



Department of Industrial and Management Engineering  
Indian Institute of Technology Kanpur



Forum of Regulators

**5<sup>th</sup> Capacity Building Programme for  
Officers of Electricity Regulatory Commissions  
18 – 23 Oct., 2012**

**Renewable Energy Certificates**

**Market and Regulation**

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## Agenda

- Legal, Policy and Regulatory Framework to support RE Deployment
- Evolution of Market Model
- RPO Framework : Driver for RE Development
- REC Mechanism Need and Concept
- Experience: REC Trading
- Challenges and Way Forward



## *Legal, Policy and Regulatory Framework for Development of Renewable Energy in India*



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### **Electricity Act, 2003: Enabling Provisions**

The EA 2003 has outlined several enabling provisions to accelerate the development of RE based generation

- **Section 3**

- National Electricity Policy and Plan for development of power system based on optimal utilization of resources including renewable sources of energy

- **Section 61**

- Tariff Regulations by Regulatory Commission to be guided by promotion of generation of electricity from renewable energy sources in their area of jurisdiction

- **Section 66**

- Appropriate Commission shall endeavor to promote the development of market (including trading) in power in such a manner as may be specified and shall be guided by National Electricity Policy in Sec 3

- **Section 86(1) (e)**

- Provides Statutory Framework and Mandates SERC for taking steps for promotion of Cogeneration and Generation of Electricity from Renewable Sources of Energy

## National Tariff Policy: Aims and Objectives

- Appropriate Commission shall **fix RPO** and SERCs shall **fix its tariff** latest by April 1, 2006
- Initially Appropriate Commission to **fix preferential tariffs** for distribution utility to procure RE
- In future, distribution utility to **procure RE through competitive bidding** within suppliers offering same type of RE
- In long-term, RE technologies need to compete with all other sources in terms of full costs
- **CERC to provide guidelines** for **pricing non-firm power** if RE procurement is **not** through competitive bidding

### Amendment to Tariff Policy (January 20, 2011)

- SERCs to reserve a minimum percentage for purchase of solar energy ... which shall go up to 0.25% by the end of 2012-12 and further up to 3% by 2022
- Purchase of energy from non-conventional sources of energy takes places more or less in same proportion in different States
- An appropriate mechanism such as Renewable Energy Certificate (REC) would need to be evolved
- REC Mechanism should also have a solar specific REC

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## Promotion of RE is by Policy Design and Regulatory Initiative

### Central Government

- Electricity Act 2003 (Jun 2003)
- National Electricity Policy (Feb 2005)
- National Tariff Policy (Jan 2006)
- National Action Plan on Climate Change (Jun 2008)

### Central Electricity Regulatory Commission

- Regulations for Preferential Tariff for RE (Sep 2009)
- Renewable Energy Certificate Mechanism (Jan 2010)
- Implementation Framework (2010 – ongoing)

### State Electricity Regulatory Commission

- Preferential RE Tariff Orders by SERCs (2002–2010)
- Over 19 States have mandated Renewable Purchase Obligations (2004 – 2010)
- Modification to RPO and adoption of REC framework

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## Key Challenges in Encouraging Deployment of RE

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- Enabling Mechanism for Inter-State sales of Renewable Energy
- Cost Effective Mechanism for purchase of Renewable Energy
- Nation wide target for purchase of Renewable Energy
- Stronger enforcement and penalty mechanism
- Mechanism for purchase of small quantity of RE by individual Open Access consumer



**Forum of Regulators (FOR) initiated study to address challenges**

### **FOR Report (Nov 2008) on 'Policies for Renewables' recommended:**

- Need to facilitate 'Inter-State Exchange of RE Power from National Perspective
- Explore feasibility of introduction of REC mechanism as tool to promote RE within framework of EA 2003

## Regulatory & Policy Development at National Level

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### FOR Report on 'Policies on Renewables' recommends

- **Ascertaining Need for Inter-State exchange of RE power**
  - Inter-State exchange of RE power is desirable from National perspective and the same should be promoted
  - Mechanism for appropriate treatment for inter-State RE exchange through Regional Energy Account needs to be developed
- **Ascertaining feasibility of REC mechanism**
  - Concept of RE Certificate as a tool for promotion of RE sources has been used in some countries
  - REC mechanism can be introduced within existing framework of EA 2003
  - Co-operation amongst States is essential and SERCs should recognize procurement of RE generated in other States for purpose of compliance as RPO by regulated entity in their respective jurisdiction

## NAPCC : Guideline for RE Development

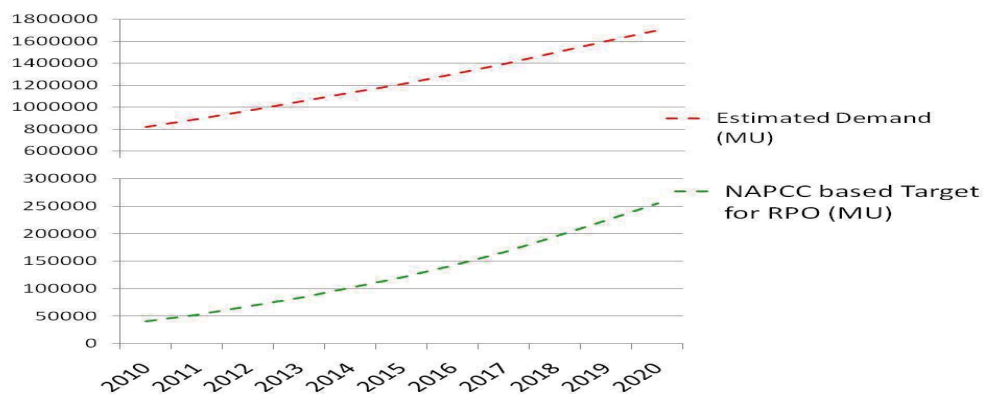
### National Action Plan for Climate Change (NAPCC)

