Global and Indian Experience

Renewable Energy – Market Development

*Three Day Programme on “Renewable Energy Regulation” – Organised by ASCI*

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  - Concept and Scope of RPO
  - Key Design features and considerations
  - Implementation experience and Enforcement
- Renewable Energy Certificate Mechanism
  - Objective and Design considerations
  - Salient features of framework
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  - Trading experience and status update
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Renewable Energy Development – Global Trends

- Global Cum.RE installed capacity
- Policy Options and instruments
- Trends in FIT and Auctions
Global trends in Cumulative RE Installed Capacity

Global renewable power capacity was ~ 2,000 GW at the end of 2014, around 1,200 GW higher than in 2000. The share of hydropower in the renewable total went from 93% in 2000 to ~ 45% in 2017 as solar and wind experienced very rapid growth.
RE Policy options and instruments across countries – 1/2

Source: REN21, 2017b
RE Policy options and instruments across countries – 2/2

Regulatory and pricing policies

- All stakeholders
  - Quotas and certificates (RPO, RPS, renewable electricity certificates)
  - Adminis-tratively set pricing instruments (FIT/FIP)
  - Competitively set pricing instruments (Auctions)
  - Administratively set pricing instruments (FIT/FIP)
  - Net metering/billing
- Large-scale installations
  - Legal provisions
- Distributed generation
  - Pricing policies
- Decentralised renewables for electricity access
  - Grid-arrival policies

Non-regulatory policies

- All project sizes
  - Financial and fiscal incentives (Tax incentives, capital subsidies, attractive loans, risk mitigation)
  - Voluntary programs (Corporate sourcing)

Note: FIT = feed-in tariff, FIP = feed-in premium, RPO = renewable purchase obligations, RPS = renewable portfolio standards.

Source: REN21, 2017b
Adoption of FIT and Auction route by countries

Source: REN21, 2015-2017

Global levelised cost of electricity 2010-2017

Note: All costs are in 2016 USD. The dashed lines are global weighted average LCOE value for Plants Commissioned in each year. Cost of capital is 7.5% for OECD and China and 10% for Rest of World. The band represents the fossil fuel-fired power generation cost range.

Source: IRENA Renewable Energy Cost Database
Renewable Energy Development in India
India’s Power Scenario & Share of Renewable Energy

40% of Energy in India shall be from non-fossil fuels by 2030

Total Installed Power Capacity 349,288 MW

- Thermal 63.86% 223,027 MW
- Nuclear 1.94% 6,780 MW
- Large Hydro 12.99% 45,399 MW
- Renewable 21.21% 74,082 MW
- Wind 47.44% 35,138 MW
- Solar 34.03% 25,212 MW
- Biomass & Bagasse 12.25% 9,076 MW
- Small Hydro Power 6.09% 4,517.45 MW
- Waste to Energy 0.19% 138 MW

Source: MNRE (As on Dec 2018)
The certainty in legal framework at National level and supportive regulatory framework at state level along with conducive policy framework by Government has ensured Private Sector’s interests in Renewable Energy Development.
Legal and Regulatory Framework for Development of Renewable Energy in India

- Role of Key Institutions (Legal/Regulatory)
- Evolution of National Tariff Policy framework
Multiple Stakeholders play important role that would influence future growth of RE Sector

Concurrent Policy Makers
- Central Government (MoP, MNRE)
- State Government

Regulators
- Central Electricity Regulatory Commission
- State Electricity Regulatory Commission

System Operators
- National Load Despatch Centre
- Regional Load Despatch Centres
- State Load Despatch Centres

Central Procurement/Testing/Implementing
- Solar Energy Corporation of India (SECI)
- National Institute of Wind Energy (NIWE)

State Nodal Agency – MEDA, GEDA, TEDA, MPNRED, NEDCAP, RREC, KREDL etc.

Transmission Companies
- Central Transmission Utility
- State Transmission Utility
- Independent Power Transmission Co.

