First Report

of

FOR Technical Committee

on

Implementation of Framework

for

Renewables at the State Level

(Covering proceedings: December 2015 – November 2017)

Volume-I

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Foreword

It gives me immense pleasure to present this Report on the Proceedings of the **Technical Committee for Implementation of Framework on Renewables at the State Level** to the Forum of Regulators. Since its inception in November 2015, the Committee has undertaken critical steps towards laying down a robust regulatory foundation for evolution of the Indian grid into a modern, reliable grid with high penetration of renewable power. Various initiatives of the Committee have enabled the States (including non-member States) to put into place the requisite infrastructure, systems, frameworks & regulations for better management of the State-grid, streamline operations as well as accounting and settlement procedures.

This first report marks the milestone of completing two years of the work undertaken and progress achieved by the Committee. It highlights some of the major issues the Committee has dealt with, viz. SAMAST, State-level Forecasting & Scheduling framework for RE sources, Model DSM Regulations for states, Regional Cooperation for optimum utilization of generation sources, Introduction of 5-minute time-block, Smart Meters, RPO web-tool and Model Regulations for State-level Hydro plants. I take pride in what has been achieved together, and urge all the States to accelerate their efforts on these fronts.

As per the mandate of FOR, this is a standing committee, and work is underway on issues of Regional Cooperation, 5-minute scheduling, Ancillary Services, Reserves, etc., and an updated report on these subjects shall be presented in due course of time.

I would like to thank our Chairperson Shri Gireesh B. Pradhan for his guidance, all the Members of the Committee for their active participation, POSOCO team for their sincere efforts and FOR Secretariat for coordinating the meetings and driving the initiatives of the Committee.

(A.S.Bakshi)

Chair, FOR Technical Committee

Introduction

Given the Government of India's target of 175 GW of renewable installed capacity by 2022 and recognising the challenges faced by the States in integrating large-scale variable renewable energy (RE) - the Forum of Regulators (FOR) at the 50th FOR Meeting in Pune on 30th September 2015 decided to form a Technical Committee to assist States to address these challenges through appropriate regulatory interventions. This Technical Committee for Implementation of Framework on Renewables at the State Level was formed under the chairmanship of Member CERC, Shri A.S.Bakshi, and comprising Technical Members of State Commissions of renewable rich States viz. Tamil Nadu, Gujarat, Rajasthan, Maharashtra, Andhra Pradesh, Karnataka and Madhya Pradesh. Representatives of POSOCO, Chief(Engg) and Joint Chief (Regulatory Affairs) of CERC were other Members and they were assisted by Advisor (RE), CERC. The Technical Committee was mandated to evolve a roadmap for implementation and ensure timely action on the following:

a) Deployment and implementation of Framework on Forecasting, Scheduling and Deviation Settlement of Wind & Solar generating stations at the State level;
b) Introduction/implementation of Availability Based Tariff (ABT) framework at the State level as mandated in the National Electricity Policy and Tariff Policy;
c) Introduction of Ancillary Services and Reserves at the State level;
d) Implementation of Automatic Generation Control (AGC) and primary control within States
e) Provide periodic reports to the FOR

So far, the Committee has held 16 meetings and has taken many steps in developing pathways for smooth integration of RE into the grid at the State and Regional Level. Minutes of all the meetings are annexed to Vol. I of this Report.

Major initiatives of the Committee are listed below and are detailed as individual chapters in this first volume:

1. **Implementation of Scheduling, Accounting, Metering and Settlement of Transactions in Electricity (SAMAST) Report**
2. **Implementation of State Level Forecasting & Scheduling Framework**
3. **Model Deviation Settlement Mechanism (DSM) Regulations:**
4. **RPO Web-Tool and related matters**
5. **Regional Co-operation for Optimum Utilization of Generation Resources**
6. **Introduction of 5 Minute Time Block**
7. **Smart Meters**
8. **Model Regulations for tariff Determination & other related matters for intra-State hydro Generating Stations**

Volume II of the Report is a compilation of reports, Model Regulations and any other important document as prepared under the aegis of the Committee.

At the 61st meeting of FOR held on 22nd September, 2017 in Chennai, it was decided that this Committee will be designated as FOR Standing Technical Committee, so that the Committee could continue to remain in place on permanent basis and assist the FOR on technical matters. It was also agreed that Members of non-RE rich States should also be invited as special invitees to the Technical Committee meetings. Starting with the 14th meeting, non-member States of the region where the meeting is held are being invited as well.

Subsequent to the formation of the Committee, Telangana has been inducted as a Member, given the large RE potential in the State. Additionally, due to evinced interest, West Bengal and Kerala have become permanent special invitees to the meetings.

Chapter 1: Scheduling, Accounting, Metering and Settlement of Transactions in Electricity (SAMAST)

This FOR Technical Committee was formed with the primary objective of evolving regulations related to grid integration of solar & wind plants i.e. variable renewable energy (RE). At the time of constitution of the Technical Committee, it was felt that besides evolving the RE Framework at the state level, it was critical to ensure that a complete suite of building blocks is worked upon, so that the foundation of a modern reliable grid is laid down. Thus, one of the objectives enshrined in the constitution of the Committee was *'Introduction/Implementation of the Availability Based Tariff (ABT) framework at the State level as mandated in the National Electricity Policy and Tariff Policy'.* At the first meeting (held on 16th December 2015) of the Committee, it was unanimously decided that ABT & DSM (Deviation Settlement Mechanism) should be implemented as early as possible at the State level in all the states.

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At the 2nd meeting of the Committee held on 8th January 2016, it was decided to have a two pronged approach towards the implementation of ABT and DSM framework. The first step would be for FOR to facilitate creation of Model Regulations. The second step would be to undertake an exhaustive exercise at the state level, which will include gathering requisite data about state infrastructure and preparedness, modifying Model Regulations and adopting it with suitable adjustments, implementation of regulations, installation of required hardware, rolling out of software, etc.

Further, it was decided to form a Sub-committee of the Technical Committee and the same was constituted on 20th Jan 2016, which was chaired by Shri. S.K Soonee (then CEO - POSOCO) and comprised one representative each from SLDC, SERC, RLDC and one representative from the FOR secretariat (as observer). The Terms of Reference (TOR) of this sub-committee were as under:

a. Evolve detailed action plan with time lines for implementation of ABT/DSM at State level
b. Suggest modification of all technical and accounting procedures as may be necessary for rolling out ABT/DSM framework
c. Assist in drafting of requisite State regulations, or amendments to existing regulations, as the case may be
d. Submit report on the progress of the sub-group to the Technical Committee of States every two months

In the same meeting, it was discussed that there was requirement of proper skill sets at each SLDC and strengthening the manpower was the need of the hour. Further, it was decided that the recommendations of Gireesh Pradhan Committee Report on strengthening Load Despatch Centres will be implemented by all States to make RE integration a success and the same was adopted accordingly in the SAMAST report.

To understand the challenges and problems faced by SLDCs, the Sub-committee visited SLDCs of various States like, Maharashtra, Tamil Nadu, Karnataka, Delhi, etc and interacted with several others via video conferencing and held a meeting with the Forum of Load Dispatchers (FOLD). The Sub-committee collected responses from 28 SLDCs and 5 RLDCs and considered them in its report. It identified that all States have been doing energy accounting, but only 6 States, namely Delhi, Maharashtra, Gujarat, Madhya Pradesh, West Bengal and Chhattisgarh have implemented intra-state ABT system completely and many other States have partially implemented the intra-state ABT mechanism.

It was inferred that the states could be categorized under the following four groups:

- Group-A comprising of States where SLDCs has the first-hand experience of all the aspects of intra State accounting and settlement system (6 states as listed above)
- Group-B comprising of States where deviation settlement system has been introduced for a few intra-state entities or mock exercises have been undertaken by the SLDC
- Group-C comprises of States where draft regulations for deviation settlement have been notified and preparatory exercises have commenced
- Group-D comprises of States/UT where deviation settlement is yet to commence

Further, the Sub-committee identified major areas and components that were required for rolling out of ABT/DSM framework. Important areas were:

- Identifying Interface Boundaries & Entities
- Establishment of REMCs
- Data collection through Automatic Meter Reading (AMR) Systems
- Energy Metering & Accounting and its associated Challenges
- Meter Data Archival & Utilization
- Deviation Settlement Challenges

Based on its learning and findings, the Sub-committee evolved a road map and presented a draft report at the 4th meeting of the Technical Committee held on 1st June 2016. The draft report was titled as E-MASS (Model Energy Metering Accounting and Settlement System) which was later re-christened to SAMAST.

The report on Scheduling, Accounting, Metering and Settlement of Transactions in Electricity (SAMAST) was presented at the 5thmeeting of the Technical Committee dated 15th July 2016. The Forum of Regulators (FOR) at its 55th meeting, held on 22nd July 2016, adopted the SAMAST report. Intra-State ABT mechanism along with SAMAST implementation will help in bringing uniformity of forecasting, scheduling, accounting and commercial settlement procedures at State and Regional level, which is critical for integration and management of renewable energy into the grid. The final report can be found at Annexure-1 in Volume-II of this report.

The report recommends that partial funding from PSDF may be utilized by States for the implementation of SAMAST, including the cost of Hardware Components, Software Components, Communication Components, Training & Capacity building and Infrastructure Development. Based on the DPRs submitted by States, PSDF has already provided/sanctioned funds for States of Madhya Pradesh, Rajasthan and Tamil Nadu. Further, on recommendation of FOR and the Technical Committee, FOR Secretariat has written to NLDC to include the cost of inter-face meters as a part of DPR of SAMAST and provide financial support for the same through PSDF. In parallel, the Chairman of CERC has written to all the State Commissions to implement SAMAST in their respective States at the earliest.

SAMAST – Key Highlights

- Number of intrastate entities within control of a particular SLDC vary widely (Min-7, Max-971, and Median-182). Intra state RE generator entities in RE-rich states range from 100- 200.
- SAMAST recommends to identify all the intra-state entities and to make them members of the state pool and proposes instituting State Power Committees (SPC) having representatives from state pool members for preparing State energy account.
- Number of interface points in the country are 23301, while the number of IEMs (Interface Energy Meters) are 22406 (less than interface points), indicating inadequate placement of meters in the country.
- Future meter procurement should comply with CEA "Functional Requirement of Advanced Metering Infrastructure" standards, having least count of 5 minutes and frequency resolution of 0.01Hz.
- The Report encompasses wide spectrum of activities for its implementation. Important ones are listed below:
    - Demarcation of Interface boundary & identification of Pool Members
    - Adequate Interface Energy Meters with AMR infrastructure
    - Ex-Ante Scheduling
    - Uniform Energy Accounting System
    - Simple, robust, scalable but dispute-free settlement system
    - Administration of transmission losses
    - Transmission Charges
    - Reactive Energy Pricing
    - STOA Registry and Clearing Agency
    - Payment Security Mechanism and Risk Mitigation
    - Archival and Utilization of Energy Meter Data
    - Governance Structure
    - Facilitating enhanced Grid Security and Economic Despatch
    - Implementation of Dispatch with Ancillary Services
- The report also provides a checklist of activities, along with timelines, to be carried out by the State entities for the implementation of SAMAST. The same has been reproduced below:

S. No.	Activity	Duration in Days*
1	Identification of Intra State Entities	7
2	Demarcation of Interface boundary for each Intra State Entity	14
3	Assessment of Meters - Main, Check and Standby	21
4	Assessment of Automatic Meter Reading logistics requirement	30
5	Assessment of IT infrastructure (Hardware and Software) requirement	45
6	Preparation of Bill of Quantities (considering logistics already in place)	60
7	Preparation of Detailed Project Report and completion of first stakeholder workshop	90
8	Approval of the State-specific SAMAST scheme by SERC	120
9	Commencement of Load Forecasting by SLDC	120
10	Commencement of Interchange Scheduling by SLDC for all the Intra State Entities	120
11	Formation of a State Power Committee for preparation of Account	120
12	Establishment of State Regulatory Pool Account	120
13	Application for funding from Central Government/PSDF	150
14	Inviting tenders	150
15	Placement of Award	210
16	Adequacy of Human Resources in SLDC as approved by SERC	210
17	Implementation of the recommended IT infrastructure-Hardware	225
18	Completion of boundary metering and AMR system (as per DPR)	240
19	Implementation of the recommended IT applications-Software a. User Registration b. Short term Open Access Processing c. Scheduling d. Meter Data Processing and Validation e. Accounting f. Settlement g. Billing and Clearing h. Data Archival and Retrieval i. Management Information System j. SLDC Website	300
20	Computation of transmission losses for each 15-min by SLDC	330
21	Preparation of Energy Accounts by SPC/SLDC and Publication of the following on SPC/SLDC website a. Process document (SAMAST handbook) for the State b. At least four weekly deviation accounts for all intra State Entities c. At least one monthly State Energy Account (SEA) d. List of tie lines for each Intra State Entity with Intra STS	345

	e. List of Interface Energy Meters to be used in accounting f. CT/PT ratios to be used in accounting g. Formula to be used for computation of Injection / Withdrawal h. Implemented Schedule – DC, Entitlement, Injection Schedule, Withdrawal Schedule, STOA schedule, Scheduled Losses, Interchange with Regional Grid i. Deviation Rates as notified by SERC j. Comparative plot of Actual Interchange computed from SCADA and from Energy Meter data of each Intra State Entity for at least four weeks k. Plot of measured Transmission Losses for at least four weeks	
22	Clearing of Pool A/c Credit / Debit for at least four weeks and its reconciliation	345
23	Two stakeholder workshops by SLDC on SAMAST system	345
24	Quarterly Reconciliation Certificate from all State Pool members	365
25	Annual 'Peer review' of SAMAST by any SLDC/RLDC	365

** From Zero Date*

SAMAST – Current Status

The current Status of implementation of SAMAST in various States/UTs is as below:

States	Implementation Status (As on Date)	Activities
Andhra Pradesh	Initiated (27^{th} Mar, 2017)	Following activities have been completed: • Identification of Intra-State Entities • Demarcation of boundaries for Intra-State Entities • Assessment of meters, IT Infrastructure • DPR Prepared and submitted to NLDC • Seeking funds from PSDF ~ Rs. 12.81 Cr.
Assam	Initiated (23^{rd} Oct, 2017)	Following activities have been completed: • Identification of Intra-State Entities • Demarcation of boundaries for Intra-State Entities • Assessment of meters, IT Infrastructure • Draft DPR Prepared and placed for board approval
Bihar	Initiated (3^{rd} Nov, 2016)	• BSPTCL would be implementing SAMAST within 365 days. • No activity status is available yet.

