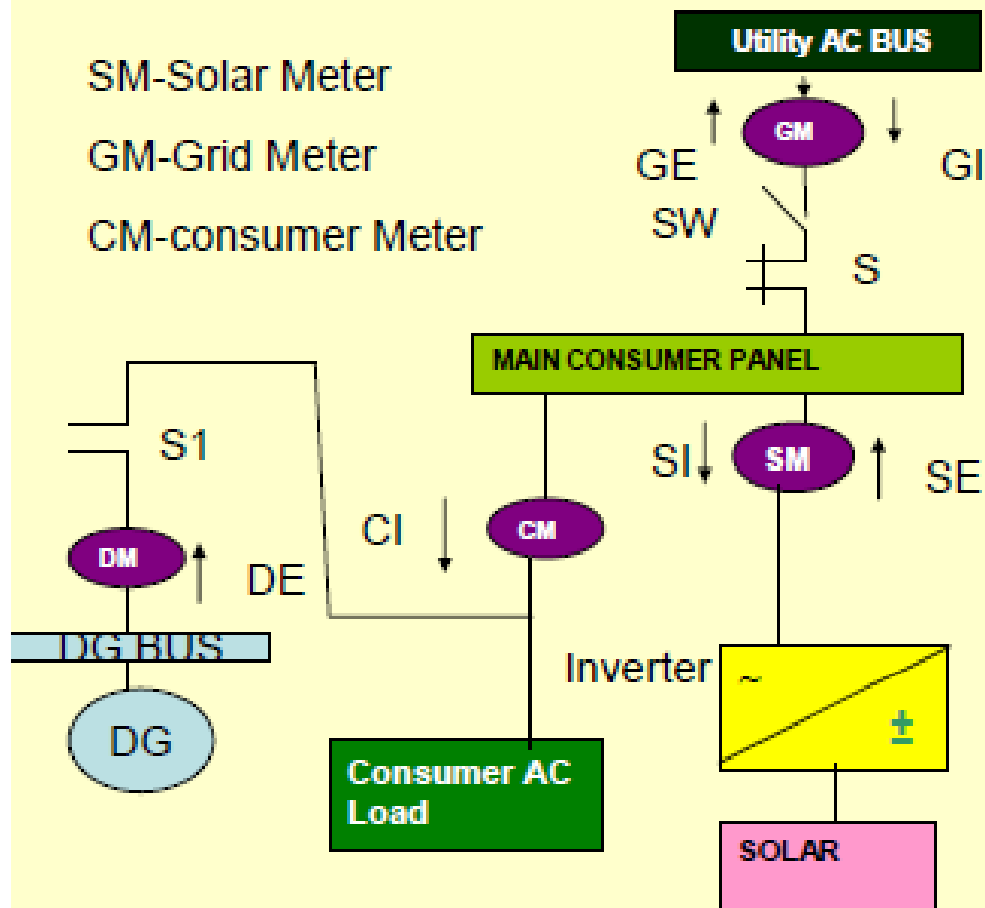




# Grid Interactive Solar PV System With Full Load Battery Backup



# Grid Interactive Solar PV System With Full Load DG Backup



# Issue 1: Connectivity

- **CERC RE Tariff Regulations-2012**

*“Interconnection Point” shall mean interface point of renewable energy generating facility with the transmission system or distribution system, as the case may be:*

*In relation to wind energy projects and Solar Photovoltaic Projects, inter-connection point shall be the line isolator on outgoing feeder on HV side of the pooling sub-station.....”*

- Rooftop PV systems being smaller in size (10-500kW) likely to be connected to the grid at the distribution network at lower voltages (LT) like 415V level where it is to be consumed

# Connectivity.....

## **Advantage of connecting at LT level:**

- No need to step-up the solar inverter output (415 V) to HV levels (11 kV or above)
- Resulting into cost savings (transformers, switch gear etc.) and also avoid transformation losses
- Avoid line losses and achieve faster timelines for project implementation

## **Proposal**

- Interconnection Point for Rooftop Solar Systems at the lower voltage level needs to be defined in the CERC/SERCs Regulations
- CEA (Technical Standards for connectivity of the Distributed generation resources) Regulations need to address:
  - What should be the appropriate voltage level for connectivity
  - Norms for capacity (kWp) restrictions for connectivity at each voltage level
  - Connectivity at LT level, even though consumer connection at HT /EHT

## Issue 2: Metering arrangements

### **Whether the present CEA Regulations cover metering requirement for rooftop PV installation?**

- CEA Regulations on Installation and Operation of Meters should be the governing regulations for the metering arrangement of rooftop solar PV
- CEA Regulations need to incorporate appropriate metering system for rooftop PV and should clarify :
  - whether separate metering (Export/Import) arrangement or single meter with separate registry for Export/Import be insisted,
  - requirements for Main Meter/Check Meter/Standby meter, if any,
  - metering Location,
  - meter accuracy class,
  - meter type,
  - What facilities the meter should be capable of - data storage, ToD slot-wise, time-block, communication facility etc.