Distribution Companies
- State Distribution Company
- Private/Deemed Distribution Companies
- State/UTs Electricity Boards

RE Power Developers
- Markets – Power Exchanges, Trading/Bilateral Exchange
- RE Associations
Role of Key Legal/Regulatory Institutions

Central Government (MoP/MNRE)
- The Electricity Act 2003
- National Electricity Policy, 2005
- National Action Plan on Climate Change (Jun 2008)
- Tariff Policy, 2016

CERC
- Regulations for Preferential Tariff for RE
- Renewable Energy Certificate Mechanism
- Implementation Framework (continuously amended)
- Forecasting & Scheduling & DSM Regulations for Regional Entities (connected to CTU)

SERCs
- Preferential RE Tariff Orders by SERCs
- All states have mandated Renewable Purchase Obligations
- Modification to RPO and adoption of REC framework
- Forecasting & Scheduling & DSM Regulations for State level (connected to STU)

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
• Development of Tariff Regulations by Regulatory Commission for promotion of generation from RE sources in their area of jurisdiction.

Section 66
• Regulatory Commission shall endeavor to promote the development of market (including trading) in power.

Section 86 (1)(e)
• Provides Statutory Framework and Mandates SERC for promotion of Generation of Electricity from RE sources
### Tariff Policy, 2006

- 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

### Amendments TP, 2011

- SERCs to reserve a minimum percentage for purchase of solar energy ... which shall go up to 0.25% by the end of 2012-13 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

### Tariff Policy, 2016

- New tariff policy seeks State Commissions to fix year wise RPO trajectory so as to reach 17% in the total energy mix by 2022 including minimum 8% from Solar
- It also refers to adoption of an appropriate mechanism such as REC mechanism
- Appropriate Commission may also provide a suitable regulatory framework for encouraging such other emerging renewable energy technologies by prescribing separate technology based REC multiplier
- Concept of Renewable Generation Obligation (RGO)-
- No inter-State transmission charges and losses to be levied for solar and wind power.
Renewable Energy Market models and Evolution of policy framework and regulatory regime
Policy Options and Regulatory Instruments for promotion of Renewable Energy technologies

- Capital Subsidy
- Grant for pilot projects
- Generation Based Incentives
- Soft loans / Interest subvention
- REC mechanism
- Competitive bidding guidelines
- Standard contracts for Auction Process
- Payment security arrangements

- Concessional Import duty
- Electricity Duty waiver/exemption
- Accelerated depreciation / Tax benefits
- Support in VAT/GST regime
- Solar Park development scheme

Regulatory framework
Fiscal support
Market Mechanism
Financial Instruments
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
D - Competitive Procurement of RE – predominantly solar and later wind

*Till December, 2018
Alternate A: Open Access and Wheeling Model

- 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
Possible transactions for sale of power under Open Access -
& Institutions involved

Possible transactions for sale of power:

1. to TOA Consumer using STU/transmission network
2. to TOA Consumer through trader using
   STU/transmission network
3. to DOA Consumer through trader using
   STU/transmission network
4. to DOA Consumer using STU/transmission and
   DISCOM network

STU: State transmission utility
SLDC: State load despatch centre (State Grid Operator)
DISCOMs: MEDCL, RInfra-D, TPC-D
Power Exchange: IEX, PXIL
TOA Consumer: OA consumers connected to Transmission n/w
DOA Consumer: OA consumers connected to Distribution n/w
## Key OA Charges

1. **Transmission charges and transmission losses**
   - Applicable for usage of transmission network (uniform across the State)

2. **Wheeling charges and wheeling losses**
   - Applicable for usage of distribution network of DISCOMs (varies with DISCOMs)

3. **Cross-subsidy surcharge (CSS)**
   - Applicable when an industrial/commercial consumer decides to purchase power from an independent generator and not from the DL in that area, that DL loses the cross subsidy amount. The CSS is imposed on the consumer to ensure that DL does not pass on this additional amount to consumers, which can result in rise in cost of power (varies with DISCOMs)

## Other Incidental Charges

4. **Standby charges**
   - Applicable for availing standby supply from DISCOMs (varies with DISCOMs)

5. **Additional surcharge**
   - Applicable for availing supply from source other than DISCOM to which they are connected. (Varies with DISCOMs). Such charges are levied to compensate DISCOM for fixed cost (n/w cost & or Fixed cost for power sourcing) incurred by DISCOMs with regard to serving such OA consumer moving out of it.

