Disclaimer: All information presented in this newsletter is from publicly available sources. REConnect Energy does not warrant the accuracy and completeness of information available and therefore will not be liable for any loss incurred. The content provided here is for the general informational purposes only. REConnect Energy shall not be held responsible for damages resulting from the use of this report. Readers are advised to make appropriate analysis and take appropriate advice before acting on the contents of this report.
Dear Reader,

The main article this month analyses the discussion paper by CERC on redesigning of the Power Market in India. The paper proposes a radical change in the design of the power markets: it will require all capacity in the country to be cleared at the market discovered price, with the difference in PPA price (of long term contracts) being settled separately. Such a change will have significant benefits and implications on the power markets. These aspects are discussed in detail.

In this volume, we also provide regulatory updates like KERC’s revised tariff order on rooftop plants, DER’s draft guidelines for net metering and DSM regulations for Gujarat & Uttar Pradesh, and other changes.

Further included are the monthly RE Generation status in the country, REC Trading results, Year-on-Year growth and price discovery scenario. January saw good participation from the market due to good price realization in non-solar RECs and increased demand for solar REC in the last few months.

We hope you find this volume of the newsletter an engaging and informative read.

- Team REConnect
Central Electricity Regulatory Commission (CERC) recently published a discussion paper titled “Market-based economic dispatch of electricity: Redesigning of Day-Ahead in India”. Currently, the Indian Power Sector is characterized by various players across all segments of the value chain viz. Generation, transmission, trading & distribution. Among the 29 states, there is a total installed capacity of 346 GW (as on sept. 2018) out of which 57% is coal, 13% is hydro, 21% RE, 7.2% gas & 2% nuclear.

Most of these generations are tied up in long-term power purchase agreements with the discoms and the rest in medium-term (5 years) & short-term (1 year). At present, the discoms self-schedule generation from the portfolio to meet the majority of their daily power needs & the remaining is procured through bilateral transactions with other discoms, through power exchanges or traders.

- Issues with the current mechanism include:
  The present mechanism under self-scheduling process does not mandate the discoms to declare the cost of their scheduled generation or the variable cost. This causes issues like leaving several low-cost generation capacities partially or sub-optimally utilized. (Because the discoms do not have visibility of other cheaper options nor do they have a right to acquire power from... generation stations they do not have a contract with) This occurs because each discom operates in its own region, known as Un-requisitioned Surplus (URS).
  - The case of sub-optimal utilization of generation assets become all the more prominent when the actual generation of each state is combined together and is contrasted with the cumulative pooled generation.
  - Given that the discoms are not obligated to reveal the variable cost of the generation that they are scheduling, true system marginal cost is not known.
  - Self-scheduling often constrains optimum utilization of renewable sources of energy. As the visibility of a discom is limited to its own territory, surplus renewable energy in the state is curtailed.
Proposed framework - Market-Based Economic Dispatch on a Day Ahead basis

The discussion above suggests a need for optimization of scheduling and dispatch of generation capacities through suitable market design. The proposed framework known as Market-Based economic Dispatch (MBED) model will be on a day-ahead basis and schedule and dispatch all generation on the economic principles with respect to the technical constraints.

- The main objective of the model will be to meet the system load by dispatching the least-cost generation mix while ensuring the security of the grid.
- Ensuring that the total cost (system cost) of the generation that meets the system load in all the time-blocks for a day is minimized.

The MBED model involves primarily two following aspects viz ‘Scheduling and Dispatch’ and ‘Settlement of contacts’.

Consider a discom and a generator with a Contracted Price (VC) of Rs. 3 / kWh

If the Market Clearing Price (MCP) is Rs 4 / kWh,
- discom pays to pool/Market: Operator (MO) Rs 4 / kWh
- Generator receives Rs 4/kWh from pool/MO
- Generator refunds discom 1 Re/kWh.

Discoms would be hedged against any increase in the market clearing price through BCS

For demand which is met out side of existing contracts, discoms would pay MCP.