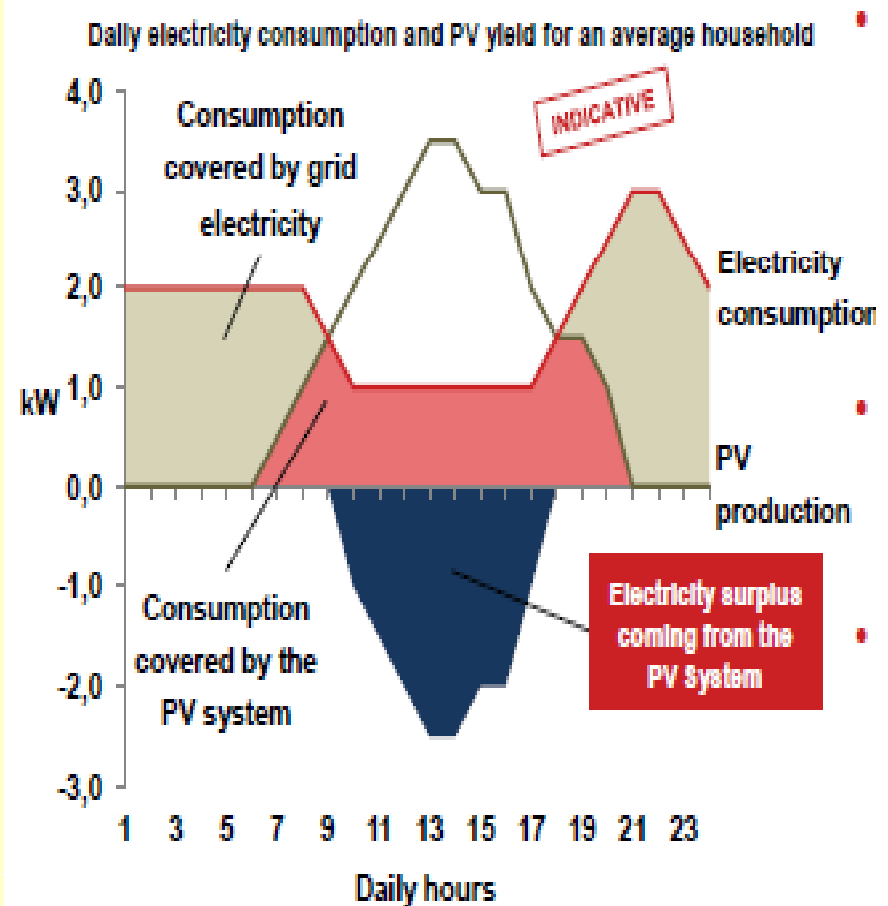
## Issue 3: Energy Accounting

- Need to specify responsibilities of Discom in terms of joint meter reading, issuance of energy credit notes etc.:
  - The Host Distribution Licensee should undertake joint meter reading on monthly basis
  - At the beginning of the project the Host Discom needs to take the custody of the meter and seal appropriately after proper testing of all the meters (main, check & stand by meter)
  - Host Discom, for the projects registered under the REC mechanism, shall communicate the meter recording to the SLDC, clearly mentioning the net units generated by the rooftop solar system and net energy injected to the grid from the rooftop solar system.
  - SLDC will then send the report to NLDC for issuance for RECs
  - Line losses & transformer losses should be standardized for simplification of the calculation. This could be done based on the installed capacity of the rooftop system.

# Net Metering

## DEFINITION OF NET METERING

- RES production is first used to cover the electricity demand of the consumer and excessive power is fed to the grid
- Electricity fed into the grid is credited to the electricity bill of the consumer; thus decreasing the energy costs



# Issue 4.1: Commercial Arrangement: Net Metering

## NET METERING

- Consumer utilizes solar power on its premises offsetting grid power;
- Excess power to be exported to the grid;
- Import / Export meter provides net-metering of power
- Consumer pays only for the difference of power consumed at retail tariff rate and get paid for power exported also at retail tariff

## Advantages

- Comparatively simple structure;
- With subsidy contemplated by MNRE, cost of solar power would be reduced
- Once installed, a solar project will keep generating electricity without cost escalation for 25 yrs.
- The generated solar electricity will offset the electricity from grid and DG which is increasing rapidly