6. **Reactive energy charges**
   - Applicable for importing reacting power into the Grid. (Varies with Load and nature of Power Supply)

7. **Any other charge as approved by Commission**
   - Applicable for availing supply from source other than DISCOM to which they are connected. (Varies with DISCOMs)

8. **Scheduling fees & charges**
   - Applicable for incorporating the day ahead transaction schedule in DISCOMs schedule. (Uniform across State)
Alternate B: Preferential Tariff Based Market Model

- 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:
- 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
Key Parameters preferential tariff (FIT) framework

General Parameters
- Tariff Period
- Control Period
- Tariff Structure
- Tariff Design

Financial Parameters
- Capital Cost
- Debt Equity Ratio
- Return on Equity
- Interest on loan
- Depreciation
- Working Capital

Technology specific Parameters
- O&M expenses
- CUF / PLF
- Aux Consumption
- De-ration factor
- Station Heat Rate
- Fuel parameters

Development of Base Case or Generic Case
- Eligible RE technologies
- Configuration / Sizing / capacity range & limits
- Resource assessment
  Geographic factors, diversity & seasonal factors
- Operational Performance
  Benchmarking – CUF/PLF
- Funding mix & Sources
- Treatment for Grants and Subsidies, Incentive
RPO Mechanism: Indian Experience
Section 86 (1) (e) – Driver for RPO

❑ 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
RPO - The concept

- **RPO - Renewable Purchase Obligation**
- **Tool for promoting RE development**
- **Purchase of RE power made an obligatory requirement.**
- **Obligated Entities to meet part of their consumption through RE purchase**
- **Obligated Entities to include** *Distribution Licensee, Open Access or Captive consumer*
- **Obligation on energy consumption (MU terms)**
- **Targets set on Annual Basis and may be Generic or Technology specific**
RPO : Key Design Parameters and considerations

- Energy based vs Capacity based
- Renewable energy eligibility
- Percentage requirement Vs Specific Quantum
- New vs Existing
- Applicability
- Operating mechanism
- Enforcement
- Administration
- Sunset date

- Considering Tariff policy Provisions & national level RE capacity addition target, MoP in consultation with MNRE notified overall RPO target for initial 3 years FY 17 to FY 19
- The notification mentions that SERCs may consider to notify RPO in line with the notification

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<tr>
<td>Non-Solar</td>
<td>8.75%</td>
<td>9.50%</td>
<td>10.25%</td>
<td>10.25%</td>
<td>10.25%</td>
<td>10.50%</td>
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<tr>
<td>Solar</td>
<td>2.75%</td>
<td>4.75</td>
<td>6.75%</td>
<td>7.25%</td>
<td>8.75%</td>
<td>10.50%</td>
</tr>
<tr>
<td>Total</td>
<td>11.50%</td>
<td>14.25%</td>
<td>17.00%</td>
<td>17.50%</td>
<td>19.00%</td>
<td>21.00%</td>
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</table>

- Various State Commissions have amendment of RPO target in line with the above targets
RPO Targets set across the States (in recent years – FY 14 to FY 18)
RPO compliance status - Solar (in MU terms for FY 2016-17)