The major difference in the existing framework and the proposed MBED model is: unlike in the current framework, the discoms acquire power specifically from their contracted generators whereas, in the proposed model, the discoms would bid into the power exchange for procuring power and meeting their demand. The generators are expected to bid based on their variable/marginal cost of generation. The existing bilateral contract holders will be paid the fixed cost separately outside the market and fit in the proposed model based on their variable/marginal cost.
The price settlement scenario

\[
\text{Discom's payment} = \text{Discom's load} \times \text{MCP} \\
\text{Genco's revenue} = \text{Genco's total scheduled generation} \times \text{MCP} \\
\sum \text{Discom payment} = \sum \text{Genco revenue (under no transmission constraint)}
\]

Bilateral contract settlement:

Long term contracts always have a fixed price already determined in the contract. Once the power for such contracts is settled at a market determined price, the difference will be settled between the constituents. This is generally known as a “contract for difference” and is a well established practice in more developed power markets.

Pros & Cons of the model:

Pros:

- Better price discovery: since the entire power capacity in the country will be cleared through the market, price discovery will be more robust and more transparent.
- Reduction of Un-requisitioned Surplus (URS): a possibility of some cheaper generation capacities not getting scheduled fully will be reduced since the process of self-scheduling will be ruled out.
- Along with self-scheduling other challenges emanating from the practice of self-scheduling including lack of flexibility to meet seasonal and diurnal variation in demand will be brought down drastically.

Cons:

1. The function of Bilateral Contract Settlement (BCS) which is introduced in the model can also increase the rates of the trade and cause disruption if a proper process is not set up.

Implementation timelines:

- Participation will be on a voluntary basis in the initial phase
- After a year all the discoms and other consumers will be required to participate mandatorily

Conclusion:

Overall, the proposals outlined by CERC, when implemented will result in a radical transformation of the power markets in India. It will help eliminate inefficiencies and gaps that result from a bifurcated power sector.

Like any large scale change, it will require significant preparation from all stakeholders for a proper implementation, and will also take time to implement.
KERC announces a revised tariff order for rooftop solar plants for domestic consumers.

KERC has recently announced an order for the “revision of tariff in respect of new Solar Rooftop Photovoltaic Units of 1kW to 10kW capacity installed by domestic consumers”. The government of Karnataka has set a target of 2400 MW of grid-connected rooftop generation projects under its solar policy 2014-2021. As of August 2018, Karnataka’s installed capacity for both ground-mounted and rooftop solar capacity is 5179 MW. Out of the total installed capacity, only 145 MW is solar rooftop photovoltaic plants (SRTPV) units have been installed & commissioned.

- The capital cost for SRPTV plants of 1 kW to 10 kW is decided to be INR 48,000/kW.
- The generic tariff for grid-connected new Solar Rooftop Photovoltaic Units of 1kW to 10kW capacity installed by domestic consumers at Rs 4.15 per unit (without capital subsidy) and at Rs 3.08 per unit (with capital subsidy).
- The above-mentioned changes will be applicable to new plants with commissioning date on or after 19.12.2018.

DERC announces draft guidelines for group & virtual net metering


The key points of the guidelines are as below:

- Group net metering: Group Net Metering is an arrangement where the surplus energy exported to the grid from a solar plant at the location of the solar plant can be adjusted in any other (one or more) electricity service connection(s) of the consumer within the NCT of Delhi, provided these connections are in the same DISCOM territory.
- Virtual net metering: Virtual Net Metering is an arrangement to give access to the Solar Net Metering facility for consumers who do not have a suitable roof for installing a solar system (e.g. residential consumers who live in apartments, consumers with shaded rooftops) there will be the facility of Virtual Net Metering.
- In the initial phase, only government entities will be eligible for utilizing Group and Virtual net metering.
Under Virtual Net Metering, there is no restriction on intra DISCOM or inter DISCOM transfer of surplus energy as per Delhi Solar policy, 2016. Therefore, in case of inter DISCOM transfer of power due to the physical location of either of Generation plant or Consumer in different DISCOM area, normative distribution losses on account of the transfer of power shall be borne by the consumer.

In our opinion, this is a very progressive policy, and can encourage deployment of solar rooftop. However, that will only happen once the private sector and individual consumers are allowed to take part, and viable business models around this are allowed to be developed.

CERC announces draft (Deviation settlement mechanism and related matters) (fourth amendment) Regulations 2018

The CERC has announced the draft (fourth) amendments of Deviation Settlement Mechanism & related matters regulations. The principal regulations came into effect in January 2014 followed by three amendments in December 2014, August 2015 and May 2016 in that order. The previous amendments were notified to solve issues related to grid operations the Deviation Settlement Mechanism (DSM) impact with respect to frequency due to emerging markets.