Chhattisgarh	Initiated (3^{rd} Nov, 2016)	• Activities recommended under SAMAST have been initiated per the prevailing rules & regulations. • Notification of Intra-State ABT including RE generators is in process and therefore necessary steps for system up gradations would be in line with the recommendations of SAMAST report. • Subsequently, CSERC has notified state level DSM Regulations including F&S framework in line with FOR model framework.
Delhi	Initiated (10^{th} Nov, 2017)	• DERC convened 2^{nd} meeting with SLDC & DTL on 4^{th} Oct 2017 regarding implementation and recommendation of SAMAST framework • DTL to submit report to DERC on technical specification of 5 minutes Least Count (LC) Energy Meters • SLDC to submit report on cost involved in change of software and hardware by shifting from 15 minutes to 5-minute scheduling.
Gujarat	Initiated (2^{nd} Dec, 2016)	• The State has already notified Intra-State ABT Mechanism, with adequate interface meters at pooling stations & other relevant regulations in line with the SAMAST recommended activities.
Haryana	Initiate (5^{th} Dec, 2017)	Following activities have been completed: • Identification of Intra-State Entities • Demarcation of boundaries for Intra-State Entities. • Assessment of meters &, IT Infrastructure • Draft DPR prepared and placed for board approval
Madhya Pradesh	Initiated (5^{th}Aug, 2017)	Following activities have been completed: • 1120 Nos. of ABT meters of 0.2s accuracy class have been installed. • In process of commissioning new integrated ABT, OA and MIS system expected to be completed by November 2017. • Submitted DPR to PSDF to update the software for accounting, and has received a funding to the tune of INR 3.6 crores
Maharashtra	Initiated (13^{th} Oct., 2017)	Intra-State ABT/FBSM framework at state level under operation since 2011. The following activities have been completed: • Identification of Intra-State Entities • Demarcation of boundaries for Intra-State Entities • Assessment of meters, IT Infrastructure • Preparation of DPR, Energy Accounts & publishing on SLDC/SPC website. • Formation & Establishment of SPC & State

		Regulatory Pool A/C.
Odisha	Initiated (9^{th} Oct., 2017)	Following activities have been completed and some are in process • Identification of Intra-State Entities • Demarcation of boundaries for Intra-State Entities • Assessment of meters, AMR Logistics requirements (under approval stage), IT Infrastructure • Preparation of DPR in process • State Power Committee not in place • Proposal for funding for implementation of ADMS at SLDC from PSDF placed before NLDC • DSM/Pool Accounted created • Required IT infrastructure in place Most of the other recommended activities are also in implementation & approval stage.
Punjab	Initiated (7^{th} Sept, 2017)	• Roadmap for SAMAST implementation for Punjab and steps for DPR preparation deliberated. Meetings with STU/SLDC are being convened to initiate the work of Preparation of DPR for SAMAST implementation in Punjab
Rajasthan	Initiated (9^{th} June 2017)	Following activities have been completed: • State Transmission Operation Management System (STOMS) project implemented by RVPN. • Estimated cost of Rs. 13.54 Cr and 90% (Rs 11.86 Cr) sanctioned from PSDF
Tamil Nadu	Initiated (28^{th} Mar, 2017)	Following activities have been completed: • Identification of Intra-State Entities • Demarcation of boundaries for Intra-State Entities • Rs. 11.98 Cr sanctioned from PSDF for intra-state ABT
Telangana	Initiated (6^{th} July 2017)	Following activities have been completed: • DPR prepared and submitted for approval
Uttar Pradesh	Initiated (28^{th} Sept., 2017)	Following activities have been completed: • Identification of Intra-State Entities • Demarcation of boundaries for Intra-State Entities. • Assessment of meters &, IT Infrastructure • State Power Committee formed, yet to functionalized • DSM Pool A/C opened
Uttarakhand	Initiated (2^{nd} Nov, 2017)	Following activities have been completed: • Identification of Intra-State Entities

		• Demarcation of boundaries for Intra-State Entities. • Assessment of meters &, IT Infrastructure Working Group has been formed and held 2 meetings so far for implementing activities of Intra State ABT and DSM along with recommendations of SAMAST report.
West Bengal	Initiate (5th Dec, 2017)	Following activities have been completed: • Identification of Intra-State Entities • Demarcation of boundaries for Intra-State Entities. • Assessment of meters &, IT Infrastructure • Draft DPR prepared and placed for board approval
Jammu & Kashmir	Yet to Initiate (12th Jan, 2017)	• No information available on the status of recommended activities.
Karnataka	Yet to Initiate (7th Aug 2017)	• Officials of KSLDC would like to visit Gujarat and MP to understand various aspects of implementation as well as preparation of DPR.
JERC (Mizoram* & Manipur)	Yet to Initiate (8th March, 2017)	• No information available on the status of recommended activities.
Tripura	Yet to initiate (20th May, 2017)	• Up gradation of SLDC yet to be done in respect of SAMAST • Request for proper training of TSECL

**Data available only from Mizoram*

It is evident from the Status Report above that only 5 States have submitted final DPRs to POSOCO, and another 6 States are in the process of finalizing the DPR. However, majority States are yet to initiate action, and it is imperative that this critical component is undertaken and completed in every State at the earliest possible.

Chapter 2 - Implementation of State Level Forecasting & Scheduling Framework

Accurate forecasting & scheduling of renewable energy is a preliminary requirement to enable the State/Regional Load Despatch Centers to have visibility into the quantum of RE power expected to be injected into the grid, and hence minimize grid imbalance. CERC, in its effort to provide a framework for effective large-scale integration of variable RE sources, in August 2015, notified the Framework on Forecasting, Scheduling and Imbalance Handling for Wind and Solar Generators connected to ISTS. IEGC and DSM Regulations were suitably amended to incorporate this framework. Subsequently, the FOR Secretariat prepared Model Regulations on "Forecasting, Scheduling and Deviation Settlement of Wind and Solar Generators at the State level" which were endorsed during the 50th meeting of Forum of Regulators (dated 29th Sept – 1stOct. 2015). The Model Regulations can be found at Annexure-2 in Volume-II of this report. The States are expected to use the Model Regulations as a guideline or template to finalise their own.

The Model Regulations introduced the concept of Qualified Coordinating Agency (QCA) with regards to multiple generators connected to the Intra State Transmission System through a pooling station, who will be responsible for forecasting, scheduling, metering, data collection, communication with SLDC and commercial settlement of deviation.

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At the fifth meeting of the Technical Committee, dated 15th July 2016, the Consultant to the Committee presented the comparison of Forecasting & Scheduling Framework of various States (both Final & Draft). Below listed issues and their potential solutions/resolutions were also presented and discussed:

a. Role of QCA
b. Operationalisation of Virtual Pool and De-pooling Mechanism
c. Funding the deficit in State Imbalance Pool
d. Metering arrangement
e. Treatment for Inter-State RE transactions of State Entities

Consensus was reached among the members of the Committee on the above discussed points and the final decisions are reproduced below:

1) Qualified Coordinating Agency (QCA)
   i. QCA shall be an empanelled State Entity
   ii. QCA shall provide schedules with periodic revisions on behalf of all the Wind/Solar Generators connected to the pooling station(s)
   iii. Each Pooling Station shall have one QCA. Regulatory oversight over QCA to be exercised through SLDC

iv. QCA shall be responsible for coordination with STU/SLDC for metering, data collection/transmission and communication
v. QCA shall undertake commercial settlement and de-pooling of payments on behalf of generators
vi. SLDC to formulate Procedure for Empanelment/Registration of QCAs at state level, upon approval by concerned SERC
vii. Technical eligibility criterion for QCA: the entity shall have an experience of at-least 2 years of metering, billing, consumer management in any domain with demonstrable IT resources and infrastructure
viii. Financial eligibility criterion for QCA: net-worth requirement shall be INR 1 lakh per MW with average annual turnover at INR 5 crores and positive profit after tax in past two years
ix. Disputes between QCA and SLDC shall be subject to jurisdiction of respective SERCs. Disputes between QCA and the generators shall be settled mutually, failing which will be subject to jurisdiction of SERCs

2) Operationalization of Virtual Pool and De-pooling Mechanism
   i. Virtual pool for RE generators within State DSM pool shall be operationalized
   ii. QCA to undertake settlement of only Deviation Charges at Pooling with State Imbalance Pool
   iii. De-pooling shall be based on actual injection by the generators
   iv. QCA to provide energy credit statement (monthly / weekly)

3) Funding the deficit in State Imbalance Pool
   i. Designing of state level Imbalance Pool with 'Non-Zero Sum' features is crucial. For covering the deficit in the overall pool, at the end of the year (if any), the SLDC may approach the National Funds such as PSDF or NCEF
   ii. In addition, SERCs may consider creating State level funding support mechanism to manage deficit
      a) Levy of System Benefit charges (paise/MWh) on all STUs
      b) Regulatory charges for shortfall in RPO Compliance

4) Mechanism for DSM for inter-state transactions
   i. Intra-state embedded entities selling inter-state may be managed on separate feeder connected to pooling substationDeviations for Inter-State and Intra-State transactions at Pooling S/S to be accounted for separately
   ii. Virtual Pool Accounting at State level shall exclude such Deviation Accounting for inter-State transactions
   iii. SLDC/State Energy Account shall provide separate Energy/DSM accounts for inter-State and intra-state transactions to QCA
   iv. QCA shall separately settle Deviation Charges with RE Generators for inter-State and intra-State transactions

v. Reference rate for Deviation Charge computation of inter-State transactions may be APPC of host State

5) Metering Arrangement
   i. Metering infrastructure, metering and accounting practices need to be aligned across the states
   ii. Uniform practice for Energy Accounting for DSM computations should be adopted

Further discussions have taken place at subsequent meetings as and when issues have been brought up by the Members. At the 16th Meeting held on 30th Nov 2017 in Gujarat, it was decided that a model agreement between generators and QCA shall be evolved for the benefit of the States, and the same may be annexed to the Model Regulations.

Forecasting & Scheduling Model Regulations – Key Highlights

It is expected that the States will use Model Regulations as guidelines to finalize their own. The primary objective of Model regulations is to facilitate large scale grid integration of wind and solar power and to maintain grid stability and security. The key highlights of the Model Regulations are as below:

- Applicability - All wind and solar generators connected to the State grid are covered:
  a. regardless of date of commissioning,
  b. including those connected via pooling stations
  c. selling power within or outside the state.
- All solar and wind generators connected to State grid have to provide day-ahead and week-ahead schedule
- Revisions can be made on a one-and-half hourly basis, up to a maximum of 16 revisions per day
- Payment for generation shall be as per actual generation
- The deviation tolerance band is suggested as (+/-)10% for upcoming projects but has been kept as (+/-)15% for existing generators at Intra-state level
- RPO accounting can continue as per existing arrangement, and needs no change
- Deviation charges are a function of the error % as calculated for every time-block:

$$\text{Error} = \frac{100 \times (\text{Actual Generation} - \text{Scheduled Generation})}{\text{Available Capacity}}$$

- Deviation Charges are specified as follows:
  For existing generators -

Deviation/Error	Charges per unit
Within +/- 15%	No Penalty
From 15% to 25%	₹ 0.50

Deviation/Error	Charges per unit
From 25% to 35%	₹ 1.00
Greater than 35%	₹ 1.50

For up-coming/new generators –

Deviation/Error	Charges per Unit
Within +/- 10%	No Penalty
From 10% to 20%	₹ 0.50
From 20% to 30%	₹ 1.00
Greater than 30%	₹ 1.50

The Committee, through the team of the consultant, has assisted several States in preparation of state-level regulations: Andhra Pradesh, Tamil Nadu, Haryana, Punjab, Telangana and Maharashtra. Furthermore, FOR Chairperson has written to all State Commissions to notify the RE Framework on priority.