- At National level for FY 2010, target for RE Purchase may be **set at 5%** of total grid purchase, to be **increased by 1% each year** for 10 years
- SERCs may set **higher target than this minimum** at any point in time
- Central & State Govts may set up a **verification mechanism** to ensure that renewable power is actually procured
- Appropriate authorities may issue **certificates** that procure renewable power in excess of the national standard. **Such certificates may be tradable**, to enable utilities falling short to meet their RPS
- **Penalties** as may be allowed under EA 2003 may be levied, if utilities are still falling short in RPS

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## NAPCC has set challenging target for RE Development

- NAPCC target of 5% for RE Procurement in 2010
- Target to increase by 1% each year to reach 15% by 2020
- Separate target for Solar Energy
- Provides for creation of Renewable Energy Certificate Mechanism



Considering that demand for electricity would increase to 1700 BU by 2020, it would create market for 255 BU units of renewable energy generation

NAPCC identified REC framework to realize annual target of National RPO

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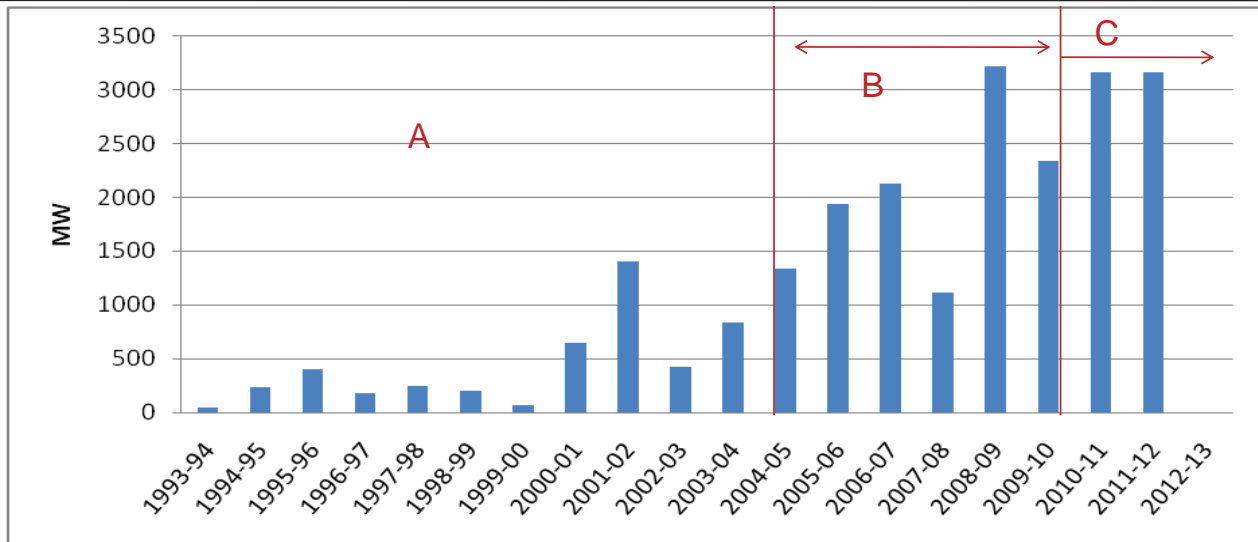


## Renewable Energy and Evolution of Market Models



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### Evolution of Market Model



- A- Market model based on Open Access/wheeling for self use
- B- Model based on FIT and RPO for sale to distribution licensee & third party, within State
- C- Market model based on instruments with cross border features (REC) catering to National level demand

## Alternate A : Open Access and Wheeling Model

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- RE Power Plant setup mainly to meet captive/third party requirements
- Wheeling of power limited to two or three locations
- Governed by State Government policy provisions or concessional wheeling arrangements

### Key Considerations for Prospect of OA Wheeling Model

- Market models based on Wheeling and Open Access have the following difficulties
  - Compatibility with Open Access Regulations
  - Pricing Reforms and un-bundling of State Utilities have resulted into High Transmission/Wheeling Charges
  - Complex scheduling and Energy Accounting requirements pose limitation on Inter-State wheeling transactions

**Open Access : Wheeling charges & Other Conditions continue to be prohibitive**

## Alternate B : Preferential Tariff Based Market Model

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- Preferential tariffs determination by various SERCs
- Generic tariff approach based on Norms for projects to be commissioned over pre-specified control period
- Substantial addition of capacity occurred under this market model

### Issues in determination of preferential tariff

- Different Approaches for Tariff determination across States:
  - RERC notifies norms through Tariff Regulations
  - MERC specifies tariff parameters through separate Orders
- Ambiguity over the definition of preferential tariff, control period etc.
- Wide variation in financial parameters like O&M expense, interest rate, which is not State specific
- Constant tariff over the Control Period, not reflecting changes in market conditions and underlying parameters

## Alternate C : New Market Model – REC Mechanism

- Renewable Energy Certificate Mechanism to enable Inter-State exchange of RE power
- REC mechanism seeks to address the mismatch between availability of RE sources and the requirement of the obligated entities to meet their renewable purchase obligation across States.
- REC mechanism shall facilitate emergence of large number of cross-border RE transactions based on non-firm RE sources and firm RE sources

### *Aspects considered for REC Design in Indian Context*

- Electricity Market is Regulated to large extent
- More than 90 % of electricity volumes continue to be transacted at regulated price
- Preferential RE Tariff Regime to continue (Feed – in – Tariff % REC shall co-exist)

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## *RPO Mechanism : Driver for RE Development*



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## Section 86 (1) (e) – Driver for RPO

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- Section 86(1): The State Commission shall discharge the following functions, namely:
  - *(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, a percentage of the total consumption of electricity in the area of a distribution licensee;*
- Various State Commissions have put significant emphasis on the last part of this important clause while developing regulations for Distribution Licensees under their jurisdiction

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## National Tariff Policy : Harnessing RE