## Sample Calculations

- Solar Generation: 100 units/M
- Total Consumption: 250 units/M
- Grid offset: 70% of Solar Generation: 70 units
- Grid Export: 30% of Solar Generation- 30 units
- **Tariffs:** Consumer Tariff: Rs. 5/unit
- **Net Payment to utility:**  $((250 \text{ units} - 100 \text{ units}) * \text{Rs. } 5/\text{unit}) - = \text{Rs. } 750$



## Issue 4.2: Commercial Arrangement: Preferential Tariff

### Generation based incentive

- For the consumptions from the grid , the consumer to pay to utility at retail tariff rates
- The consumer is paid for solar power generation based on his solar energy production at preferential tariff rate

### Advantages

- Generation based incentive ensures the consumer operates and maintains the plant properly
- If capital subsidy is given by the MNRE, cost of power will get reduced

### Sample Calculations

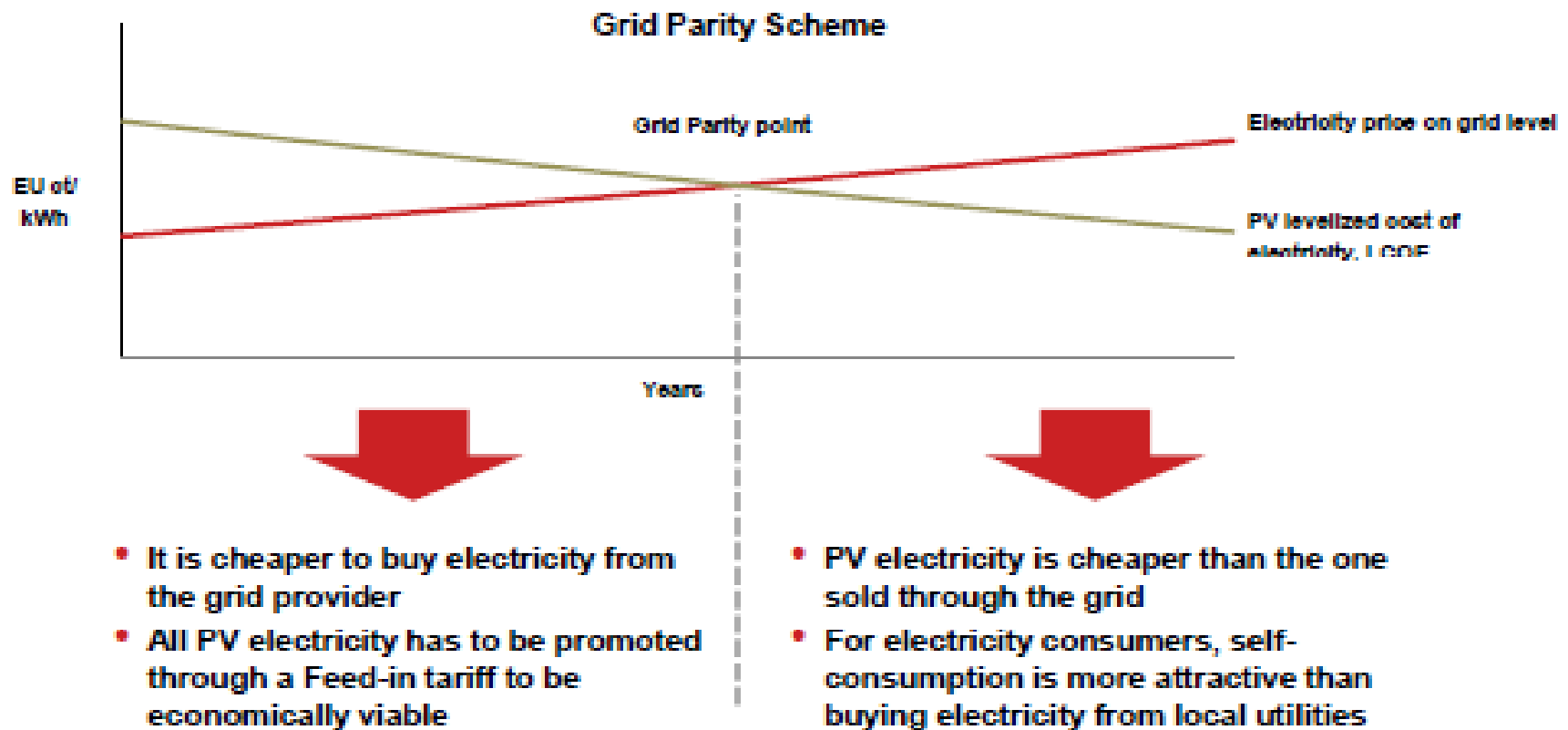
- Solar Energy Generation: 100 units /M
- Total Consumption: 250 units
- Grid offset: 70% of the Solar Generation: 70 units
- Grid Export: 30% of the Solar Generation: 30 units
- **Tariffs:**
- Consumer Electricity Tariff: Rs. 5/unit
- Solar Power Tariff: Rs. 10/unit
- **Net Payment to utility:**
- $(250 \text{ units} * \text{Rs. } 5/\text{unit}) - (100 \text{ units} * \text{Rs. } 10/\text{unit}) = \text{Rs. } 250$