Following States have come up with the F&S Regulations that are either at the draft stage or final stage. Details are as follows:

Sr. No.	State	Status of F&S Regulations as on 30th Nov. 2017		Remark
		Draft	Final	
1	Andhra Pradesh		√	Notified in Aug 2017. Implementation starting from 1st Jan 2018 while commercial implication to begin from 1st July 2018
2	Chhattisgarh		√	Notified as part of DSM Regulations on 7-11-2016
3	Gujarat	√		Regulations have been finalized. SOR under preparation
4	JERC for Mizoram & Manipur		√	Finalized on 18th July 2016
5	Jharkhand		√	Notified on 28-9-2016
6	Karnataka		√	Notified on 31-5-2016. Implementation from 1-6-2017
7	Maharashtra			Developed Draft F&S Regulations and Discussion Paper. SOR under preparation
8	Madhya Pradesh	√		To be notified soon

Sr. No.	State	Status of F&S Regulations as on 30th Nov. 2017		Remark
9	Odisha	√		Draft DSM Regulations incl. F&S framework for Wind/Solar published on 23-09-2015
10	Rajasthan		√	Notified in Sept. 2017, implementation to begin from 1st Jan 2018
11	Tamil Nadu	√		Under Preparation
12	Tripura		√	Notified on 24-6-2016.
13	Uttarakhand		√	Notified on 6th February, 2017 (Under DSM Mechanism)

The table on the following page represents a comparison of salient features of Forecasting & Scheduling Regulations (both final & draft) as notified by selected member States vis-à-vis the FOR Model Regulations:

Sr. No.	Particulars	FOR Model F&S	APERC (final)	KERC (final)	RERC (final)	MPERC (draft)	TNERC (draft)
1	Applicability	Wind and solar generators selling power within or outside the state	Wind and solar generators selling power to discoms/third party sale/captive consumption through OA within or outside the state	Wind generators combined capacity 10 MW and above. Solar generators capacity 5 MW and above within or outside the state	Wind and solar generators selling power to discoms/third party sale/captive consumption through OA: >5MW connected to state grid	Wind and solar generators selling power within or outside the state	Wind and solar generators (excluding Rooftop PV Solar Projects) selling power within the state
2	Forecasting Responsibility	Wind and solar generator or by QCA Or forecast by SLDC to be accepted	Wind and solar generator or by QCA Or forecast by SLDC accepted	Wind and solar generator or QCA or aggregator Alternatively through REMC	Wind and solar generator or by QCA Or forecast by SLDC accepted	Wind and solar generator or by QCA Or forecast by SLDC accepted	Wind and solar generator or by QCA Or forecast by SLDC accepted
3	Scheduling Responsibility	Wind and solar generator or by QCA	Wind and solar generator or by QCA	Wind and solar generator or QCA or aggregator. Alternatively through REMC	Wind and solar generator or by QCA	Wind and solar generator or by QCA	Wind and solar generator or by QCA
4	Computation of Error Formula	Available Capacity in denominator	Available Capacity in denominator	Available Capacity in denominator	Available Capacity in denominator	Available Capacity in denominator	Available Capacity in denominator
5	Tolerance Band for DSM	10% new wind and solar generator. < = 15% existing wind and solar generator	± 15% for wind and solar generators	± 15% for wind and solar generators	± 15% for wind and solar generators	< = 10% new wind and solar generator , < = 15% existing wind and solar generator	± 10% for wind & solar generators.
6	Scheduling Requirement	Weekly and day-ahead with maximum 16 revisions during a day	Weekly, day-ahead and intra-day with maximum 16 revisions during a day for wind and max. 9 revision for solar	Weekly, day-ahead and intra-day with maximum 16 revisions during a day	Weekly and day-ahead with maximum 16 revisions during a day	Weekly and day-ahead with maximum 16 revisions during a day	Weekly and day-ahead with maximum 16 revisions during a day
7	Reference point for DSM	Pooling station	Pooling station	Pooling station/ Aggregator Level	Pooling station	Pooling station	Pooling Station

Chapter 3 – Model Deviation Settlement Mechanism (DSM) Regulations

Proceedings

At the very first meeting of the Technical Committee, it was agreed that along with ABT framework, Deviation Settlement Mechanism for all grid-connected entities must be put in place in all the states. The relevant excerpts from the minutes are reproduced below:

> *"After detailed discussion, there was a unanimous consensus on the need for:-*
>
> *(i) implementation of Availability-Based Tariff (ABT) & Deviation Settlement Mechanism (DSM) in States;*
> *(ii) specifying Regulations on Forecasting, Scheduling and Deviation Settlement of Wind & Solar generating stations at the State level"*

As mentioned in the previous chapter, at the 2nd meeting of the Technical Committee, it was decided to have a two pronged approach towards the implementation of ABT and DSM framework. The first step would be to facilitate creation of Model DSM Regulations.

At the 7th meeting of the Technical Committee, held on 4th Nov. 2016, the consultant presented first draft of Model DSM Regulations at the State Level. Aspects such as DSM pricing, Volume Limits and Area Control Error were deliberated upon. There was a broad consensus on the need for identification of State entities, interface boundaries; coverage of entities (Generators (RE/Non RE), DISCOMS, OA Consumers, CPPs) under DSM pool; uniform definition of 'Deviation' and 'Error at inter-state and intra-State Level; Non-Zero Sum based DSM Pool Design, etc.

Subsequently, at the 8th meeting of the Technical Committee, held on 2nd December 2016, the consultant presented the Model DSM Regulations at State Level wherein the Pricing Framework, Deviation Limits and Volume Cap, Zero Crossing, ACE etc were discussed in detail and consensus was reached among the members. The Committee decided to take the Model Regulations to FOR for its endorsement.

The Model DSM Regulations were presented at the 57th Meeting of FOR held on 16th December 2016. After discussion, the Forum agreed on the following points before endorsing the Model Deviation Settlement Mechanism Regulations:

- The State-level framework should provide for a non-zero-sum deviation pool.
- The deviation charges at the State-level should be aligned with those at the Inter-State level.

- Keeping in view the volume limit for deviation at the Inter-State level, each State Regulator should specify volume limits for the State Pool participants.
- The State-level Deviation Settlement Mechanism framework should provide for the concept of "Zero Crossing", thereby discouraging persistent deviation in any one direction.
- Further studies should be carried out to bring in the concept of Area Control Error (ACE), which can form the basis for setting deviation limit in future

The Model DSM Regulations at State Level are uploaded on FOR website and a copy is attached as Annexure-3 in Volume-II of this report.

Deviation Settlement Mechanism Model Regulations – Key Highlights

The objective of these Regulations is to maintain grid discipline and grid security as envisaged under Grid Code through commercial mechanism for Deviation Settlement of over/under drawal and injection of electricity by users of the grid.

- Applicability - to Seller(s) and Buyer(s) involved in the transactions facilitated through short-term open access or medium-term open access or long-term access in intra-state transmission or distribution of electricity (including inter-state wheeling of power)
- Deviation (as calculated for each 15 minute time block) for a Seller means its total actual injection minus its total scheduled generation and for a Buyer means its total actual drawal minus its total scheduled drawal,
- Charges payable (overdrawal/under-injection) and receivable (under-drawal/over-injection) for each time-block
- Charges for deviation for each 0.01 Hz step is equivalent to 50 Paise/kWh in the frequency range of 50.05 - 50.0 Hz and in step of 27.50 Paise/kWh in the frequency range of 50.0 - 49.8 Hz
- Volume Cap of 150 MW or 12% of Schedule [Different volume caps for RE Rich States]
- No over-drawal/under-injection when Frequency below 49.7 Hz
- Additional Charges at rate of 20%, 40%, 100% of Applicable Deviation Charges Zero Crossing: Change in sign of deviation once every 6 time blocks- violation attracts additional charges @10% of deviation charges applicable for the continuance of violation
- Capping of Deviation Charges for Generating Stations (using Coal, Lignite or Gas supplied under APM) regulated by SERC - Cap Rate of Paise 303.04/ unit
- Infirm Power: Priced at 178 Paise/unit (coal/lignite/hydro), 282 Paise/unit (APM Gas), 303 Paise/unit (imported coal), 824 Paise/unit (RLNG). Allowed upto 6 months or as per time extension allowed by Commission
- State Deviation Pool Account to be operated by SLDC and review by State Power Committee

Chapter 4: Development of RPO Web-Tool and related Regulatory Requirements

Need for Development of RPO Web-Tool

The State Nodal Agencies (SNAs) are entrusted with the responsibility of monitoring and reporting Renewable Purchase Obligation (RPO) compliance of all the Obligated Entities (OEs), i.e., distribution companies (DISCOMs), Captive and Open Access (OA) consumers. However, RPO enforcement has been weak due to several reasons, inter-alia an inefficient framework for RPO compliance monitoring and reporting. Currently, States have a combination of manual and excel-based reporting, which is tedious and insufficient for streamlined reporting at the entity level and raising flags when there is non-compliance. Additionally, this information is not transmitted through the eco-system, as a result of which the Central Commission/FOR does not have visibility into RPO compliance issues on a regular basis. RPO compliance monitoring is crucial to ensure that the nation-wide RPO targets are met and non-compliance is brought to the attention of Regulators for necessary intervention.

A web enabled tool for all obligated entities, for regular and ongoing reporting/compliance monitoring of RPO targets and achievements can enable easy access to information and ensure transparency at the State level. It will also serve as institutional arrangement to streamline RPO compliance monitoring/enforcement in the States, and provide a platform for Central agencies to access this data.

Proceedings

MNRE-USAID PACE-D TA Program supported development of RPO Compliance Monitoring and Reporting Framework and Web Tool development for the State of Rajasthan.

Representatives of the Program presented “RPO Compliance Framework for Captive/OA Transactions at State Level” with a focus on RPO framework prepared for RRECL at the 51st Meeting of Forum of Regulators (FOR). They also demonstrated key functionalities of RPO Compliance Web Tool at the 56th Meeting of FOR. Based on the recommendation of FOR, the scaling up and generalisation of this web-tool for other states was taken up by the FOR Technical Committee on RE Integration. The sequence of discussions are summarized in the schematic below.

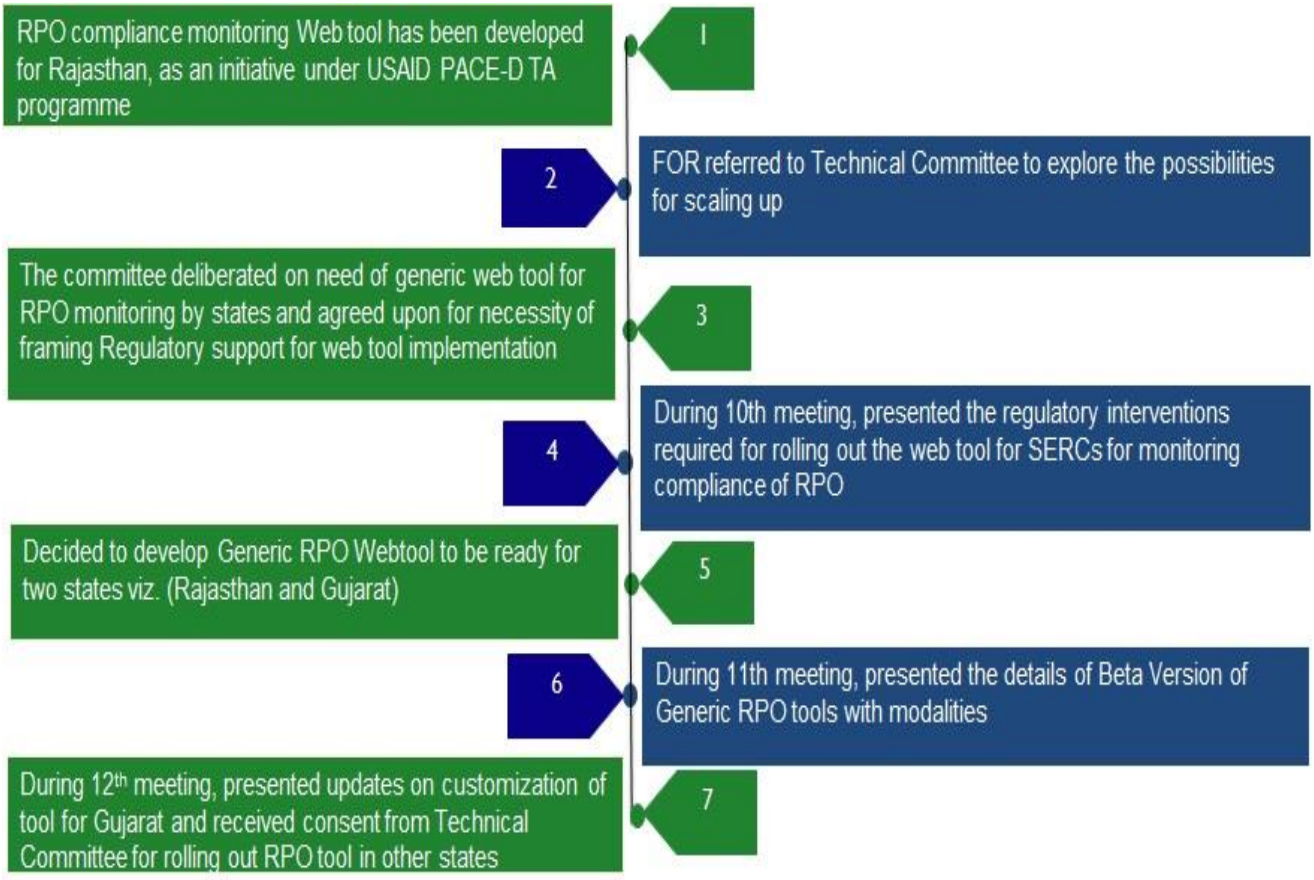

Figure 1: Schematic of the discussions on RPO Web-tool during various meetings of Technical Committee

The details of the discussions held in various meetings of the Technical Committee on RE Integration are as under:

At the 8th meeting of the Technical Committee chaired by Shri A. S. Bakshi, a presentation was made on development of Generic RPO Compliance Web-tool which was a generalized version of the tool prepared for the State of Rajasthan.