The latest amendments talk about the limitations of the DSM price vector and recommendation for the same. These amendments apply to conventional power only; there are separate regulations for DSM of RE power.

As per the report, the present DSM has design limitations and since the rates are designed by CERC the changing of rates takes time under the regulatory process and does not catch up with the change in prices in other market segments. The present DSM rates at 50 Hz (178 paise/unit) are linked to the variable charges of a pit-head thermal station whereas the highest DSM rate (824 paise/unit) is linked to the variable charges of the costliest generator (liquid fired). Ideally, the DSM price should capture the Value of Lost Load (VoLL) so that utilities procure adequately in advance so as to meet their universal service obligations.

Few amendments from the draft document are as below:

- The reference frequency band (49.85 Hz to 50.05 Hz) is proposed for the purpose of DSM price vector from the previous frequency band of (49.70 Hz and above).
- The maximum ceiling limit applicable for average daily ACP discovered in the DAM segment of power exchange at 50.00 Hz is proposed to be 800 Paisa/kWh from 824 Paisa/kWh.
The Day-ahead market price of the Power Exchange having a market share of 80% or more in energy terms on a daily basis is proposed to be taken into consideration for linking to the DSM price vector. If there is no single Power Exchange having a market share of 80% or more, the weighted average day-ahead price is proposed to be used for linking to the DSM price.

Reduction in the number of time blocks (from 12 to 6-time blocks) for a change of sign in case of sustained deviation in one direction is proposed.

Levy of an additional surcharge of 20% on the daily base DSM payable/receivable in case of violation of the stipulation regarding the change in sign.

---

**Gujarat announces RE forecasting & scheduling regulations 2019**

Gujarat Electricity Regulatory Commission has recently issued Forecasting, Scheduling, Deviation Settlement, and related matters of solar and wind generation sources regulations, 2019 on 19th January 2019. The notifications are effective from the date of notification, however, the deviation charges specified in the regulations will be effective from 1st August 2019.

The key points of the regulations are as below:

- Deviation accounting:

  \[ \text{Absolute Error in %} = \frac{\text{Actual Generation} - \text{Scheduled Generation}}{\text{Available Capacity (AvC)}} \]

- The permissible error band is lower as compared to other states (or CERC or Model FoR regulations) - for wind it is upto +12%, +12% - 20%, +20% - 28% and > +28%; for solar it is +7%, +7% - 15%, +15% - 23% and > +23%.

- However, along with the lower permissible error, the deviation charges are also lower compared to other regulations - for the three DSM charge ranges, it is Rs 0.25, Rs 0.50 and Rs 0.75 respectively.

- Aggregation across multiple pooling stations is not allowed

- The regulation is applicable immediately, however DSM charges will be applicable from Aug 1, 2019

- Interface Metering for intra-state entities shall be undertaken on an urgent basis. Every entity must be metered with a Special Energy Meter (SEM) i.e. ABT compliant meter, capable of recording the energy in 15 minutes time block.

Authorized representative of the distribution licensee/GETCO/QCA/generator, as the case may be, shall forward weekly/monthly meter readings to the SLDC latest by Wednesday of the previous week / 5th day of the next month of a previous month in addition to data acquisition provided to SCADA for energy accounting purpose under these Regulations.
The table for the deviation charges and deviation limits is given below:

**Deviation charges for wind projects:**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Absolute Error in the 15-minute time block Deviation</th>
<th>Charges payable to State DSM Pool</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>&lt;= 12%</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>&gt;12% but &lt;=20%</td>
<td>At Rs. 0.25 per unit for the shortfall or excess energy for absolute error beyond 12% and up to 20%</td>
</tr>
<tr>
<td>3</td>
<td>&gt;20% but &lt;=28%</td>
<td>At Rs. 0.25 per unit for the shortfall or excess energy beyond 12% and up to 20% + Rs. 0.50 per unit for balance energy beyond 20% and up to 28%</td>
</tr>
<tr>
<td>4</td>
<td>&gt;28%</td>
<td>At Rs. 0.25 per unit for the shortfall or excess energy beyond 12% and up to 20% + Rs. 0.50 per unit for balance energy beyond 20% and up to 28% + Rs. 0.75 per unit for balance energy beyond 28%</td>
</tr>
</tbody>
</table>