RPO Compliance (Solar) - FY 2016-17

- Rajasthan: RPO Target (MU) 1,738, RPO Achieved (MU) 695
- Madhya Pradesh: RPO Target (MU) 650, RPO Achieved (MU) 930, RPO Excess (MU) 281
- Telangana - NPDCL: RPO Target (MU) 338, RPO Achieved (MU) 89
- Karnataka: RPO Target (MU) 490, RPO Achieved (MU) 624, RPO Excess (MU) 134
- Tamil Nadu: RPO Target (MU) 2,221, RPO Achieved (MU) 1,502
- Gujarat: RPO Target (MU) 1,474, RPO Achieved (MU) 1,645, RPO Excess (MU) 171
- Maharashtra: RPO Target (MU) 1,115, RPO Achieved (MU) 424
RPO compliance status – Non-Solar (in MU terms for FY 2016-17)

RPO Compliance (Non-Solar) - FY 2016-17

- Rajasthan: 5,653 MU (RPO Achieved), 533 MU (RPO Shortfall)
- Madhya Pradesh: 3,155 MU (RPO Achieved), 223 MU (RPO Excess)
- Telangana: 486 MU (RPO Achieved), 1,739 MU (RPO Shortfall)
- Karnataka (BESCOM, MESCOM): 4,047 MU (RPO Achieved), 40 MU (RPO Excess)
- Tamil Nadu: 6,646 MU (RPO Achieved), 1,351 MU (RPO Shortfall)
- Gujarat: 5,570 MU (RPO Achieved), 957 MU (RPO Excess)
- Maharashtra: 11,154 MU (RPO Achieved), - MU (RPO Excess)
Limitations of RPO Framework: Key learnings

- **Target Specification**: Specify % of renewable energy every utility need to purchase:
  - Separate Targets for Solar, Non-Solar procurement.
  - Usually set close to existing purchase levels,

- **Eligible Sources**: RE sources, non-fossil fuels, cogeneration

- **Tenure**: Period is up to five years

- **Scope of Obligated Entities**: Applicability to OA/Captive Users

- **Jurisdiction**: Purchase of RE from outside the State has not been permitted,

- **Mode of Procurement**: Silent on mode of procurement, competitive or cost based except for few States

- **Implementation**: Monitoring and verification mechanisms need further refinement

- **Enforcement conditions**: Weak on enforcement methodology
RPO trajectory for future (FY 19 to FY 22)
## Comparison of RPO framework for select states

<table>
<thead>
<tr>
<th>S. No</th>
<th>Parameters</th>
<th>Maharashtra</th>
<th>Gujarat</th>
<th>Rajasthan</th>
<th>Tamil Nadu</th>
<th>Karnataka</th>
<th>AP</th>
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<tbody>
<tr>
<td>3.</td>
<td>Operating Period</td>
<td>1April 2016 - 31March 2020</td>
<td>Not specified</td>
<td>Not Specified</td>
<td>The RPO specified for the previous year shall be continued beyond the period till any revision</td>
<td>Not Specified</td>
<td>Not Specified</td>
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<tr>
<td>4.</td>
<td>Obligated Entities</td>
<td>I. DISCOM</td>
<td>I. DISCOM</td>
<td>I. DISCOM</td>
<td>I. DISCOM</td>
<td>I. DISCOM</td>
<td>I. DISCOM</td>
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<td></td>
<td></td>
<td>2. OA based on conventional fossil fuel (Contract Demand- 5MVA)</td>
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<td>2. OA</td>
<td>2. OA</td>
<td>2. OA</td>
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<td></td>
<td></td>
<td>4. Third party sale</td>
<td></td>
<td></td>
<td>*Such obligation to purchase RE shall include the purchases, if any, from RE sources already being made by concerned OE</td>
<td></td>
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</tr>
<tr>
<td>5.</td>
<td>Implementing Agency</td>
<td>MEDA</td>
<td>GEDA</td>
<td>RRECL</td>
<td>SLDC</td>
<td>SLDC</td>
<td>SLDC</td>
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<td>Formats specified</td>
<td>Formats specified</td>
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Need of RPO Compliance Reporting and Monitoring

- RPO compliance monitoring is crucial to ensure:
  - RPO targets are met
  - Non-compliance is brought to the notice of regulators

- RPO compliance monitoring for DISCOM through Annual Performance Review, but no such monitoring mechanism for other obligated entities.