At the 9th meeting of the Technical Committee, the following was agreed:

a) **RPO as Percentage of Consumption or Input Energy** – For DISCOMS, it would be desirable to compute RPO as a percentage of energy input, uniformly across States. For OA and CPP consumers, RPO should be computed as a percentage of metered consumption.

b) **Rooftop Solar Projects as RPO Compliance -** FOR Secretariat could write to MoP to suitably incorporate the provision of crediting generation (Gross) from Rooftop Solar Projects to the DISCOMs for the purpose of their Solar RPO in Tariff Policy, to ensure uniform application across the country.

c) **RPO Implementing and Monitoring Agencies -** States could choose either of the options - of a committee on lines of having Grid Coordination Committee (GCC) of Maharashtra or an SNA for implementing and compliance monitoring of RPO in States. The selected agency / committee should submit a quarterly report on compliance status to the State Commission.

d) **Data Verification for OE -** It was suggested that Electrical Inspectors can verify the data for CPPs and SLDCs can verify for other OEs. A standard format for data verification would be developed as part of the web tool.

e) **Web-Tool Hosting -** To define the required regulatory changes in the RPO regulations of States so that by April 2017, the web-tool is ready for at least 2 States viz., Rajasthan and Gujarat (which can act as a model for other States to follow).

Thereafter, at the 10th meeting, the consultant highlighted the hardware and software requirements for rolling out the web tool. The functionalities of the web tool for monitoring & compliance of RPO made for Rajasthan State were demonstrated.

Regulatory Requirements

Additionally, the regulatory interventions required for rolling out the web tool for monitoring compliance of RPO were agreed upon:

1. **Mandatory RPO compliance reporting through web portal**: Appropriate provisions to be incorporated in the RPO Regulations of respective SERCs / JERCs mandating RPO compliance reporting through the web portal. Following clauses may be incorporated in the RPO Regulations by SERC:

   "For the purpose of RPO Compliance monitoring and reporting, the State Agency shall formulate procedures and develop RPO Webportal within six months from the date of notification of these Regulations.

   All Obligated Entities shall mandatorily register themselves with RPO Webportal and shall furnish requisite information to State Agency through RPO Webportal in the manner and form, as prescribed under the Procedures to be formulated by State Agency.

   Electrical Inspectorate and Nodal Agency for Open Access (SLDC/STU or Distribution Licensee, as the case may be) or Third Party Verifier appointed by State Agency, shall verify and confirm the data submissions by Obligated Entities from time to time in the manner prescribed under Procedures to be formulated by State Agency.

   The State Agency shall submit Quarterly Report of status of RPO Compliance by Obligated Entities in the State to State Commission.

Failure to provide necessary information, data, reports by Obligated Entities & stakeholders shall attract penal actions under Section 142 of EA 2003."

2. **RPO as Percentage of Consumption or Input Energy**: It transpired that in so far as DISCOMS are concerned, even if 'sales' are used as reference for RPO computation, the energy at sales level will have to be grossed up by T&D losses to arrive at the purchase of RE by DISCOMS. This is the same as input energy. As such, it would be desirable to compute RPO for DISCOMS as a percentage of energy input, uniformly across States.

   As regards consumption by OA and CPP consumers is concerned, it was agreed that RPO should be computed as a percentage of metered consumption recorded at drawl/consumption point. Following clauses may be incorporated in the RPO Regulations by SERC:

   "In case of Distribution Licensee as Obligated Entity, RPO target percentage shall be applicable on the Energy Input for concerned Distribution Licensee (i.e. Energy Sales grossed up for transmission and distribution losses).

   In case of any other Obligated Entity (other than Distribution Licensee), RPO target percentage shall be applicable on the actual Electricity Consumption (excluding consumption supplied by Distribution Licensee) recorded at Drawal point or Consumption point of such Obligated Entity."

3. **Rooftop Solar Projects as RPO Compliance** - As regards the point of crediting the generation (Gross) from Rooftop Solar Projects to the DISCOMs for the purpose of their Solar RPO, it was agreed that following Model Conditions may be incorporated in the RPO Regulations/Net Metering Regulations, as appropriate:

   "The quantum of electricity generated by the Eligible Consumer from the Roof-top Solar PV System under the Net Metering arrangement shall, if such Consumer is not an Obligated Entity, qualify towards meeting the Solar RPO of the Distribution Licensee.

   Provided that the quantum of electricity consumed by the Eligible Consumer from the Roof-top Solar PV System under the Net Metering Arrangement shall qualify towards his compliance of Solar RPO, if such Consumer is an Obligated Entity.

   The Eligible Consumer shall install, at his own cost, a Solar Generation Meter conforming to the applicable CEA Regulations at an appropriate location to measure the energy generated from the Roof-top Solar PV system, if he is an Obligated Entity and desires that such energy be counted towards meeting its RPO.

The Distribution Licensee shall install, at its own cost and with the consent of the Eligible Consumer, a Solar Generation Meter conforming to the applicable CEA Regulations at an appropriate location to measure the energy generated from the Roof-top Solar PV System if it desires that such energy be counted towards meeting its RPO. The Solar Generation Meter shall be maintained by the Distribution Licensee at its cost."

Subsequently, at the 12th meeting of the Technical Committee, the members of the Committee expressed their consent for roll-out of the tool to their States and promised their support for implementation in respective States. Additionally, Shri A.S. Bakshi asked the Consultant to revert with modalities of possible way forward for deployment in all States.

It was also concluded that the feature for reflecting the carry forward for RPO shall not be incorporated in the Generic RPO Web-tool.

During the 14th meeting of the Technical Committee, the Consultant apprised the members about the development of Generic RPO Web-tool for the State of Gujarat. The members were informed about the appointment of Gujarat Energy Development Agency (GEDA) by the GERC to own and host the Web-tool; the web hosting requirements have been shared with GEDA. The next steps include sharing of source code with GEDA, Security audit and migration of Web Tool in Gujarat.

Salient Features of RPO Web-tool

- Reliable compliance reporting platform is designed to facilitate all relevant stakeholders to provide compliance information in a transparent manner for all obligated entities to ensure monitoring by State Agencies to facilitate timely enforcement actions by the Regulators.
- Features are as below, also presented in the schematic:

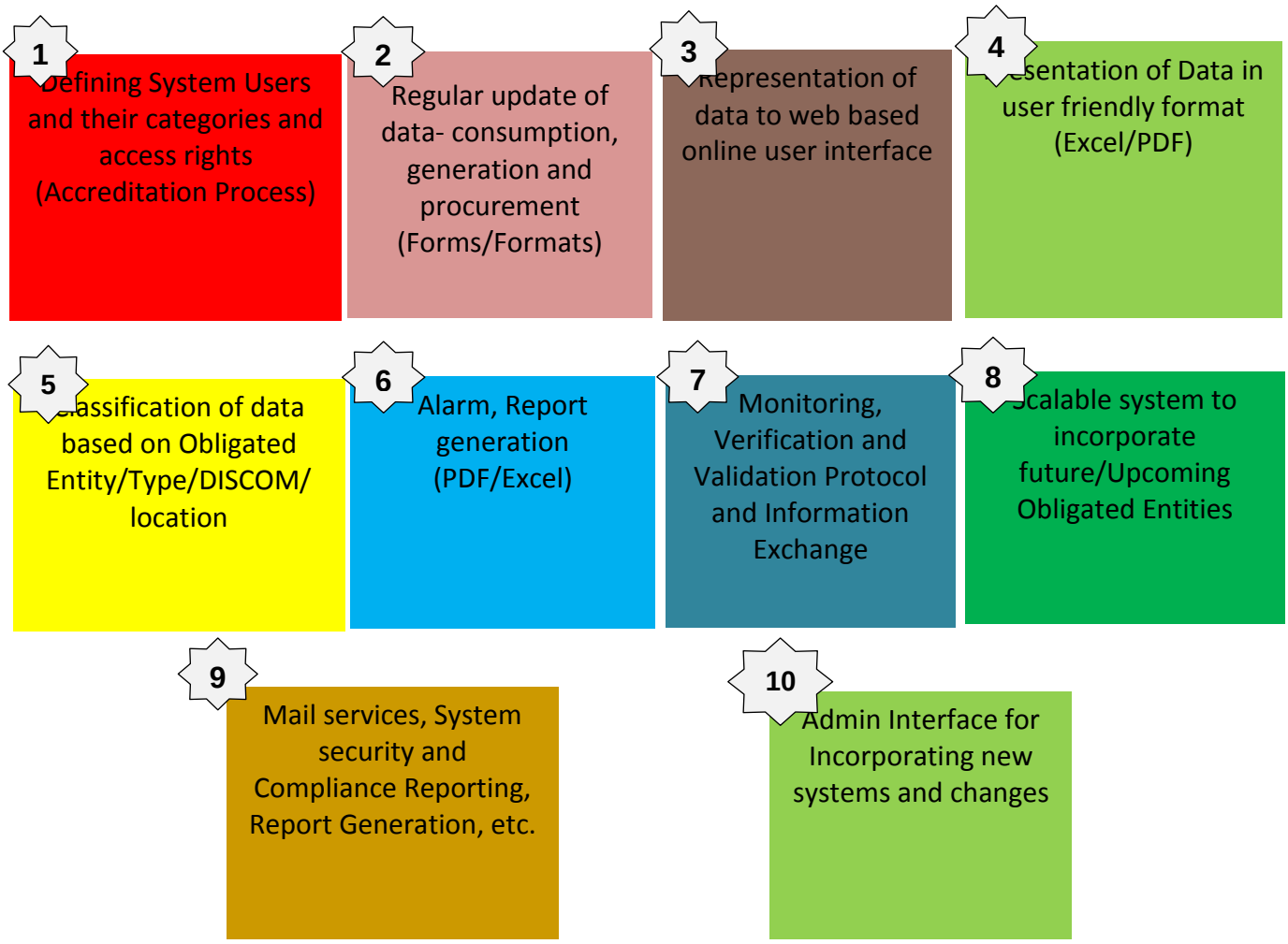

Figure 2: Schematic of the functionalities of RPO web-tool

1. **Registration process:** This application has a facility to create multi-level users with login credentials. Super user (admin) can set the roles and permissions for users and depending on this, users can access the system modules.
2. **Regular updating of data:** Users can regularly update their consumption, generation, procurement, and other information in multiple predefined web formats.
3. **Data presentation:** This application will store structured information from the data given by different categories of users.
4. **Export data:** The tool will generate the processed data into user friendly format such as Portable Document Format (PDF).
5. **Classification of data:** Users will view/classify the data based on the OE/DISCOM/type/location.
6. **Alarm/Report generation:** Users will get an alert through the system after the verification and validation of their given information and can generate multiple type reports as per their requirements.
7. **Monitoring/Verification/Validation:** The system will have multiple steps for monitoring, verification, and validation in different user/access level.
8. **Scalable system for future:** The tool will have the facility for future updates, new process implementation, and other scalable options.

9. **Email/Report generation:** Email service will be implemented within the system based on the report submitted, validated, and verified.
10. **Admin. interface:** The proposed system will have an admin. interface for incorporating new systems, rules, and other necessary changes.

Current Status

At the 16th meeting of the Technical Committee meeting held on 24.11.2017 at Sasan, Gujarat, it transpired that the RPO web-tool for the State of Rajasthan is complete and the launch of the same is scheduled for 27th November 2017 and the RPO tool for Gujarat is in final stage of security audit.

Besides Gujarat and Rajasthan, strong interest for implementation has been expressed by the state of Andhra Pradesh, wherein consent letter from Department of Energy, Govt. of AP has been received.

Furthermore, during discussions of FOR Secretariat with MNRE, it was concluded that the national-level RPO tool as prepared by TERI and implemented for Chhattisgarh & Maharashtra shall be provided to all States. The roadmap for the same is under finalization by MNRE.
The data sharing interface for transfer of data from portals of Gujarat & Rajasthan stands complete.

Chapter 5: Regional Co-operation for Optimum Utilization of Generation Resources

With the increasing penetration of variable renewable energy on the grid, there will be increased requirement of balancing resources. While fast and more flexible resources like hydro plants within a region are more valuable for providing fast tertiary services for maintaining load-generation balance, not all RE rich states are blessed with these resources, and are facing challenges in balancing high levels of RE power injected into the state grids. Therefore, a framework to enable regional cooperation for sharing of generation resources is needed.

Proceedings

Considering the above objective, the Technical Committee in its 12thmeeting held on 28th March 2017 at Chennai, discussed how to evolve such a framework, amongst other issues. During the discussion, it was decided that sub-groups be constituted in the Northern Region, Western Region and Southern Region (the three RE rich regions) headed by the Member Secretaries of the respective Regional Power Committees (RPCs). The Sub-groups were mandated to examine the feasibility and modality of co-operation among States in the respective regions for ensuring optimum utilization of generation resources with least cost options for balancing across the region and submit their findings before the Technical Committee.