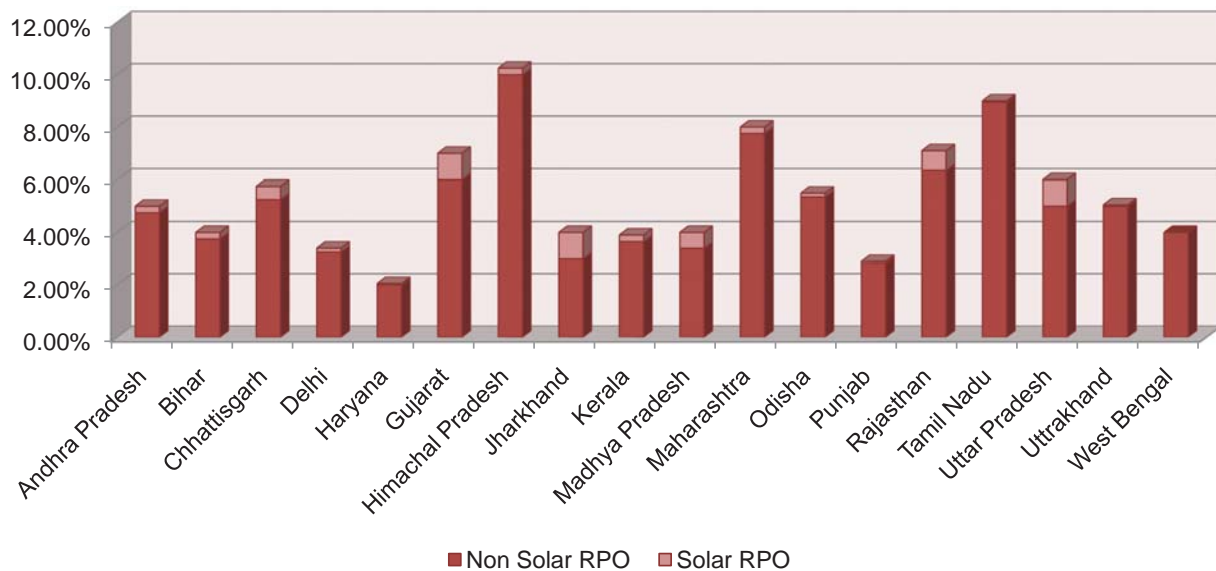
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- **Clause 6.4 of NTP States:**
  - (1) Pursuant to provisions of section 86(1)(e) of the Act, the Appropriate Commission shall fix a minimum percentage for purchase of energy from such sources taking into account **availability of such resources in the region and its impact on retail tariffs**. Such percentage for purchase of energy should be made **applicable for the tariffs to be determined by the SERCs latest by April 1, 2006**.

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## RPO Targets Across the States (2012-13)



- NAPCC recommends 5% RPO in 2009-10 with 1% increase till 15% RE by 2020
- RE Capacity Addition of around 6000MW per annum shall be required to meet the target envisaged under NAPCC

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## RPO already established : Key Features

- Specify % of renewable energy every utility need to purchase:
  - Single target for overall renewable energy purchase,
  - Usually close to existing purchase levels,
  - In some cases Y-o-Y targets,
  - no technology specific targets
- Period is up to five years,
- Applicable to OA/Captive in only three States,
- Purchase of RE from outside the State has not been permitted,
- Silent on mode of procurement, competitive or cost based
- Implementation mechanisms need further refinement
- Weak on enforcement methodology

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## RPOs – what further was required?

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- Separate % for RE sources which are not commercial
- Application of RPO to OA and Captive transactions
- Efficient mechanism for purchase of RE
- Enabling mechanism for inter-state sales
- Nation wide target for purchase of RE
- Stronger enforcement and penalty mechanism
- Mechanism to create competition amongst RE sources

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## Need for inter-state sales

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- Renewable sources are not spread evenly across country
- Many states with no or little RE, cannot procure RE
- States with good RE have exhausted their capacity
- Currently, no mechanism is available for purchase of RE across the State boundary
- It may not be possible to carry out inter-State sales using CERC OA Regulations for following reasons:
  - Most RE difficult to schedule
  - Transaction is expensive as capacity factors for RE are low
  - Intra-state balancing systems have not yet stabilized
- Therefore, a mechanism which will enable inter-state sale and purchase of renewable energy is required

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## RPO for OA and Captive Consumers

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- Section 86 (1) (e) also require State Commissions to promote 'Sale of electricity to any person'
- Obvious intent is to promote RE purchase by all users
- Exempting OA consumers would increase burden on already subsidized category of consumers
- Except three States, OA/Captive users were not subjected to RPO targets
- **Benchmark Order of Rajasthan High Court on applicability of RPO on Captive and OA consumers and powers of SERCs to levy penalties (August 2012)**
- However, current methodology of contracting of power makes it difficult to contract for small quantity of RE required by the individual OA consumer
- It is necessary to develop cost effective mechanism to enable purchase of RE by large number of OA/Captive consumers

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## Earlier RPO regulations (< 2010) fail to address :

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- Nation wide target for purchase of RE
- Enabling mechanism for inter-state sales of RE
- Efficient mechanism for purchase of RE
- Stronger enforcement and penalty mechanism
- Specific targets for RE sources which are not yet commercial
- Application of RPS to OA/Captive/trading transactions

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## RPO Enforcement and Penalty

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- FOR notified draft model Regulations in October 2009 for SERCs under Section 86(1)(e) in which FOR proposed 'Effect of Default'
- **Effect of Default**
  - 1) If the obligated entities does not fulfill the renewable purchase obligation as provided in these regulations during any year and also does not purchase the certificates, **the Commission may direct the obligated entity to deposit into a separate fund, to be created and maintained by such obligated entity, such amount as the Commission may determine on the basis of the shortfall in units of RPO and the forbearance price decided by the Central Commission**

**Provided that:**

- Fund so created shall be utilised, as may be directed by the Commission, for purchase of the certificates.
- Commission may empower an officer of the State Agency to procure from the Power Exchange the required number of certificates to the extent of the shortfall in the fulfillment of the obligations, out of the amount in the fund.

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## RPO M&V and Enforcement

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(2) Where any obligated entity fails to comply with the obligation to purchase the required percentage of power from RE sources or the RECs, it shall also be liable for penalty as may be decided by the Commission under **section 142 of the Act**

**Provided** that in case of genuine difficulty in complying with the RPO because of non-availability of certificates, the obligated entity can approach the Commission for carry forward of compliance requirement to the next year

- **Designation of State Agency by SERCs:**

One of the function of State Agency would be:

*The State Agency shall submit quarterly status to the Commission in respect of compliance of renewable purchase obligation by the obligated entities in the format as stipulated by the Commission and may suggest appropriate action to the Commission if required for compliance of the RPO.*

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## REC Mechanism



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## Why REC Mechanism was created?