**Deviation charges for solar projects:**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Absolute Error in the 15-minute time block Deviation</th>
<th>Charges payable to State DSM Pool</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>&lt;= 7%</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>&gt;7% but &lt;=15%</td>
<td>At Rs. 0.25 per unit for the shortfall or excess energy for absolute error beyond 7% and up to 15%</td>
</tr>
<tr>
<td>3</td>
<td>&gt;15% but &lt;=23%</td>
<td>At Rs. 0.25 per unit for the shortfall or excess energy beyond 7% and up to 15% + Rs. 0.50 per unit for balance energy beyond 15% and up to 23%</td>
</tr>
<tr>
<td>4</td>
<td>&gt;23%</td>
<td>At Rs. 0.25 per unit for the shortfall or excess energy beyond 7% and up to 15% + Rs. 0.50 per unit for balance energy beyond 15% and up to 23% + Rs. 0.75 per unit for balance energy beyond 23%</td>
</tr>
</tbody>
</table>

We did an analysis of the forecast quality considering the DSM slabs in Gujarat & other states, and the results are as below:

**WIND:**

**Solar performance comparison:**
15% & 7%:

**WIND:**

Though the Error band is narrowed to 12%, DSM impact is lower due to 50% reduction in DSM Charges.
Rajasthan Electricity Regulatory Commission (RERC) recently announced (Renewable Energy Obligation) (Fifth Amendment) Regulations, 2019, which shall come into effect from 1st April 2019 provided that the revised RPO for FY 2018-19 shall become applicable from 1.04.2018. The original RPO target was 14.25% for FY 18-19. This has been reduced with retrospective effect.

Amendment in Regulation 4 of the Principal Regulations:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Year</th>
<th>Obligation expressed as percentage of energy consumption (%) excluding consumption met from hydro sources of power</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Non-solar</td>
</tr>
<tr>
<td>1</td>
<td>2018-19 (revised)</td>
<td>8.60%</td>
</tr>
<tr>
<td>2</td>
<td>2019-20</td>
<td>9.00%</td>
</tr>
<tr>
<td>3</td>
<td>2020-21</td>
<td>9.40%</td>
</tr>
<tr>
<td>4</td>
<td>2021-22</td>
<td>9.80%</td>
</tr>
<tr>
<td>5</td>
<td>2022-23</td>
<td>10.10%</td>
</tr>
<tr>
<td>6</td>
<td>2023-24</td>
<td>10.50%</td>
</tr>
</tbody>
</table>

(3) The RE Obligation for a distribution licensee including deemed licensee for FY 2018-19 and onwards shall be as under:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Year</th>
<th>Obligation expressed as percentage of energy consumption (%) excluding consumption met from hydro sources of power</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Non-solar</td>
</tr>
<tr>
<td>1</td>
<td>2018-19 (revised)</td>
<td>8.00%</td>
</tr>
<tr>
<td>2</td>
<td>2019-20</td>
<td>8.30%</td>
</tr>
<tr>
<td>3</td>
<td>2020-21</td>
<td>8.60%</td>
</tr>
<tr>
<td>4</td>
<td>2021-22</td>
<td>8.90%</td>
</tr>
<tr>
<td>5</td>
<td>2022-23</td>
<td>9.10%</td>
</tr>
<tr>
<td>6</td>
<td>2023-24</td>
<td>9.40%</td>
</tr>
</tbody>
</table>

In our opinion, the reduction in RPO in FY 18-19 from 14.25% to 13.35% defeats the purpose of having RPO targets, and runs afoul on various Aptel judgements.

- If the solar RPO compliance is achieved upto 80%, then the remaining shortfall if any, can be met by excess non-solar energy purchase over and above the specified non-solar RPO for that particular year.

- Similarly, if the non-solar RPO compliance is achieved upto 80%, then the remaining shortfall if any, can be met by excess solar energy purchase over and above the specified solar RPO for that particular year.
Regulatory updates

UPERC announces DSM regulations, 2018

Uttar Pradesh Electricity Regulatory Commission (UPERC) recently announced the (Forecasting, Scheduling, Deviation Settlement and Related Matters of Solar and Wind Generation Sources) Regulations, 2018.

The key points of the regulations are as below:

- The regulations are applicable to all solar (excluding rooftop solar) and wind energy plants in Uttar Pradesh connected to the intra-state transmission system and having an installed capacity of 5 MW & above and captive generators with an installed capacity of 5 MW or more, will also be covered under these regulations.

- Each pooling station having a minimum combined installed capacity of 5 MW will have one QCA, However, in case a particular solar or wind generator having a capacity of 50 MW or more, then such generators will act as a QCA provided that such generator is connected alone to a pooling station.