In this regard, meetings were convened by NRPC on 16th Aug 2017, WRPC on 14th Aug 2017 and by SRPC on 20th May, 7th June and 31stJuly 2017.

A meeting of the Heads / Representatives of the Sub-Groups was convened under the Chairmanship of Shri A.S.Bakshi, Member, CERC on 18th Aug 2017 at CERC, wherein update on deliberations on facilitation of faster trade of energy among States was provided by them. During the meeting, further brainstorming took place on the advantages and disadvantages of various options that were submitted by the RPCs.

The following emerged during the deliberations in the meeting:-

- The States have recognized the value of electricity vis-à-vis the cost of generation. Some of the States are not willing to cooperate with other States in the Region on “cost” basis, for example, valuing pumped hydro resources.
- Some of the Regions are predominantly “surplus” in power, leaving little scope for co-operation within the region. This necessitates a national level framework / product for optimum resource utilization.
- Inter-state transactions need to be enabled closer to real-time, which will necessitate new intra-day market products at the national level.

- Dr. S.K. Chatterjee presented (views were personal) various options for enabling inter-state trade of power, viz.
    i. Banking;
    ii. DAM (Day Ahead Prices) price on Power Exchange as reference;
    iii. Pool based on Variable Cost (VC) as approved by the Regulator and on payment of cost;
    iv. Pool based on VC as approved by the Regulator and on payment of Marginal Cost (MC);
    v. Pool based on auction for intra-day for the rest of the day;
    vi. Pool based on auction for intra-day on hourly basis;
    vii. Pool based on auction for intra-day on intra-hour basis i.e for 15 min. block-wise etc.

These were deliberated upon, along with benefits and disadvantages of each. The presentation was shared with the RPCs soliciting their feedback.

During the 14th meeting of the Technical Committee, held on 13th Sept 2017, Dr. S.K Chatterjee presented (views were personal) on 'Load/Generation Management – Intra Day' which included the above listed seven options for Intra Day/Hour Ahead transactions. The Members of the Committee appreciated the presentation and consensus was arrived in taking this discussion forward. Pros and cons of each option are tabulated below:

S.No.	Options	Pros	Cons
1	Banking - Excess Power is banked with another State in regional grid and utilized back when required	- Voluntary; - No price transaction; - Easy to implement	- Still bilateral - Opaque to cheaper options; - True marginal cost of meeting demand not known; - Elements of Cost and Value missing; - No knowledge of gain or loss
2	Day Ahead Market Price on Power Exchange as reference	- Well accepted reference price; - Dispute free	- Very remote chance of availability of generation sources with marginal cost equal to or less than DAM price; - Liquidity will always be an issue
3	Pool based on variable cost as approved by the Regulator and on Payment of cost	- Visibility of all options for purchase decision; - Dispute free as regulator approved VC; - All resources get paid as per their cost or marginal cost; - Improvement over option 2, liquidity	- Still based on cost and not on value; - VC difficult to ascertain; - Merchant plants cannot participate as their tariffs are not determined by regulator

4	Pool based on variable cost as approved by the Regulator and on payment of marginal cost	- Same as Option 3; - Improvement over Option 3 – element of 'value' introduced because of marginal cost based payment	- VC difficult to ascertain; - Merchant plants cannot participate as their tariffs are not determined by regulator; - Payment based on marginal cost may lead to heart burn; - still administered
5	Pool based on auction (intra-day for the rest of the day)	- Market Discovered Price; - Dispute free; - Not administered; - Akin to DAM but closer to real time	- Preparedness of RPC or PX; - Discoms decision making process; - OA registry, a pre-requisite
6	Pool based on auction (hourly)	- Market Discovered Price; - Dispute free; - Not administered; - Akin to DAM but closer to real time	- Preparedness of RPC or PX; - Discoms decision making process; - OA registry, a pre-requisite
7	Pool based on auction (intra-hour i.e. 15 min. block)	- Market Discovered Price; - Dispute free; - Not administered; - Akin to DAM but closer to real time	- Preparedness of RPC or PX; - Discoms decision making process; - OA registry, a pre-requisite

Feedback from NRPC, WRPC and SRPC has been received. All of them have recommended Option 5 i.e. 'Pool based on auction for intra-day for rest of the day' as a starting point. Feedback from other RPCs is still awaited.

Further deliberations and final recommendation will be concluded in subsequent meetings of the Technical Committee.

Chapter 6: 5-Minute Scheduling, Metering, Accounting and Settlement

Worldwide, it has been recognized that 5-minute scheduling and settlement offers a lot of advantages, particularly in terms of reduction of requirement of reserves, price discovery and bringing out the value of flexibility.

Introduction of fast markets and moving to 5-Minute Scheduling, Despatch and Settlement will result in enhancement of grid operation efficiency, accuracy in forecasting and scheduling and ultimately leading to reduced cost of electricity to the consumer.

Currently, tertiary reserves ancillary services have been implemented at the ISTS level where actions at the power plant happen 16-30 minutes after the same are advised by NLDC. Secondary regulation services through Automatic Generation Control (AGC) are soon expected to be introduced.

Proceedings

During the 11th Meeting of the Technical Committee on RE Integration held on 28.3.2017, it was emphasized that the decision for 5-minute scheduling and settlement at the ISTS level need not come in the way of SAMAST implementation at the intra state level. Way forward would be that the states implementing SAMAST at the intra state level factor the 5-minute periodicity in the metering as well as software being procured for scheduling and settlement. Discussions are also ongoing with CEA for amending the CEA Metering Regulations to this effect.

Members appreciated the need to move to 5-minute scheduling and settlement. For working out the modus operandi, it was decided that a sub-group would be constituted comprising CEA, CTU, RPCs, POSOCO and CERC Staff that would examine these issues in further detail and submit its report to the FOR Technical Committee.

Accordingly, the Sub-Group has been constituted comprising of the following members:-

(a) Shri S.K. Soonee, Advisor, POSOCO

(b) Representative of all RPCs and NPC

(c) Representative of CEA

(d) Representative of POSOCO

(e) Representative of CTU

(f) Representative from one RE rich state each in NR, WR and SR

The broad terms of reference (TOR) for the Sub-Group are:-

a) Look at all pros and cons of moving to 5-Minute Scheduling, Metering, Accounting and Settlement

b) Identify all activities to move from 15-minute to 5-minute scheduling, metering, accounting and settlement

c) Identify changes required in various Regulations including Grid Code and suggest the required amendments

d) Suggest amendments required to the CEA Metering Regulations and assess the metering infrastructure required

e) Suggest any specific requirements in this context for cross border transactions

f) Infrastructure requirements in terms of hardware & software upgradation needed for scheduling, metering, accounting and settlement by the NLDC, RLDCs, SLDCs and RPCs/NPC

g) Detailed action plan for migration including phasing of activities if required

h) Time-frames for the implementation of identified activities and target date for migration to 5-minute scheduling, metering accounting and settlement

i) Information dissemination requirements to be identified

j) Capacity building measures required for all stakeholders

k) Any other suggestions related to above

During the 12thMeeting held on 30.5.2017, Shri S.K. Soonee, Advisor POSOCO, shared a draft paper (attached as Annexure–4 in Volume-II of this report) on imperatives for moving and issues to be tackled while moving from 15-minute to 5-minute dispatch. Specifically, he stated that with a 5-min time-block, ramps will become more manageable, load and RE forecasts will be more accurate and that a 15-min block would be too long to run Automatic Generation Control (AGC) in an effective manner. He recounted that several benefits were obtained by moving from hourly to 15-min dispatch, similarly we expect more efficiency by transitioning to a 5-min time-block. He explained the changes that will be required on forecasting, markets, gate closure, metering standards, various regulations etc. He said that the settlement cycle would continue to be weekly, while the settlement period would now be 5 minutes.

Sub-Group Meetings

Three meetings of the Sub-Group have been held so far viz. 3rd August, 2017, 28th August, 2017 and 25th October, 2017. The deliberations in the meetings are summarized as follows:

- Need to move to “fast” markets is recognized
- 5-minute scheduling & settlement and earmarking of the reserves are interwoven processes

- 5-minute bidding in OTC/PX markets would lead to more efficient price discovery
- 5-minute DSM prices would be a vital indicator for imbalance handling caused especially by renewable generation
- Provisions for 5-minute may be made mandatory for future procurement of meters.
- Requirement of amendments in the CEA Metering Standards
- 5-minute scheduling & settlement entail regulatory interventions
- Handling Transition
- To begin with, 5-minute metering will be in parallel with 15 minute metering.
- "Scheduling and Despatch" has to be aligned with "Settlement" process in 5-min too.
- To begin with, accounts for both 5-minute and 15-minute accounting may be kept in parallel.
- Need for capacity building for 5-minute granular forecasting at state level
- SAMAST implementation would enable states to leapfrog

The 5-minute meter testing was witnessed jointly by representatives of POSOCO (NLDC, WRLDC), POWERGRID, Gujarat SLDC and Meter Manufacturers (M/s Secure Meters & M/s Elster-Honeywell) at 400/220 kV Magarwada PGCIL S/s, Daman-Diu UT and 765/400 kV Vadodara (Wagodia) PGCIL S/s, Gujarat (M/s L&T) on 13th September, 2017 and 10th October, 2017 respectively.

The Meter Demonstration & Testing Results were summarized as follows:

Title	Elster	Secure	L & T
Reconfiguration of existing 15-min meter to 5-min	Possible in Existing meters, Simple, on-site	Not possible in existing meters, possible in new models only, on-site	Not possible in existing meters, new models only, off-site
Reconfiguration Time	Fast	Fast	At factory
Retention of old data	Old data erased	Block wise data erased cumulative data retained	Data yet to be made available
Conversion software for NPC File	The software for conversion to .npc file is available	Software for converting to NPC format needs upgrade	Software for converting to NPC format needs upgrade
Wh recording	Acceptable	Acceptable	Data N.A.
VARh recording	Variations observed due to integration time difference		Data yet to be made available
Storage	Could not be ascertained		Storage upgraded in factory

Key Action Points

The sub-group agreed that, on a pilot basis, 5-minute capable meters may be installed at say, 4-5 locations in each Region to gain practical experience in 5-minute metering, interfacing requirements / file interchange formats and develop data analytics/tools for 5-minute metering, data validation, reporting, etc. It was recognized that pilot project would help in

formulation/refinements of Technical specifications and Software Requirement Specifications (SRS) for Metering Software at RLDCs and Accounting Software at RPCs for 5-minute metering.

The suggested action plan, time-lines and target date for migration including phasing of activities at inter-state level were agreed as follows:

Required Action	Action By	Timeline
Submission of Sub-Group Report	FOR Sub-Group	Nov 2017
Pilot Projects implementation	CTU / RPCs / POSOCO	March 2018
CERC Staff Paper on Regulatory Framework for 5-minute Scheduling, Metering & Settlement	CERC	March 2018
Changes in CEA standards & regulation	CEA	March 2018
Final Regulatory Framework	CERC	September 2018
Formulation of Technical specifications for new meters and configuration change at RPC/State level	CTU/RPCs/ POSOCO	July 2018
Procurement process from tendering to commissioning led by CTU at inter-state level and STU at intra-state level	CTU/RPCs/ POSOCO	September 2018
Trial Run (Transition)	All	Apr'19 – Mar'20
Go Live	All	01st April, 2020

Way forward

At the 16th Meeting of the Technical Committee, Shri K.V.S Baba, CEO POSOCO, updated the Committee regarding proceedings of the sub-group on 5-minute metering.

Shri Baba underscored that moving to 5-minute grid management will be beneficial for improving reliability and security of the grid. He said that along with variable RE power, the variability in load is increasing too as on-demand power becomes increasingly available.

He stated that all future procurements of meters should be compatible with 5-minute resolution. He also informed the Committee that most meters procured post 2014 can be upgraded to 5-minute format through change of firmware only.

The Committee members reiterated the need for firming up of technical standards by CEA.

Chapter 7 – Smart Meters

Proceedings

During the 60th Meeting of Forum of Regulators held on 23rd June 2017, the issue of rolling out of Smart Meters and its installation for all consumers was discussed with the Hon'ble Minister of Power. It was suggested that the FOR Technical Committee may carry out a detailed study with regard to advantages, costs, technical feasibility and total requirement of smart meters and provide suitable recommendations.

The Technical Committee invited meter manufacturers, ISGF, DISCOMs and industry experts for meetings on 19th July and 31st July 2017 to discuss the various issues involved. The comprehensive discussions covered varied dimensions of the issue, such as basic features mandated as per Indian Standards, utility of these features, feasibility of replacement and the likely cost of smart meters in case of large roll out.

The Tariff Policy 2016 also mandates to introduce Smart Meters. Section 8.4.3 of the Tariff Policy has been reproduced below:

"The Appropriate Commission may provide incentives to encourage metering and billing based on metered tariffs, particularly for consumer categories that are presently unmetered to a large extent. The metered tariffs and the incentives should be given wide publicity. Smart meters have the advantages of remote metering and billing, implementation of peak and off-peak tariff and demand side management through demand response. These would become essential in future for load-generation balancing due to increasing penetration of intermittent type of generation like wind and solar power.