- Renewable sources are not spread evenly across country
- Many states with no or little RE were not able to promote RE
- States with good RE felt they have exhausted their capacity to absorb
- It is difficult to carry out inter-State sales using CERC OA Regulations for large scale deployment of RE due to following reasons:
  - Most RE generators are difficult to schedule
  - Transaction would be expensive due to low capacity factors of RE
  - RE generators are not connected to STU but to Discoms
  - Intra-state balancing systems have not yet stabilized
- Therefore, a mechanism that will enable inter-state sale and purchase of renewable energy was required.

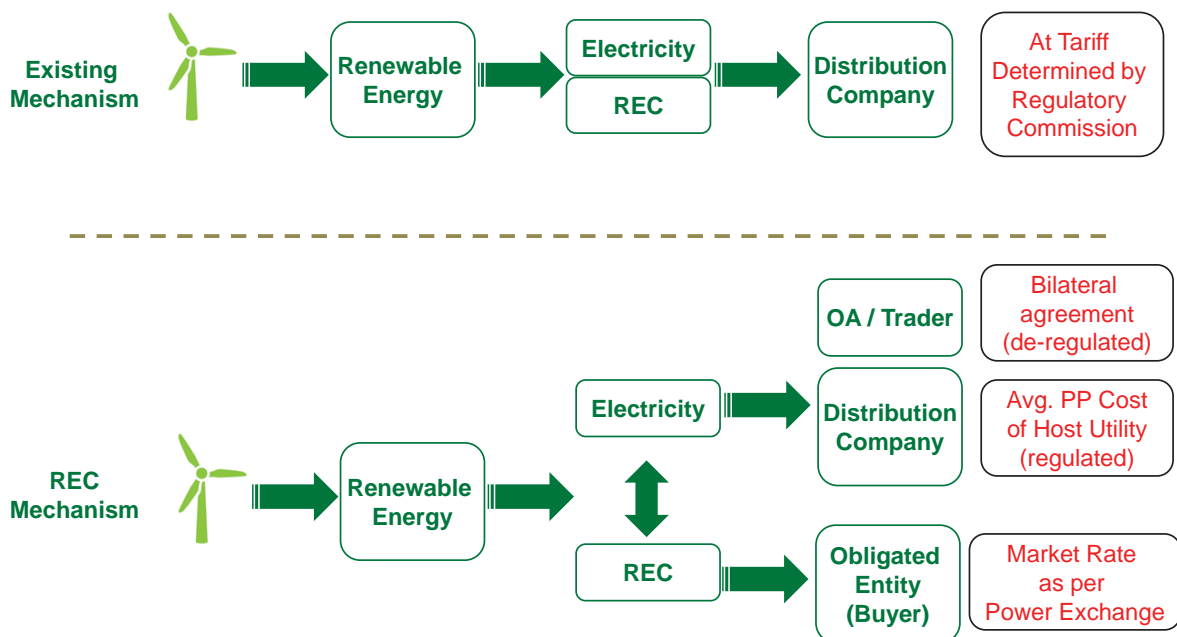
## Key Objectives for Introduction of REC Mechanism

- Effective implementation of RPS
- Increased flexibility for participants
- Overcome geographical constraints
- Reduce transaction costs for RE transactions
- Enforcement of penalty mechanism
- Create competition among different RE technologies
- Development of all encompassing incentive mechanism
- Reduce risks for local distributor by limiting its liability to energy purchase

In the view of hurdles faced by RE Development, it appears that these objectives should take precedence over others

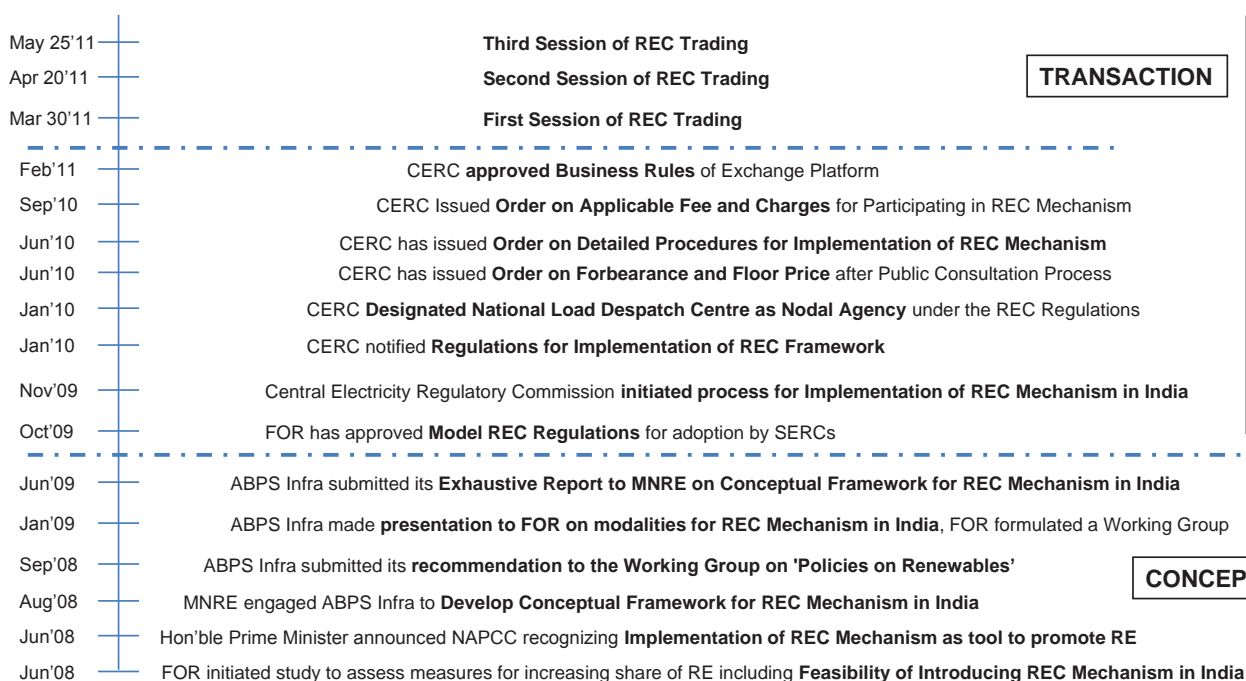
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## Concept of REC Mechanism in India