- Suo-Motu proceedings in few states to review the RPO compliance status by OA and captive consumers.

- RPO compliance review process is undertaken with significant time lag.

Need for an innovative, process-driven and technology-based solution to address these challenges.
Development of Generic framework

- **Key Considerations for Generic framework**
  - Mandatory reporting of RPO compliance through use of RPO Webtool
  - Clarification on applicability of RPO target for Consumption or Input Energy
  - Credit for Solar Energy generated through Solar RTPV systems

- **Advantages of Generic RPO Webtool are**
  - Update RPO regulations for current and future years
  - Outline the roles and responsibilities of state agencies for RPO monitoring
  - Enforcement actions for non-obligation of RPO Compliance
  - Strengthen the institutional capacity and infrastructure
Launch of Generic RPO Compliance monitoring framework by FOR Technical Committee

Launch of Manual on Generic RPO WebTool during Forum of Regulators' Technical Committee meeting at Sasan, Gujarat (Nov 2017)
Snapshot of Generic RPO Webtool

System Settings page to setup mails and other settings

State Agency page to define financial year-wise RPO %

Verification of energy generator requests, Contracts with energy generator and Periodical consumption.

Compliance report and other report formats

Obligated entity summary

List of Obligated Entities updating data

Webtool has been successfully deployed at Rajasthan, Gujarat and Andhra Pradesh, Meghalaya, Assam (in process)

Compliance Report Summary of all obligated entities
Renewable Energy Certificate Mechanism
Why REC Mechanism was created?

- Renewable sources are not spread evenly across the 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 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 RPO
- 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.
## Chronology of Events – Concept to Implementation

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
</tr>
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<tbody>
<tr>
<td>Nov'99</td>
<td>FOR initiated study to assess measures for increasing share of RE including Feasibility of Introducing REC Mechanism in India</td>
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<tr>
<td>Jun'08</td>
<td>Hon'ble Prime Minister announced NAPCC recognizing Implementation of REC Mechanism as tool to promote RE</td>
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<tr>
<td>Jun'08</td>
<td>MNRE asked Team Idam to Develop Conceptual Framework for REC Mechanism in India</td>
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<tr>
<td>Jun'08</td>
<td>FOR initiated study to assess measures for increasing share of RE including Feasibility of Introducing REC Mechanism in India</td>
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<tr>
<td>Apr'08</td>
<td>Team Idam submitted its recommendation to the Working Group on 'Policies on Renewables'</td>
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<tr>
<td>Jan'09</td>
<td>Team Idam made presentation to FOR on modalities for REC Mechanism in India, FOR formulated a Working Group</td>
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<tr>
<td>Oct'09</td>
<td>FOR approved Model REC Regulations for adoption by SERCs</td>
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<tr>
<td>Nov'09</td>
<td>Central Electricity Regulatory Commission initiated process for Implementation of REC Mechanism in India</td>
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<tr>
<td>Jan'10</td>
<td>Team Idam submitted its Exhaustive Report to MNRE on Conceptual Framework for REC Mechanism in India</td>
</tr>
<tr>
<td>Feb'11</td>
<td>CERC approved Business Rules of Exchange Platform</td>
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<tr>
<td>Jun'10</td>
<td>CERC has issued Order on Detailed Procedures for Implementation of REC Mechanism</td>
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<tr>
<td>Jun'10</td>
<td>CERC has issued Order on Forbearance and Floor Price after Public Consultation Process</td>
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<td>Jan'10</td>
<td>CERC Designated National Load Dispatch Centre as Nodal Agency under the REC Regulations</td>
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<tr>
<td>Jan'10</td>
<td>CERC notified Regulations for Implementation of REC Framework</td>
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<tr>
<td>Sep'10</td>
<td>CERC Issued Order on Applicable Fee and Charges for Participating in REC Mechanism</td>
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<tr>
<td>Jun'10</td>
<td>CERC Order on Fee and Charges</td>
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<tr>
<td>Dec'10</td>
<td>CERC Order on Floor Price</td>
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<td>CERC has issued Order on Forbearance and Floor Price</td>
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<td>Dec'14</td>
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<td>Dec'16</td>
<td>CERC Order on Forbearance and Floor Price</td>
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<tr>
<td>Mar’16</td>
<td>Team Idam submitted its Exhaustive Report to MNRE on Conceptual Framework for REC Mechanism in India</td>
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<td>Jan’17</td>
<td>FOR initiated study to assess measures for increasing share of RE including Feasibility of Introducing REC Mechanism in India</td>
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<tr>
<td>Feb’17</td>
<td>CERC Order on Floor and Forbearance Price</td>
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<tr>
<td>Mar’17</td>
<td>Highest Number RECs Traded</td>
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<tr>
<td>Dec’17</td>
<td>CERC Order on Fee and Charges</td>
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<td>Mar’18</td>
<td>Fourth Amendment to REC Mechanism</td>
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<td>Feb’18</td>
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<td>Apr’18</td>
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<td>Nov’18</td>
<td>First Session of REC Trading</td>
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<td>Dec’18</td>
<td>94th REC Trading Session</td>
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Concept of REC Mechanism in India