Appropriate Commission shall, therefore, mandate smart meters for:

(a) Consumers with monthly consumption of 500 units and more at the earliest but not later than 31.12.2017;

(b) Consumers with monthly consumption above 200 units by 31.12.2019.

Further, two way smart meters shall be provided to all prosumers, who also sell back electricity to the grid as and when they require."

Further, it was noted that there are about 5 crore consumers having consumption of more than 200 units per month. The total numbers of installed meters are about 25 crores in the country. With indigenous manufacturing capability of about 2.5 crore meters per year, it is envisaged that the total time required to replace all the meters will take about 3-10 years including communication infrastructure.

Based on the discussions, the Technical Committee prepared a report on "Proposed implementation plan for roll out of Smart Meters" (attached as Annexure-5 in Volume-II of this report), which includes detailed analysis of various aspects, such as features of Smart Meters, Provision of Time of Use Tariff, Benefit to Consumers & Utilities, Estimated Cost

&Financing options, Total Requirement & Manufacturing Capacity, etc. Important conclusions were as follows:

- Installation of smart meters may be taken up in phased manner following a systematic and pragmatic approach
- Dynamic pricing by way of Time of use or Time of Day tariff may be introduced
- Few pilots may be conducted initially to establish cost benefits such as reduction in AT&C losses or overall reduction in tariff before taking up large scale roll out
- Appropriate view regarding full scale roll out could be taken based on results of such pilots
- As a start, Remote connect/disconnect and load management may be disabled for small consumers consuming less than 500 units

The report was presented at the 15th Meeting of the Technical Committee on 30th Oct. 2017 and the Committee members unanimously agreed that the roll-out of Smart Meters should be taken up in a phased manner.

It was also decided that a letter from FOR Secretariat be sent to the Ministry requesting to include the recommendations proposed in the report in the roll out plan of Smart Meters by the Government. The same has been sent on behalf of Chairperson Shri Gireesh B. Pradhan to Secretary, MoP (attached as Annexure-6 in Volume-II of this report).

Chapter 8: Model Intra-State Hydro Generating Stations Regulations

Hydro generation is considered as an important source of flexibility for the system to manage the challenges of large scale renewable integration. This has been voiced in many meetings of the Technical Committee and during the 3rd Meeting of the Technical Committee held on 10th Feb 2016, Shri Soonee emphasized that there is a huge scope of better utilization of Hydro plants as they provide flexibility in generation which is a pre requisite to the integration of renewables. It was also agreed by the Committee members that State level regulations on hydro tariff should follow CERC principles (viz., the principles of two-part tariff and recovery of capacity charge based on declared capacity at least for 3 hours during peak period).

Proceedings

In June 2017, POSOCO released a Report on "Operational Analysis for Optimization of Hydro Resources & facilitating Renewable Integration in India". The report has recommended that many of the existing hydro generating stations can achieve a better peaking capability, while honouring the associated hydro logical constraints and obligations of multipurpose hydro power projects, such as flood control, drinking water supply & irrigation requirements etc. One of the salient observations of the FOLD-POSOCO Hydro report is that the CERC regulated hydro power stations are providing better peaking compared to intra-state-hydro power stations. CERC Regulations have provisions for two-part tariff where-in the flexibility services like daily peaking capability and annual mechanical availability of hydro units have been linked to the recovery of capacity charge.

At the 13th Meeting of the Technical Committee, held on 4th August 2017, Shri Soonee presented on 'Optimization of Hydro resources'. He highlighted that with total installed capacity of about 45 GW of Hydro, about 16 GW are ISTS projects and the balance capacity is within the States, which needs appropriate tariff framework. With optimum utilization, hydro can be significantly used for peaking demand, which can also enhance the load factors of thermal plants by ensuring that hydro plants are not run during off-peak hours. The States are also required to adopt aforementioned CERC principles in the state-level hydro tariff regulations. In the same meeting, it was deliberated that Model Regulations for Hydro Plants for the States should be evolved, that'll include the revised tariff structure, including that for pumped storage.

At the 14th meeting of the Technical Committee, held on 13th Sept 2017, POSOCO presented the Model Regulations on Tariff Determination and Other Related Matters for Intra-State Hydro Generating Stations, and the same were endorsed by the Committee and recommended for consideration by FOR. Subsequently, the Model Regulations were endorsed by FOR at the 61st FOR Meeting held on 22nd Sept 2017. The Model Regulations can be found at Annexure-7 in Volume-II report.

Model Regulations - Key Highlights

- Annual Fixed Charges (AFC) comprise of :

    - Return on Equity
    - Interest on Loan
    - Interest on Working Capital
    - Depreciation
    - Operation & Maintenance Expense
- Return on Equity:
    - 15.5% for RoR (Run of River) Hydro Plants
    - 16.5% for Storage & Pumped Storage Type Plants
    - Additional 0.5% for timely completion
    - 1% deduction in case of commissioning without peaking/FGMO/PSS/Communication/Blackstart/Synchronous Condenser facility wherever applicable
- Annual Fixed Cost recovery through Two-Part tariff
    - Capacity Charge (50% of AFC); PAF (Plant Availability Factor) to be more than or equal to NAPF (Normative Plant Availability Factor)
    - Energy Charge (50% of AFC, Energy rate computed by using Design Energy)
- Deviation Charges to be computed as per Deviation Settlement Mechanism
- Submission of Undertaking prior to COD
    - Successful trial operation for 12 hours
    - Black Start Capability
    - Islanded Operation / House load operation
    - Dead bus charging and line charging capability
    - Auto synchronization
    - Peaking Capability (110 %)
    - Dynamic VAR support as per the capability curve
    - Frequency Response (Primary & Secondary)
    - Synchronous Condenser Mode of Operation wherever applicable
    - Pumped Mode of Operation wherever applicable
    - Part-load operation
    - Ramp-up capability
    - Ramp-down capability
    - AVR and Power System Stabilizer wherever applicable
- Scheduling
    - By 0600 Hrs, Submission from Station to SLDC for next day
    - By 0800 hrs: Entitlement of beneficiaries as per allocations
    - By 1000 hrs: Requisition in the Station by beneficiaries
    - By 1200 hrs: Optimized Injection Schedule for the Station and the drawal schedule of the beneficiaries from the Station
- Synchronous Condenser Operation
    - Demonstration of Synchronous Condenser Mode of Operation (SCMO) at-least once in a calendar month as per SLDC instructions

        - when voltage is more than 103% or less than 97% of the nominal value at the interface point of the station with the grid
    - Active power drawn during SCMO to be socialized and included in pooled transmission loss by the SLDC during preparation of state energy accounts
    - VARh exchange payable @ 25 p/kVArh subject to periodic review by the Commission
- Blackstart
    - Demonstration of Blackstart at least once every year
    - Testing of Diesel Generator sets (BSDG) for black start on weekly basis
    - Fuel stock (useable under black out conditions) to be maintained in sufficient quantity to operate at full for a minimum of 20 hours and/or at 50% of accredited capacity for 40 hours
    - Reimbursement of O&M expenses incurred during Blackstart
    - Lumpsum incentive of Rs. 0.5 Lakh for successful demonstration of Blackstart capability by the Station subject to certification by the SLDC

The Technical Committee strongly recommends that all states should embark on the exercise of better utilization of their hydro resources, by aligning state-level regulations with the Model Regulations as endorsed by this Committee and FOR.

ANNEXURE- MEETING MINUTES

MINUTES OF FIRST MEETING OF TECHNICAL COMMITTEE ON IMPLEMENTATION OF FRAMEWORK FOR RENEWABLES AT STATE LEVEL

Venue	:	CERC, New Delhi
Date	:	16-12-2015
List of Participants	:	At Annexure - I **(Enclosed)**

1. The first meeting of Technical Committee on implementation of framework for renewables at State level was held under chairmanship of Shri A. S Bakshi, Member, CERC on 16th December 2015.Shri Bakshi welcomed all the Members and highlighted the terms of reference of the Committee.

2. Ms. Shruti Deorah, Advisor (RE), CERC, presented Regulatory Roadmap for States to achieve reliable grid management and large-scale integration of Variable Renewable Energy sources. The presentation discussed agenda for the Committee, recent steps taken by CERC and the need to emulate complementary regulatory framework at the state level. She also informed that 6 states have already implemented Deviation Settlement Mechanism (DSM) in some form. A copy of the presentation is attached as **Annexure-II**.

3. Shri. S. K. SOONEE (CEO POSOCO) discussed the current frequency scenario, requirements and next steps for improved grid management, and elaborated on the complexities involved in Grid Management for the large interconnected Indian grid. He also expressed that challenges in India are different from the developed nations as they had a mature grid when renewable power emerged. A copy of the presentation is attached as **Annexure-III**.

Discussion

4. The Chairman requested the state representatives to briefly summarize the status of implementation of ABT and DSM in their respective states.

5. Shri. R.S. Rathore (RERC) informed that ABT regulations are already in place in Rajasthan. However, work to deploy ABT meters is still in progress and is expected to complete by 31st March 2016.

6. Shri S.A. Kumar (TERC) brought up the challenges being faced in Tamil Nadu to meter thousands of turbines. Tamil Nadu is currently pursuing metering at the pooling station level. CERC staff emphasized that once metering of all conventional generators and all pooling stations with RE generators is complete, implementation of DSM is feasible. Shri S.K.Chatterjee (JCRA, CERC) also underscored that it is best to initiate the process of drafting the regulations now so that they are ready in a few months by the time metering is complete.

7. The Members agreed that there is a need for a robust institution as a system operator, which should be neutral, independent, transparent, non-discriminatory and equipped with skilled manpower. Concept of Distribution System Operator (DSO) on bylines of SLDC was also elaborated.

8. Requirement of Technical Consultant or Partner to iteratively modify the software keeping pace with evolving regulations was discussed. The job of TC would be to provide necessary assistance in load forecasting and strategizing grid management.

9. It was suggested by members that for proper ring fencing of SLDC, it must be isolated from state control. Shri Lad (MERC) emphasized that this needs amendment to the Electricity Act.

10. It was concluded that ABT and DSM implementation in all states is the need of the hour. Proper Forecasting and Scheduling have to be focused upon.

Decision

11. After detailed discussion, there was a unanimous consensus on the need for :-

    (iii) implementation of Availability-Based Tariff (ABT) & Deviation Settlement Mechanism (DSM) in States;
    (iv) specifying Regulations on Forecasting, Scheduling and Deviation Settlement of Wind & Solar generating stations at the State level
    (v) creation of reserves at the State level; and
    (vi) introduction of Ancillary Services at the State level

12. It was also agreed that in the next meeting, SLDC Heads of 4 states viz Maharashtra, Gujarat, Rajasthan and Tamil Nadu, along with the representatives of respective State Commissions, shall present the status of implementation of ABT/DSM in the respective states.

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

Annexure I

LIST OF PARTICIPANTS

FIRST MEETING OF TECHNICAL COMMITTEE ON FRAMEWORK FOR IMPLEMENTAION OF RENEWABLES IN GRID

HELD ON 16.12.2015

1	Mr. A. S Bakshi, Member	CERC
2	Mr. S. K Soone, CEO	POSOCO
3	Mr. S Akshay Kumar, Chairman	TNERC
4	Mr. A. B Bajpai, Member	MPERC
5	Mr Deepak Lad, Member	MERC
6	Mr. P J Thakkar, Member	GERC
7	Mr. Anand Kumar, Chairman	Meghalaya ERC
8	Mr. P Rama Mohan, Member	APERC
9	Mr. Raghuvendra Singh Rathore, Member	RERC
10	Dr. Sushanta K. Chatterjee, JC(RA)	CERC
11	Mr. S.C. Shrivastava, JC(Engg)	CERC
12	Ms. Shruti Deorah, Advisor (RE)	CERC
13	Tanay Tarany, Research Associate	FOR

MINUTES OF SECOND MEETING OF TECHNICAL COMMITTEE ON IMPLEMENTATION OF FRAMEWORK FOR RENEWABLES AT THE STATE LEVEL

Venue	**:**	**CERC, New Delhi**
Date	**:**	**8-1-2016**
List of Participants	**:**	**At Annexure I Enclosed**

1. The second meeting of Technical Committee on implementation of framework for renewable at State level was held under chairmanship of Shri A. S Bakshi, Member, CERC on 8 January 2015.Shri Bakshi welcomed all the Members and recalled the decisions taken in First meeting held on 16 December 2016.

2. Ms. Shruti Deorah, Advisor (RE), CERC, presented a summary of conclusions of the last meeting along with a two pronged approach towards the implementation of Availability Based Tariff (ABT)/Deviation Settlement Framework (DSM) at the state level. The first step would be for FOR to facilitate creation of Model Regulations, for which a consultant might be hired by FOR Secretariat. The second step would be to undertake an exhaustive exercise at the state level, which will include gathering requisite data about state infrastructure and preparedness, modifying Model Regulations and adopting it with suitable adjustments, implementation of regulations, installation of required hardware, rolling out of software, etc. A copy of the presentation is attached as **Annexure-I**.

3. Shri. S. K. SOONEE (CEO POSOCO) stated that nuances of every state have to be understood while implementation of DSM. This requires manpower with required skill sets at each SLDC. He expressed that strengthening the manpower is need of the hour. It was also suggested that this matter be taken up for discussion at Forum of Regulators (FOR) meeting.