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## Chronology of Events – Concept to Implementation



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## REC Mechanism Key Design Features

### Design Features



Eligible Source

Eligible Entities

Obligated Entities

REC Issuing Authority

Sale/Purchase of REC

- **Eligible Source**
  - All sources recognised by MNRE under Renewable Energy Category
  - Two Categories of Certificates one for Solar and other for Non-Solar
- **Eligible Entities**
  - Grid Connected RE Power Projects having NO PPA at preferential tariff and received accreditation certificate from State Agency
  - Shall sell electricity at Pooled cost of Power Purchase to distribution utility or at mutually agreed price to any other licensee
- **Obligated Entities**
  - As defined by SERC, distribution utility, OA User, Captive Consumer
- **REC Issuing Authority**
  - National Load Despatch Centre shall issue REC to Generator based on the Energy Injection Report prepared by SLDC
- **Sale/Purchase of REC**
  - Transaction of REC shall take place at Power Exchanges operating under the guidance of CERC

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# REC Mechanism Key Design Features

## Design Features



Denomination

Form of REC

Pricing of REC

Redemption of REC

Shelf Life

- **Denomination**
  - One (1) REC shall be issued corresponding to 1 MWh of renewable energy is generated and injected into the Grid
- **Form of REC**
  - REC shall be issued electronically to the Generator
- **Pricing of REC**
  - To be discovered only on Power Exchanges through auction route.
  - Floor and Forbearance Price shall be determined by the CERC
- **Redemption of REC**
  - Obligated entities shall purchase REC from Exchange Platform and redeem it in-lieu to their fulfilment of RPO with State Agency.
  - Only single trade (once through) permissible. Multiple trades not allowed.
- **Shelf Life**
  - RE Generator shall apply for issuance of certificate from 3 months of energy injection in the grid
  - REC shall be valid for 1 year from the date of issuance

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# Entities involved to operationalise REC Mechanism

## Institutional Framework



Central Entities

State Entities

- Forum of Regulators
- Central Electricity Regulatory Commission
- Central Agency (National Load Despatch Centre)
- Power Exchanges
- Compliance Auditors

- State Electricity Regulatory Commission
- State Load Despatch Centre
- State Agencies
- Eligible Entities
- Obligated Entities

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## Key Role performed by FOR

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- Formulated Model REC Regulations for SERCs
- Sought Legal Opinion from Solicitor General on key legal aspects
  - Applicability of RPO to Captive Users and Open Access Consumers
  - Statutory backing for Enforcement mechanism as regulatory measure
- Introduced Enforcement Mechanism for non-compliance
  - Apart from legal provisions under EA 2003, obligated entity has to contribute a charge to Fund at Forbearance Price.
  - Fund to be utilised for purchase of RECs or creation of RE infrastructure as directed by SERCs
- Extended scope of RPO applicability to captive users, open access consumers apart from DISCOMs
- Undertook study for setting RPO targets and long term trajectory at National level to accomplish NAPCC goals

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## REC Pricing Framework (1/2)

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CERC issued suo motu order on Forbearance and Floor Price on June 10, 2010 and Aug 23, 2011

### Methodology for Determination of forbearance and Floor Price :

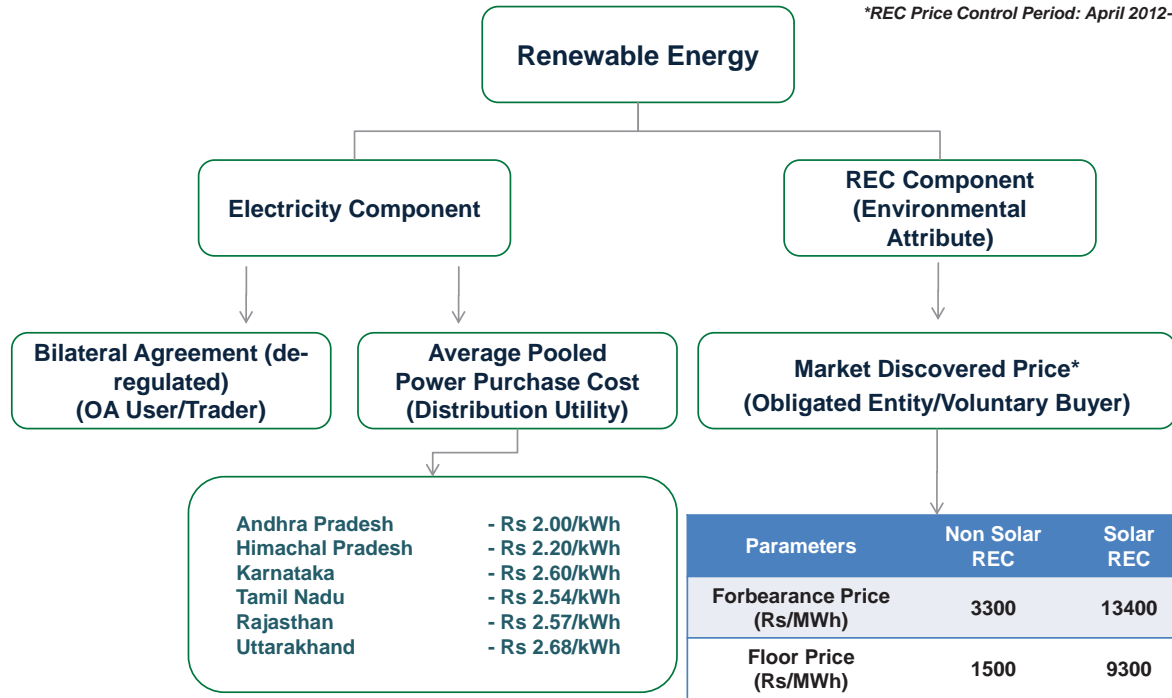
- **RE Target** : NAPCC targets have been considered for total projected energy requirement (i.e. RE Generation for FY 2010-11 as 6% of total Energy requirement)
- **Additional RE Capacity Addition**: based on the CAGR for RE Technology for each State based on last five years performance, MNRE target, Capacity addition plan etc.
- **RE Tariff**: Based on the CERC RE tariff Regulations for the sake of uniformity
- **Average power purchase cost**: weighted average pooled power purchase by distribution licensee for the last financial year
- **Forbearance price** : It is derived as highest cost of difference between the RE tariff (as cost of generation) and average power purchase cost (APPC)
- **Floor Price**: To ensure the basic min. requirement for financial viability of RE projects. Viability requirement covers loan repayment interest charges, O & M Expenses and Fuel expenses if any.