Existing Mechanism

- Renewable Energy
- Electricity
- Distribution Company
- At Tariff Determined by Regulatory Commission

REC Mechanism

- Renewable Energy
- Electricity
- Distribution Company
- Obligated Entity (Buyer)
- OA / Trader
- Bilateral agreement (de-regulated)
- Avg. PP Cost of Host Utility (regulated)
- Market Rate as per Power Exchange
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
Design Features

- **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 (later extended for further period)
 Entities involved to operationalise REC Mechanism

**Institutional Framework**

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

**State Entities**
- State Electricity Regulatory Commission
- State Load Despatch Centre
- State Agencies
- Eligible Entities
- Obligated Entities
Key Role performed by FOR

- 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
REC Pricing Framework

Renewable Energy

Electricity Component

Bilateral Agreement (de-regulated) (OA User/Trader)

Average Pooled Power Purchase Cost (Distribution Utility)

Andhra Pradesh - Rs 4.04/kWh
Maharashtra - Rs 3.98/kWh
Karnataka - Rs 4.29/kWh
Kerala - Rs 3.53/kWh
Tamil Nadu - Rs 4.12/kWh
Gujarat - Rs 3.59/kWh

REC Component (Environmental Attribute)

Market Discovered Price (Obligated Entity/Voluntary Buyer)

Forbearance Price (Rs/MWh) - 2,900
Floor Price (Rs/MWh) - 1,000

Parameters

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<tr>
<th>Non Solar REC</th>
<th>Solar REC</th>
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Source: Sigma Insights, for FY 2018-19
Status of Accreditation and Registration of Projects

Total Accredited RE Capacity: 4632 MW

Total Registered RE Capacity: 4005 MW
Status update on REC transactions and inventory

- Accumulated Inventory of RECs is slowly depleting; closing as on Dec 2018 is around 2.5 million RECs.
- Stringent enforcement of RPO is expected to reduce the inventory further.
- RECs are mostly traded at floor prices owing to weak demand.
Way forward for RPO and REC Mechanism

➢ RPO trajectory and Compliance Monitoring
  ▪ Long term RPO trajectory and improved periodicity for compliance
  ▪ Verification and Enforcement of RPO targets by SERCs for all Obligated Entities

➢ Next level of reforms in REC framework needs to be ushered in.
  ▪ Enabling multiple/bilateral transactions for REC trading
  ▪ Long term visibility of Floor/Forbearance price
  ▪ Standard Rules for procurement at Reference Rate/ Model contracting arrangements

➢ Deepening and widening the scope of REC mechanism
  ▪ Encouraging participation by Voluntary market players
  ▪ REC multipliers for emerging technologies – WtE, RTPV
Thank You

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