4. Shri Soonee also dwelled upon the challenges encountered in implementing DSM framework at the regional level, and suggested that those complexities be proactively tackled when implementation is undertaken at the state level.

Discussion

5. The Chairman requested the SLDC representatives to briefly summarize the status of implementation of ABT and DSM along with challenges and learnings in their respective states.

6. Shri. R.A.Sharma (MPLDC) informed that ABT started in MP in 2009. The fluctuations caused by wind are managed by bringing Hydro power as a balancing measure. MPLDC is responsible for open access, scheduling, metering and DSM accounting. The financial transactions are being done by MPPPMCL. A copy of the presentation is attached as **Annexure-II**.
   Shri A B Bajpai (MPERC) informed that Draft Forecasting regulations have been issued and hearing is due on 19 January 2016.

7. Shri Arvind Agrawal (SLDC, Rajasthan) brought up the challenges being faced in Rajasthan related to meter vendors. It was discussed that upcoming Renewable Energy Management Centres (REMC) shall have a major role to play. A copy of the presentation is attached as **Annexure-III**.

8. Shri Venkatesan (SLDC, Tamil Nadu) presented the current status of ABT implementation in Tamil Nadu. A copy of the presentation is attached as **Annexure-IV**.

9. Shri M. Satyamurti (SLDC, AP) presented the status of ABT in Andhra Pradesh. He elaborated that DSM is directly or indirectly already implemented for solar and wind generators in the state. A copy of the presentation is attached as **Annexure-V**.

10. Shri Jayant Kulkarni (SLDC, Maharashtra) presented the settlement mechanism adopted in Maharashtra illustrating the complexities involved. Maharashtra follows a DSM framework that is not linked to frequency, instead, is based on the concept of marginal pricing. It was underscored that the mechanism is not completely effective as PPA generators are not covered under the framework. A copy of the presentation is attached as **Annexure-VI**.

11. SLDC Gujarat sent their presentation via email, though no representative was able to attend (attached as **Annexure-VII**).

12. It was discussed that credibility of Qualified Coordinating Agency (QCA) shall be an important factor in the successful implementation of Forecasting regulations for renewable generators. States such as Maharashtra emphasized that more clarity is needed on screening QCAs and ensuring financial integrity of the process.

Decisions

13. There was a unanimous consensus on the need for putting in place ABT and Deviation Settlement Mechanism (DSM) at the earliest, along with the regulation on forecasting and scheduling of variable RE, at the State level.

14. Critical to all this is the need for strengthening SLDCs. The recommendations of Gireesh Pradhan Committeee Report on strengthening Load Despatch Centres should be implemented by all States to make RE integration a success. It was agreed that the Report shall be circulated to all SERCs by POSOCO. This report presents a comprehensive plan for staff and skill-building required at SLDCs.

15. It was agreed that Chairperson, FOR, shall be requested to hire a consultant to enable the Committee to draft model regulations for ABT/DSM for states.

16. For taking up planning and implementation of ABT/DSM at the state level, a small group headed by Mr. Soonee, CEO, POSOCO and comprising one representative each from SLDC, SERC and respective RLDC was formed. It was pointed out that Tamil Nadu is ready with draft regulation, and as such the group headed by Mr Soonee should forthwith take up the issues for Tamil Nadu. During the next one month, the group should take up at least two States and present its findings before the Committee.

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

LIST OF PARTICIPANTS: SECOND MEETING OF TECHNICAL COMMITTEE ON FRAMEWORK FOR IMPLEMENTAION OF RENEWABLES IN GRID held on 8.1.2016

1	Mr. A. S Bakshi, Member	CERC
2	Mr. S. K Sooney, CEO	POSOCO
3	Mr. S Akshay Kumar, Chairman	TNERC
4	Mr. A. B Bajpai, Member	MPERC
5	Mr Deepak Laad, Member	MERC
6	Mr. P J Thakkar, Member	GERC
7	Mr. P Rama Mohan, Member	APERC
8	Dr. Sushanta K. Chatterjee, JC(RA)	CERC
9	Ms. Shruti Deorah, Advisor (RE)	CERC
10	Mr G Venkatesan, SE	TNTRANSCO
11	Mr. S.C. Shrivastav, JC(Engg)	CERC
12	Mr. R A Sharma, SE	MPPTCL
13	Mr. Arvind Agrawal	SLDC, Rajasthan
14	Mr. A K Arya	SLDC, Rajasthan
15	Mr. S K Gupta	SLDC, Rajasthan
16	Mr. S C Saxena	POSOCO
17	Mr. B Bhanu Prasad	APTRANSCO
18	Mr. AKV Bhaskar, SE	SLDC,AP
19	Mr. M. Satyamurthy, Consultant	APERC
20	Ms. T Nirmala Mary, EE	TNTRANSCO
21	Mr. Jayant Kulkarni	SLDC, Maharashtra,
22	Mr. Tanay Tarany, RA	FOR

MINUTES OF THIRD MEETING OF "TECHNICAL COMMITTEE FOR IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"

Venue	:	CERC, New Delhi
Date	:	10-2-2016
List of Participants	:	At **Annexure I(Enclosed)**

1. The third meeting of Technical Committee on implementation of framework for renewable at State level was held under chairmanship of Mr. A. S Bakshi, Member, CERC on 10th February 2016.Mr. Bakshi welcomed all the members and appreciated the hard work done by the sub-groups.

2. Dr. S K Chatterjee, JC (RA), CERC presented a summary of conclusions of the last meeting. He also updated about the efforts made towards exploring the possibility of engaging consultants for supporting the Committee. That various agencies viz., USAID under the Greening the Grid programme, have offered to support with a technical Consultant.

Discussion

3. Mr. S.K. Soonee, CEO, POSOCO presented the experience and learning of the sub group's visit to SLDC-Kalwa on 23rd January, 2016 and SLDC-Chennai on 30th January, 2016. He appreciated the excellent cooperation from both SLDCs. He emphasized that the problems of SLDCs need to be understood. The nuances of both States were discussed in depth. The presentation is enclosed as **Annexure-II.**

4. Mr. Soonee emphasized that there is a huge scope of better utilization of Hydro plants as they provide the flexibility in generation which is a pre requisite to the integration of renewables given its infirm nature. It was agreed after discussion that State level regulations on hydro tariff should follow the CERC principles (viz., the principles of two part tariff and recovery of capacity charge based on providing 3 hours peak). This will encourage peak support.
5. He also focused on the need of proper energy accounting and metering. It was also proposed that India should adopt a 5 minute settlement period instead of 15 minutes for better granularity and ramp monitoring. Mr. P Rama Mohan, Member, APERC expressed the importance of proper testing and calibration of the meters.

6. Mr. Deepak Lad, Member, MERC, assured that MERC will issue the DSM regulation after analysing the recommendations made by the Committee. He also expressed that the Consultant, as proposed, must be able to provide a guaranteed support in the various facets involved in the implementation.

7. Mrs. A Axilium Jayamary, Director, TNTRANSCO expressed the concern over the source of funding of the proposed activities. Mr. Lad suggested the cost can be incorporated in ARR and PSDF can also be utilised. Mr. Bakshi suggested that 50% of funding may be used from PSDF in order to ensure seriousness amongst the SLDCs. Mr. Soonee emphasized the funds must be released only after certifying that order for equipments has been placed.

8. Mr. A. B Bajpai, Member, MPERC informed that MP has already issued draft Ancillary Services regulations in January 2016 and stakeholder comments have been invited.

9. It was felt that functions of QCA need more clarity. Dr. S K Chatterjee assured that a joint presentation shall be soon made to address the questions pertaining to QCA.

Decisions

1. It was agreed that Chairperson, FOR, shall be requested to authorize the Committee to hire a Consultant to support the Committee in accomplishing the tasks assigned to it. Furthermore, it was discussed that one Consultant per State shall be ideal to work through the entire process of planning and implementation of ABT/DSM at the State level.

2. It was agreed upon that the sub group needs to interact with more States to understand the specificities of implementation for every State. In continuance, it was proposed that Karnataka SLDC shall be visited on 15th February, 2016.

3. All intra-State entities (for instance, the generators) are not subject to deviation settlement at present even in States where ABT has been implemented. It was agreed that the causer pays principle should be followed and all entities responsible for deviation should be accounted for separately.

4. There is an urgent need for putting in place interface meters for intra-State entities. Losses in intra-State transmission should be computed. 15 minute accounting is a pre-requisite for seamless integration of RE. Meter should be the starting point of the exercise and the magnitude of investment required to put in place suitable meters should be identified immediately.

5. SERCs should direct the STUs to prepare metering/telemetry plan and send the proposal for part funding from PSDF.

6. Knowledgeable experts could be called for presentation in the next meeting, especially on QCA criteria and de-pooling arrangements for implementation of State level RE forecasting and scheduling.

7. The next meeting of the Committee shall be held on **18th March, 2016 at CERC.**

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

ANNEXURE - I

LIST OF PARTICIPANTS ATTENDED THE THIRD MEETING OF THE TECHNICAL COMMITTEE FOR "IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL" HELD ON 10.02.2016 AT THE CERC OFFICE, NEW DELHI

1	Mr. A. S Bakshi, Member	CERC
2	Mr. S. K Soonee, CEO	POSOCO
3	Mr. S Akshaykumar, Chairperson	TNERC
4	Mr. A. B Bajpai, Member	MPERC
5	Mr Deepak Lad, Member	MERC
6	Mr. P. Rama Mohan, Member	APERC
7	Mr. Raghuvendra S. Rathore, Member	RERC
8	Dr. Sushanta K. Chatterjee, JC(RA)	CERC
9	Ms. Shruti Deorah, Advisor (RE)	CERC
10	Ms. A. Axilium Jayamary, Director	TNTRANSCO
11	Mr. S.C. Shrivastav, JC(Engg)	CERC
12	Mr. Vivek Pandey	POSOCO
13	Mr. S.C. Saxena	POSOCO
14	Ms. T. Nirmala Mary, EE	TNTRANSCO
15	Mr. Saurabh Garg, RO	FOR
16	Mr. Tanay Tarany, RA	FOR

MINUTES OF FOURTH MEETING OF "TECHNICAL COMMITTEE FOR IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"

Venue	:	CERC, New Delhi
Date	:	01-06-2016
List of Participants	:	At **Annexure - I(Attached)**

1. The fourth meeting of Technical Committee for implementation of Framework for Renewables at State level was held under chairmanship of Mr. A. S Bakshi, Member, CERC on 1st June 2016.Mr. Bakshi welcomed all the members and informed that M/s. Idam Infrastructure Advisory Private Limited (Idam Infra) in consortium with The Energy Resources Institute (TERI) has been hired as Consultant to the Technical Committee. Dr. S K Chatterjee, JC (RA), CERC introduced Mr. Ajit Pandit, (Director, Idam Infra) to the committee members.

Discussion

2. Mr. S.K. Soonee, (CEO, POSOCO) presented the progress update and informed the committee about Sub-committee's visit to SLDCs of Maharashtra, Tamil Nadu, Karnataka and Delhi. Interaction with several other States happened via video conferencing. He further elaborated upon the meeting with Forum of Load Dispatchers (FOLD) along with the SLDC survey for benchmarking and scale of operations in which 25 entities participated (including DVC). Based on the findings of the Sub-committee, a draft report has been prepared and circulated. Subsequently, the learnings have been used to evolve a Model Energy Metering Accounting and Settlement System (E-MASS) (the presentation is **attached** as **Annexure-II).**
3. The importance of defining interface points and ensuring main, check and standby meters at all points was highlighted. In addition, Automatic Meter Reading (AMR) should be deployed, but currently only ten States have it. Similarly, communication links have to be strengthened to ensure optimum use of AMR.
4. Mr. Soonee emphasized that it is time that the concept of Distribution System Operator (DSO) should be introduced in India, especially with expected large scale deployment of rooftop solar projects. DSO will be an independent operator having no conflict of interest. Mr. A. B. Bajpai (Member, MPERC) suggested that DSO has to be acknowledged in the regulations. Mr. Deepak Lad (Member, MERC) expressed concern over the ambiguity between scope of SLDCs and DSO. It was clarified that DSO will report to SLDC and the State Regulator. In a way, DSO may act as sub-SLDC.
5. It was discussed that Hydro Power plants must be incentivized when used for peaking as they are supporting the grid during critical times. This may be incorporated in the overall tariff structure.

6. Mr. Soonee expressed his concern that during production cost modeling the RE production cost is taken as zero. This creates a discrepancy in the accounting and settlement. Secondly, it was underscored that no entity should be exempted from submission of deviation data irrespective of whether they are being penalized for default or not.
7. It was also proposed that India should adopt a 5 minute settlement period instead of 15 minutes for better granularity and ramp monitoring. Mr. R. R. Rathode (Member, RERC) expressed concern on the readiness of States to implement this. Mr. Soonee suggested that it can be implemented in a phased manner. This may sensitize the manufactures and SLDCs to adopt the same for further installations.
8. Mr. Soonee acknowledged that the Ancillary Services Regulations have benefitted the sector and the results are encouraging. He also emphasized that a slight error in metering will be always there and must be accepted within the limits as unsettled account.
9. Mr. D. B. Manival Raju (Member, KERC) informed that KERC has issued final Regulations on Scheduling, Forecasting and Deviation Settlement of RE sources.