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## REC Pricing Framework (2/2)

\*REC Price Control Period: April 2012- March 2017



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## Current Status of notification of RPO REC Regulations

SN	State	Draft Regulation	Final Regulation	State Agency	SN	State	Draft Regulation	Final Regulation	State Agency
1	Andhra Pradesh	Y	Y	Y	15	Maharashtra	Y	Y	Y
2	Arunachal Pradesh	N	N	N	16	Meghalaya	Y	Y	N
3	Assam	Y	Y	Y	17	Nagaland	Y	Y	N
4	Bihar	Y	Y	Y	18	Orissa	Y	Y	Y
5	Chhattisgarh	Y	Y	Y	19	Punjab	Y	Y	Y
6	Delhi	Y	Y	Y	20	Rajasthan	Y	Y	Y
7	Gujarat	Y	Y	Y	21	Sikkim	N	N	N
8	Haryana	Y	Y	Y	22	Tamil Nadu	Y	Y	Y
9	Himachal Pradesh	Y	Y	Y	23	Tripura	Y	Y	Y
10	J&K	Y	Y	Y	24	Uttarakhand	Y	Y	Y
11	Jharkhand	Y	Y	Y	25	Uttar Pradesh	Y	Y	Y
12	Karnataka	Y	Y	Y	26	West Bengal	Y	Y	Y
13	Kerala	Y	Y	Y	27	JERC (Goa and Uts)	Y	Y	Y
14	Madhya Pradesh	Y	Y	Y	28	JERC (Manipur and Mizoram)	Y	Y	Y
	<b>Total</b>	<b>26</b>	<b>26</b>	<b>24</b>					

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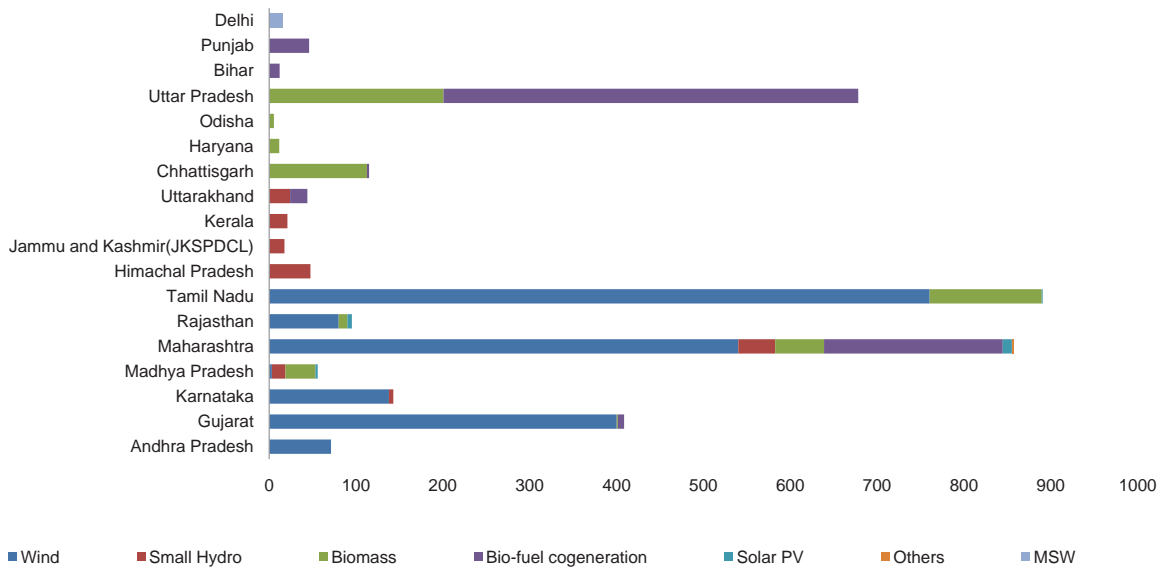
*REC Trading: Experience so far*