## Issue 4.3: Commercial Arrangement: Renewable Energy Certificates (RECs)

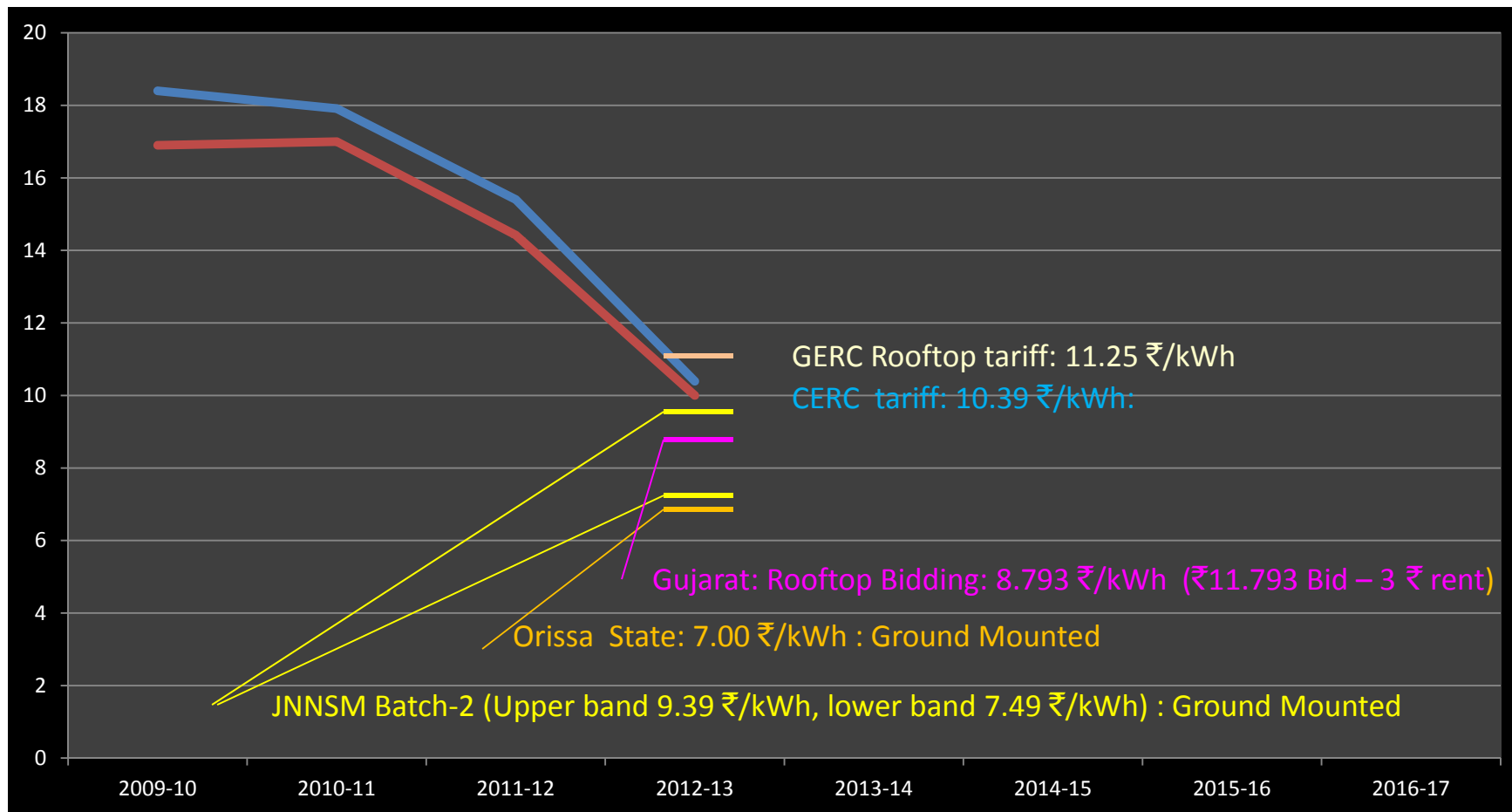
- The Rooftop solar PV generators may be provided with the RECs for their entire solar generation i.e. self consumption and grid injection (export) if any, when surplus.
- No capital subsidy to project owner as the avoided cost (i.e. the cost avoided due to reduction in the consumption from the grid) plus revenue from REC would compensate the cost of solar power
- **Treatment for exported (surplus) solar power:**
  - **Purchase by Host Utility**
    - The solar export (if any) can be purchased by the DISCOM at APPC which will then qualify for RECs
  - **Banking:**
    - The surplus solar power may be allowed to bank (monthly or annual basis as defined by the states) and shall be allowed to draw in the same time slot of injection. Under this approach, banking agreement shall be in place (with applicable charges) instead of purchase by local utility.