A penalty will be imposed in case of failure of generator/QCA to provide data as directed by SLDC or error in the data provided as below:

<table>
<thead>
<tr>
<th>Percentage of unavailability/error on day to day basis</th>
<th>Penalty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 15%</td>
<td>Nil</td>
</tr>
<tr>
<td>5% to 10%</td>
<td>INR 200/Day/MW</td>
</tr>
<tr>
<td>10% to 15%</td>
<td>INR 1,000/Day/MW</td>
</tr>
<tr>
<td>15% and above</td>
<td>INR 2,000/Day/MW</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Absolute error in the 15-minute time block</th>
<th>Deviation charges payable to state DSM pool</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>≤ 15%</td>
<td>Nil</td>
</tr>
<tr>
<td>2</td>
<td>&gt;15% but ≤ 25%</td>
<td>D15 × Rs.0.50</td>
</tr>
<tr>
<td>3</td>
<td>&gt;25% but ≤ 35%</td>
<td>D25 × Rs.1.00 + D15 × Rs.0.50</td>
</tr>
<tr>
<td>4</td>
<td>&gt;35%</td>
<td>D35 × Rs.1.50 + D25 × Rs.1.00 + D15 × Rs.0.50</td>
</tr>
</tbody>
</table>

- In case of failure of the generators/QCA comply with the above timelines, a penalty of INR 25,000/- per day will be levied.
February’s trade session saw an increase in the price trend similar to the previous sessions. The demand for both solar & non-solar remained consistent and the supply also increased. The highlight of this month’s trade was that solar crossed the price of INR 1,750 in the last session and reached at INR 1,908 at PXIL (however, PXIL accounted for only 6.1% of the total cleared solar RECs volume).

Non-Solar: This session the RECs were traded at the price of INR 1555 at PXIL (55.5% above the floor price) and INR 1395 at IEX (39.5% above the floor price). A total of 8,32,085 RECs were traded in this session leaving an inventory of 24,50,796 Non-Solar RECs.

Solar: Total number of solar RECs traded in this session was 4,08,764. RECs traded at Rs 1908 at PXIL (90.8% above the floor price) and at Rs 1500 at IEX (50% above the floor price).

The overall trade volume (12,40,849 RECs) increased by almost 54.08 % from the last months’ trade volume (8,05,318 RECs).
According to the Central Electricity Authority (CEA), overall RE generation for the FY 18-19 was up by 25% (data upto Dec 18).

A total of 1950 MU renewable energy was generated in the North Region in 2018, compared to 1918 MU in 2017 (2% increase). Similarly in the West Region 3009 MU was generated in December 2018. In the South Region there was generation of 3778 MU in 2018 compared to 3230 MU in 2017 (an increase of 17%). In the East Region there was 223 MU generated in 2018 compared to 218 MU in 2017 (increase of 2%).

A comparison of the installed capacity of RE sources for the period of June-October in 2016-2018 is as below:

Source: CEA RE generation report

Source: CEA executive summary
About REConnect Energy: REConnect Energy is India’s largest renewable energy services company with services offered under energy transactions management and predictive analytics for energy markets. In predictive analytics, the Company offers its energy forecasting and scheduling services to various utilities and wind/solar project developers. The current renewable energy forecasting portfolio stands at about 10,500MW at wind/solar farm level forecast and about 26,000MW at utility scale forecast where state/regional level forecasting is provided to some of the largest utilities in India. Under renewable energy certificate (REC) market, the Company represents about 45% of the market at national level. The Company is also supported by INFUSE Ventures, a venture fund supported by MNRE.

Awards & Industry Recognition

★ Best Wind Energy Forecaster of the Year (2014/15/16/17/18), Indian Wind Energy Forum
★ Technology Start-up Enterprise of the Year (Energy & Utilities) - 2017, 24MRC Network, India
★ Top 100 Global Energy Start-ups, Start-up energy transition Awards, Berlin, German
★ Times Network Award in Innovation in Digital Energy Solutions, New Delhi, May 2017
★ Smart Start-up of the year- ISGF Innovation Awards, New Delhi February 2018.
★ Outstanding contribution in the field of IOT - 2018, IPPAI Power Awards
★ REC facilitator of the year and forecasting company of the year - 2018 IWEF
★ Award for the highest REC volume member - 2018 IEX