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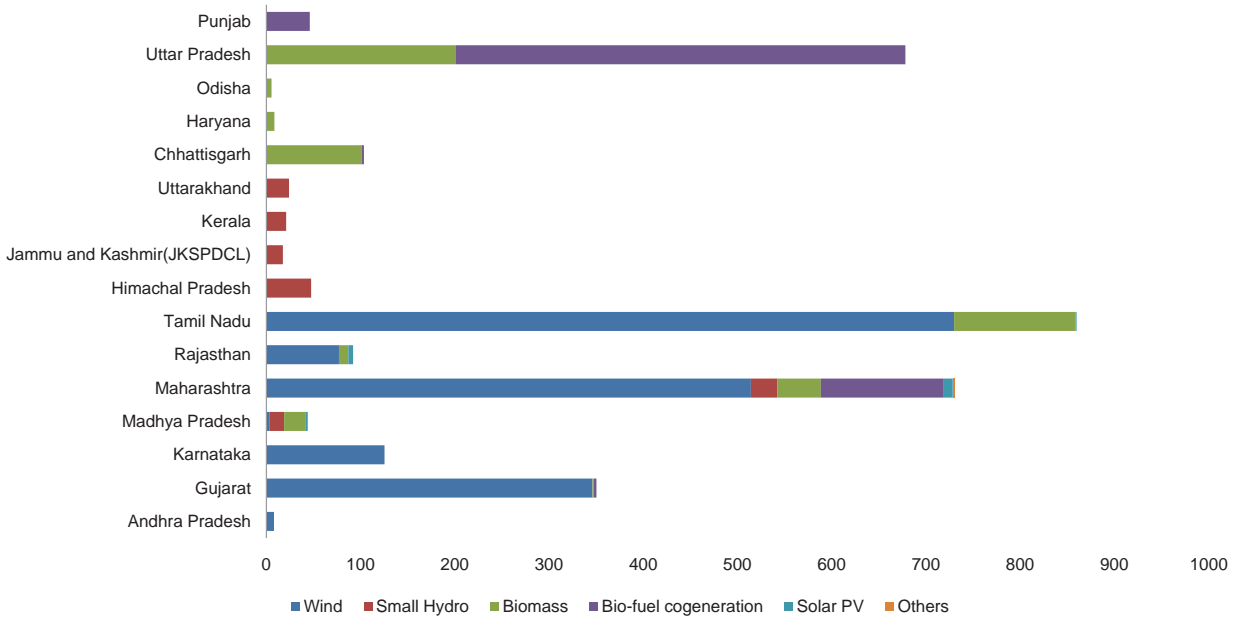
**Accredited REC Projects (As on Oct 10, 2012)**

**Total Accredited Capacity: 3535 MW**

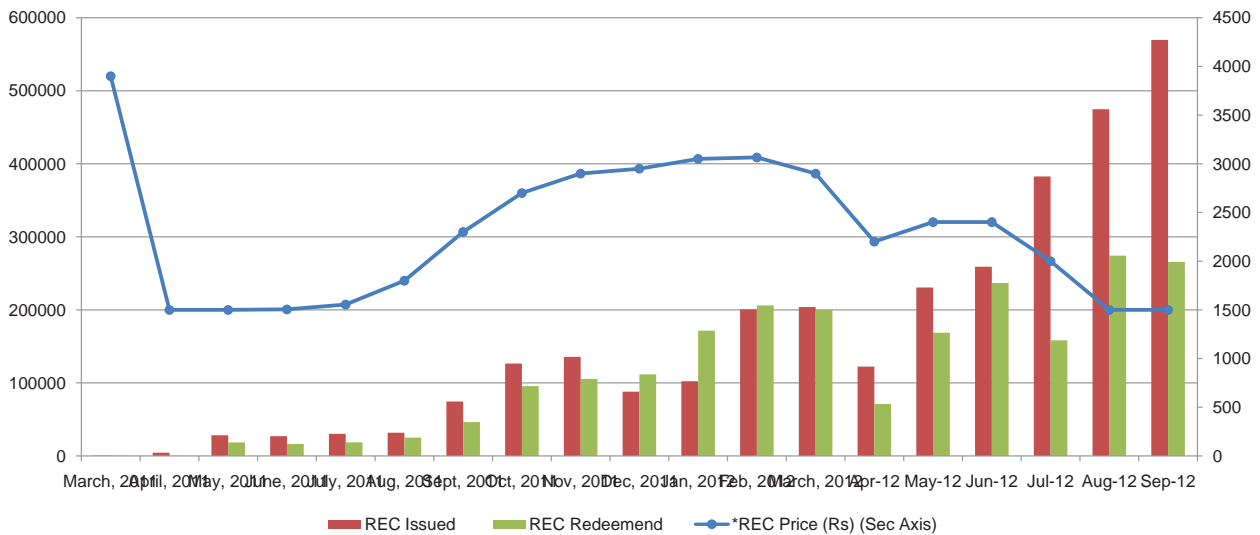


## Registered REC Projects (As on Oct 10, 2012)

Total Registered Capacity: 3161 MW

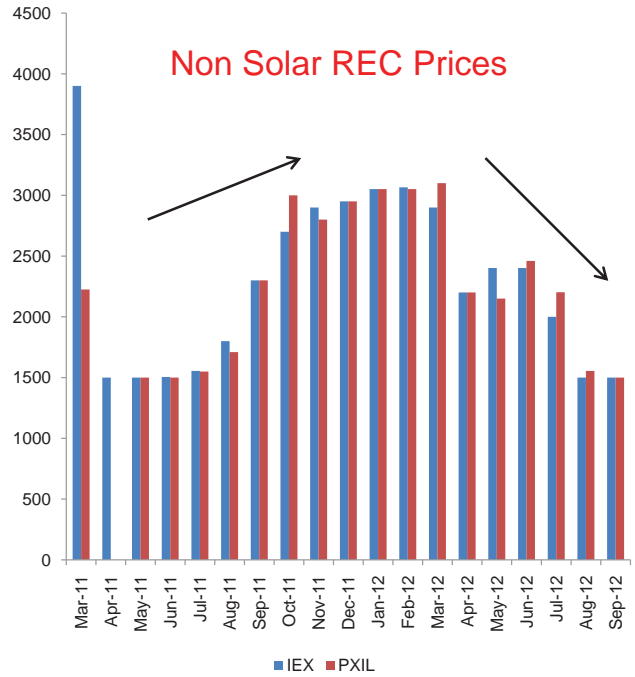
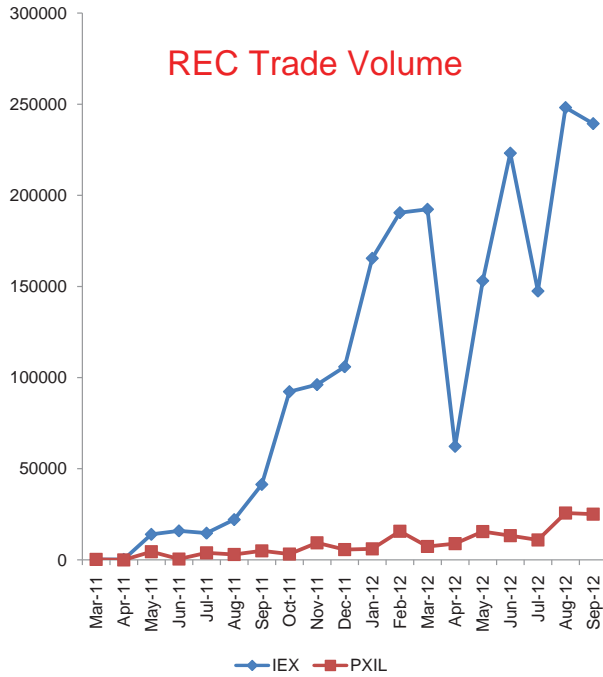


## Overview of REC Market



- Increasing Issued RECs
- No of redeemed RECs not increasing with the same pace
- More than 2.1 million RECs have been redeemed so far
- Saturating REC Market?