# Grid Parity

Reaching grid parity implies that users will start to consume their own electricity rather than buying it from utilities.



# Issue 5.: Solar PV Tariff: Ground Mounted



# 100 kW Rooftop: Airport Authority of India

## Raipur Airport Bidding: Dt. 9.4.2012

Sr. No.	Description of the item	Rates ₹/ kWh quoted
A	Per kWh tariff for solar generated from 1 <sup>st</sup> year to 5 <sup>th</sup> year	6.75
B	Per kWh tariff for solar generated from 5 <sup>th</sup> year to 10 <sup>th</sup> year	8.00
C	Per kWh tariff for solar generated from 10 <sup>th</sup> year to 15 <sup>th</sup> year	9.00
D	Per kWh tariff for solar generated from 15 <sup>th</sup> year to 20 <sup>th</sup> year	14.00
E	Per kWh tariff for solar generated from 20 <sup>th</sup> year to 25 <sup>th</sup> year	20.00
	Levelling Tariff with 10.62% discount factor : ₹ 8.874/kWh	

# Rooftop Tariff Principles

Item Description	Large scale (Rs. Crore/MW)	Rooftop PV (Rs. Crore/MW)
PV Modules	4.50	5.00
Land	0.16	0.16
Civil & General works	0.90	0.50
Module mounting Structures	1.00	1.00
Power conditioning Unit	0.98	1.20
Cables and transformers	1.00	1.00
Preliminary and pre-operative expenses including IDC	0.80	0.80
Total Capital cost	9.34	9.66
Capital cost Specified/Proposed	10.00	10.00
Capacity Utilization factor	19%	17%
Operation and Maintenance	Rs.11 Lakh/MW	Rs.11 Lakh/MW

## Issue 6: Viability of Rooftop PV with MNRE subsidy 30% of capital cost

- MNRE proposes 30% capital subsidy for Rooftop PV
- Consumer Tariff: levellised over 25 years
- Levellised Tariff for Rooftop for 25 years

# Consumer Tariff: levelled over 25 years

Base Industrial/commercial tariffs (Rs/kWh)	Escalation Rates			
	2%	3%	4%	5%
	Levelised Tariffs (over 25 Years - Rs/ kWh) @ 10.62% Discount Factor			
4.5	5.23	5.67	6.17	6.73
5	5.82	6.30	6.86	7.48
5.5	6.40	6.93	7.54	8.23
6	6.98	7.57	8.23	8.98
6.25	7.27	7.88	8.57	9.35



# Levellised Tariff for Rooftop for 25 years

## Rooftop Solar PV tariff (Levellised)

Capital Cost

₹10 Crore/MW

C U F

17%

## TARIFF WITHOUT SUBSIDY ₹/kWh (Levellised @ 10.62% Discount Factor)

With out AD benefit

With AD benefit

Year 2012-13

11.61

10.15

## TARIFF WITH MNRE SUBSIDY : 30% of Capital cost ₹/kWh (Levellised @ 10.62% Discount Factor)

Year 2012-13

8.50

7.69

# Way Forward

- **Connectivity**
  - CERC Regulations need to be amended
  - CEA Regulations need to incorporate suitable provisions
- **Metering**
  - CEA Regulations need to incorporate suitable provisions
- **Energy Accounting**
  - SERCs to provide through Regulations responsibility of Discom for meter reading
- **Commercial Arrangement**
  - SERCs to provide through Regulations
- **Tariff for Rooftop**
  - SERCs to provide through Regulations based on the principles discussed
- **MNRE**
  - To provide 30% capital subsidy for grid connected rooftop PV projects

FOR to take up  
with CERC and  
CEA

FOR can  
evolve model  
Regulations



**Thank you!**