# Overview of REC Market



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*Key Issues & Need for Modification to REC Framework*



## Bankability of REC Mechanism

- Currently, Trading in RECs is restricted to CERC approved organized trading platform.
  - As a result, generators are not able to assign / securitize RECs in favour of lenders which is necessary to raise money for new projects.
  - Lack of bilateral trade also hinders ability of distribution company to enter into long term purchase transactions.
- Bilateral transactions of the Renewable Energy Certificates should be encouraged.
- Distribution licensees upon exceeding their RPO targets, may be allowed to participate in REC transactions for their surplus RECs.

### Actions Required:

- A. **CERC:** Modification of CERC REC Regulations enabling bilateral trade of RECs.
- B. **FOR:** Consensus on proposed Modifications to REC framework and Development of Model Agreements for bilateral REC trade.
- C. **ERCs:** Modification to State level RPO/REC Regulations.

## Long Term Visibility of Floor and Forbearance Price

- CERC has addressed concern of regulatory certainty by specifying floor & forbearance price for 5 years (2012-17)

	Non Solar REC (Rs / Mwh)	Solar REC (Rs / Mwh)
Forbearance Price / Ceiling Price	3300	13400
Floor Price	1500	9300

- However, visibility to cover at least debt service period is desirable.
- CERC may specify continuation of floor and forbearance for 10 to 20 years in principle, but values to be fixed periodically, say every five years

### Actions Required:

- a) **CERC:** Order on in-principle approval of formulation for determination of Long term Floor Price / Forbearance Price

## Multiple Trading of RE Certificates

- Under the present REC Mechanism, as soon as the transaction takes place at the power exchange, RECs are redeemed.
  - No role for intermediaries which typically play a role of the market makers.
  - Banks/ lenders cannot acquire and then sell RECs.
- Multiple trading of RECs should be permitted. It should be mandatory to register every trade with the Registry.

### Actions Required:

- A. CERC:** Modification of CERC REC Regulations enabling multiple trade of RECs
- B. FOR:** Consensus on proposed Modifications to REC framework
- C. SERCs:** Modification to State level RPO/REC Regulations.

## APPC Determination: Uniformity at State Level

- Consistent approach for determination of APPC and timely notification of APPC by SERCs is desired.
- Standard Contracting Arrangement for power procurement by DISCOMs under REC mechanism
- Conducive framework for Captive/Open Access models participating in REC

### Actions Required:

- A. CERC:** Modification of CERC REC Regulations specifying pricing methodology for APPC determination
- B. FOR:** Consensus on proposed Modifications to REC framework
- C. SERCs:** Modification to State level RPO/REC Regulations and timely determination of APPC along with Annual ARR exercise.



## Difficulties in Solar REC Model

- Ensuring Cost Recovery under solar REC model
  - Due to declining price trend in installation costs, the 'Vintage based cost recovery' need to be developed for Solar REC model either through 'vintage multiplier' or any other mechanism as legally tenable.
- Solar Thermal Projects
  - Solar Thermal Project Developers desiring to work under REC mechanism, will not be able to implement CSP projects until 2014 and will be able to avail the REC Price certainty for two years only;
  - Hence, longer tenure (at least 10 yrs) visibility on Floor price / Forbearance price for Solar projects is desirable.
  - Recognition of Integrated Solar plants (solar-gas, solar-biomass, solar-coal) for RECs.

### Actions Required:

- A. Central Govt/MOP:** Amendment to EA 2003 recognizing REC as a Statutory Instrument
- B. CERC:** Modification of CERC REC Regulations recognizing banding of RECs (multiple RECs for solar power)
- C. FOR:** Consensus on proposed Modifications to REC framework

## RPO Trajectory and Compliance

- Improved frequency (Monthly/Quarterly) for RPO Compliance Monitoring and Reporting is necessary prior to ensuring enforcement for non-compliance.
- Very few States have RPO trajectory beyond 2014.
- Long term RPO trajectory covering tenure of at least 10 years (up to 2022) should be announced across States.
- Despite applicability of RPO targets for captive/open access Users, its compliance status is not known in many States.

### Actions Required:

- A. Central Govt/MOP:** Amendment to EA 2003 enacting penal provisions for Non-compliance of RPO targets
- B. FOR:** Consensus on long term RPO targets at national level and State specific differentiation.
- C. SERCs:** To evolve long term (10 yr/15 yrs) RPO framework in line with NAPCC trajectories.

## Action by SNA for RPO Compliance

- Till date only few State Agencies e.g. CREDA and MEDA have taken certain steps for RPO enforcement in the State of Chhattisgarh and Maharashtra respectively.

### CREDA (Chhattisgarh Renewable Energy Development Agency)

- Has published a list of Obligated Entities on its website (<http://www.credacg.org>)
- Has published a Consumption and RPO compliance reporting format.
- Has sent notices to obligated entities for showing their RPO compliance
- However, CSERC waived applicability of RPO for Captive/OA for 2011-12.

### MEDA (Maharashtra Energy Development Agency)

- Data collection formats are approved by MERC on Oct 28, 2010
- Issued a notice on December 13, 2011 for a meeting of all the stakeholders on December 27, 2011 for collection of information and RPO compliance Status of obligated entities

**Other SNAs have not taken serious steps towards preparation of reporting format and publication of list of OE on their website. Is it a serious capacity building issue?**

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*Thank you for your attention . . .*

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