Decisions

1. It was agreed that States shall give their feedback and comments on the draft report within 15 days.
2. Interaction of Sub-Committee with SLDCs in West Bengal, Rajasthan, Meghalaya is expected to be complete by 15th June 2016. Submission of final report to the Committee will happen by July 2016.
3. The Consultant shall visit Tamil Nadu and Madhya Pradesh and shall present their findings at the next meeting. The Consultant shall prepare Model Regulations and Procedures over the course of the project and guide the SLDCs in preparation of DPR for States, if required.
4. It was suggested that funds for roll-out of E-MASS may be requested from a Central Government fund, such as the PSDF. In this context, it was emphasized that the States must hire and build out the requisite team, as suggested by POSOCO, for planning and implementation at the State level.
5. It was agreed that there is an urgent need for an autonomous organization which will handle all Information Technology (IT) related projects and requests from system operators and manage a centralized database system for Power Sector. Such a body will have experts from IT and Power sector, akin to the Centre for Railways Information System (CRIS), that develops and manages all IT applications for Indian Railways. This may be one of the recommendations of the final report.

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

ANNEXURE - I

LIST OF PARTICIPANTS ATTENDED THE FOURTH MEETING OF THE TECHNICAL COMMITTEE FOR "IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL" HELD ON 01.06.2016 AT THE CERC OFFICE, NEW DELHI

1	Mr. A. S Bakshi, Member	CERC
2	Mr. S. K Soonee, CEO	POSOCO
3	Mr. S Akshay Kumar	TNERC
4	Mr. A. B Bajpai, Member	MPERC
5	Mr. Deepak Lad, Member	MERC
6	Mr. D. B Manival Raju	KERC
7	Mr. P. Rama Mohan, Member	APERC
8	Mr. Raghuvendra S. Rathore, Member	RERC
9	Mr. P J Thakkar, Member	GERC
10	Dr. Sushanta K. Chatterjee, JC(RA)	CERC
11	Ms. Shruti Deorah, Advisor (RE)	CERC
12	Mr. Ajit Pandit	IDAM INFRA
13	Mr. Akhil K Gupta, Engg. Division	CERC
14	Ms. Shilpa Agarwal, DC(Engg.)	CERC
15	Mr. Vivek Pandey	POSOCO
16	Mr. Rajiv Porwal	POSOCO
17	Mr. Jyotish K. Pal	IDAM INFRA
18	Mr. Tanay Tarany, RA	FOR

MINUTES OF FIFTH MEETING OF "TECHNICAL COMMITTEE FOR IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"

Venue	:	CERC, New Delhi
Date	:	15-07-2016
List of Participants	:	At **Annexure - I (Enclosed)**

1. The fifth meeting of Technical Committee on Implementation of Framework for Renewable sat the State level was held under chairmanship of Mr. A. S Bakshi, Member, CERC on 15thJuly 2016.Mr.Bakshi welcomed all the members and commended the works of the sub-committee with their report on SCHEDULING, ACCOUNTING, METERING AND SETTLEMENT OF TRANSACTIONS IN ELECTRICITY ("SAMAST").

Discussion

2. Mr. S.K.Soonee, (CEO, POSOCO) presented the summary of the SAMAST Report with an emphasis on its key findings among various States, operating procedures and recommendations. He further shared the results of the survey of SLDC activities in energy metering, scheduling, accounting and settlement at the intra State and inter-State level conducted by the sub-committee.

3. Mr. Soonee shared the recommendations and procedure based on the extensive discussions with stakeholders. The main recommendations were: Demarcation of Interface Boundary, Adequate Interface Energy Meters, Unified Energy Accounting System, Administration of Transmission Losses, STOA Registry and Clearing Agency, Transparency, Archival and Utilization of Energy Meter Data, Logistics and IT Infrastructure, Adequacy of Human Resource and Governing Structure. He stated that suggested time lines for each activity had been given in the report, the idea being that regulators and other involved agencies could ensure that the whole work is completed in a time bound manner.

4. Mr. Soonee laid emphasis on the similarity between the principles of energy accounting and financial accounting and its vitality for an error-free settlement system. He expressed his concern on the requirement of an agency like Centre for Railway Information Systems (CRIS) which shall cater to the customized requirements of the Load Despatch Centres and provide the IT solutions to stakeholders in the power sector. He also touched upon the need to have a clearing company for clearing and settlement of deviation accounts. He cited the example of Clearing Corporation of India in this regard.

5. It was discussed that the recommendations of the Pradhan Committee would be incorporated in the Human Resource requirements for SAMAST, to ensure demarcation between team requirements just for market operations vis-à-vis the entire SLDC.

6. Thereafter, Mr. Ajit Pandit (Consultant) presented the Implementation Aspects of DSM and Forecasting & Scheduling framework at State level.

7. The institutional structure of Qualified Coordinating Agency (QCA) was discussed at length among all the members. It was agreed that role of the QCA as an entity shall be defined in the detailed procedures to be prepared by POSOCO/SLDCs and their registration will be done by respective SLDCs.

8. The operationalization of virtual pool and de-pooling was also discussed with comments from all the members. It was agreed that the mechanism of transaction between the generators and QCA shall depend on their contractual agreements.

9. Recommendations related to Funding, Metering Arrangement and Mechanism for Deviation Settlement were showcased through use case illustrations by the Consultant and were discussed amongst the members.

Decisions

1. The Technical Committee adopted the "Report on SAMAST" and endorsed it to the Forum of Regulators for acceptance.
2. The Consultant shall review the Detailed Project Report (DPR) for Tamil Nadu and prepare a Model DPR for implementation of SAMAST with necessary modifications for adoption by Category B & C States.
3. It was agreed that there is an urgent need for finalization of Forecasting, Scheduling and Deviation Settlement Regulations at the State Level.
4. The next meeting of the Committee is proposed to be held in **2nd week of August 2016 at CERC.** It was suggested that SLDCs and STUs may be invited to the next meeting through video conferencing at POSOCO Office with a view to elicit their views on implementation of Scheduling, Accounting, Metering and Settlement of transactions in electricity.

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

ANNEXURE - I

LIST OF PARTICIPANTS ATTENDED THEFIFTH MEETING OF THE TECHNICAL COMMITTEE FOR "IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"HELD ON 15.07.2016 AT THE CERC OFFICE, NEW DELHI

1	Mr. A. S.Bakshi, Member	CERC
2	Mr. S. K.Soonee, CEO	POSOCO
3	Mr. S Akshay Kumar, Chairman	TNERC
4	Mr. A. B.Bajpai, Member	MPERC
5	Mr. Deepak Lad, Member	MERC
6	Mr. D. B.Manival Raju, Member	KERC
7	Mr. P. Rama Mohan, Member	APERC
8	Mr. Raghuvendra S. Rathore, Member	RERC
9	Mr. P. J. Thakkar, Member	GERC
10	Mr. S.C. Shrivastava, Chief (Engg.)	CERC
11	Dr.Sushanta K. Chatterjee, JC(RA)	CERC
12	Ms. Shruti Deorah, Advisor (RE)	CERC
13	Mr. K.Ramanathan	TERI
14	Mr. Ajit Pandit	IDAM INFRA
15	Mr. Shirish Garud	TERI
16	Ms. Shilpa Agarwal, DC(Engg.)	CERC
17	Mr. Vivek Pandey	POSOCO
18	Mr. Jyotish K. Pal	IDAM INFRA
19	Mr. Ankit Gupta, RA	CERC

MINUTES OF SIXTH MEETING OF "TECHNICAL COMMITTEE FOR IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"

Venue	:	NRLDC, New Delhi
Date	:	22-8-2016
List of Participants	:	At **Annexure I(Enclosed)**

1. The sixth meeting of FOR Technical Committee for Implementation of Framework for Renewables at State level was held under chairmanship of Mr. A. S.Bakshi, Member, CERC on 22nd August 2016.Officials of WRLDC, SRLDC, SLDCs of Gujarat, Maharashtra, Tamil Nadu, Karnataka and STU of Rajasthan (RVPN) joined the meeting through video conferencing. Mr.Bakshi welcomed all the members and informed that the SAMAST Report has been adopted by the Forum of Regulators (FOR) in the meeting held on 22nd July 2016. He further expressed the urgent need to expedite the adoption of Forecasting, Scheduling and Deviation Settlement for Solar and Wind Generators by the States and involvement of the State Load Despatch Centres (SLDCs) and State Transmission Utilities (STUs).

2. Dr. S.K. Chatterjee, JCRA, CERC, informed that six states have proposed draft Forecasting, Scheduling and Deviation Settlement Framework for Solar and Wind Generating Stations and KERC have issued the final Regulations. He summarized the discussions and decisions taken at the fifth meeting.

Discussion

3. Mr. Ajit Pandit (Consultant - Idam Infra) presented the Model Detailed Project Report (DPR) for SAMAST Framework based on the DPR issued by Tamil Nadu focusing on category B & C states as classified in the framework.

4. The model DPR classified the key cost components into five categories namely Hardware Components I & II, Software Components, Communication Components and Training, Capacity Building and Infrastructure Cost Components. The model DPR estimated the pan-India cost of implementation of the SAMAST framework at Rs. 196.32 crores. The detailed presentation is attached at **Annexure II.**

5. The case of Tamil Nadu with huge number of intra-state entities and interface points was discussed. It was clarified that the entities connected to the Discom network shall not be considered as individual state entities and will be subsumed within Discom as state entity. Those connected to the STU grid directly shall be considered as separate

intra-state entities. It was highlighted that minimum threshold limit for RE plants to be connected to CTU network is 50 MW.

6. The officials of RVPN informed that Rajasthan has floated a similar Request for Proposal as envisaged in SAMAST Report and shall be issuing the Letter of Intent (LoI) to the selected bidder shortly. The cost estimate of the project is approx. Rs. 39 crores (inclusive of meters, software and communication system).

7. The officials of Maharashtra SLDC mentioned that implementation of AMR is first priority and the pilot project has already started. They cited lack of manpower as a constraint for implementation of the framework.

8. MP SLDC informed that MPERC has issued Balancing and Settlement Code for ABT Mechanism which has been implemented w.e.f. October 2009. The Commission has also issued draft Forecasting, Scheduling and DSM Regulations for Wind and Solar generators, the public hearing process is complete and the final regulations will be issued shortly. There are 995 interface points within the state and 80-85% of the data is sourced through AMR. It was also informed that the tender for Supply, Installation, Testing & Commissioning of Availability Based Tariff, Open Access & MIS system has been issued.

9. Gujarat SLDC informed that Intra State ABT mechanism is in force since 2006 and the commercial settlement is operational since 2010. Further, ERP based system is in place since 2014. The data received through AMR is 75%. In addition they expressed concerns over the complexities arising due to repeated revisions of schedule.

10. Tamil Nadu have reviewed their DPR based on SAMAST framework and submitted a revised version seeking funds from Power System Development Fund (PSDF). The total cost estimate is Rs 39.2 crores (includes procurement of 8474 ABT Meters at a cost of Rs 26 crores).

11. Karnataka confirmed that all the interface points have been identified in the state.

12. The consultant also presented the way forward on important outstanding issues of State Level Forecasting and Scheduling Framework based on the consensus in the Fifth meeting of the Technical Committee. The presentation is placed at **Annexure III.**

13. Gujarat SLDC commented that the solar power plants within the state had single ownership and can instead employ a forecasting agency to comply with the regulatory requirement thereby mitigating the need for QCA. They reiterated their concern over the error calculation methodology.

14. Karnataka sought more clarification on the de-pooling aspect of the implementation framework.

15. Based on discussion among all the participants, the computation of deviation charges shall be on basis of 15 min time block. The Settlement cycle shall be one week and the truing up shall be on quarterly basis.

Decisions

1. It was agreed that the Technical Committee shall propose a resolution to the Forum of Regulators to direct all the SLDCs and STUs for implementation of SAMAST Framework.
2. Consensus was also reached on the implementation aspects for State level forecasting and scheduling framework. The salient points of discussion and decision are as under:
    1) Qualified Coordinating Agency (QCA)
        i. QCA shall be an empanelled State Entity
        ii. QCA shall provide schedules with periodic revisions on behalf of all the Wind/Solar Generators connected to the pooling station(s)
        iii. Each Pooling Station shall have one QCA. Regulatory oversight over QCA to be exercised through SLDC
        iv. QCA shall be responsible for coordination with STU/SLDC for metering, data collection/transmission and communication
        v. QCA shall undertake commercial settlement and de-pooling of payments on behalf of generators
        vi. SLDC to formulate Procedure for Empanelment/Registration of QCAs at state level, upon approval by concerned SERC
        vii. The technical eligibility criterion for QCA. The entity shall have an experience of at-least 2 years of metering, billing, consumer management in any domain with demonstrable IT resources and infrastructure
        viii. The financial eligibility criterion for QCA. Net-worth requirement shall be INR 1 lakh per MW with average annual turnover at INR 5 crores and positive profit after tax in past two years
        ix. Disputes between QCA and SLDC shall be subject to jurisdiction of respective SERCs. Disputes between QCA and the generators shall be settled mutually, failing which will be subject to jurisdiction of SERCs

    2) Operationalization of Virtual Pool and De-pooling Mechanism
        i. Virtual pool for RE generators within State DSM pool shall be operationalized
        ii. QCA to undertake settlement of only Deviation Charges at Pooling with State Imbalance Pool

iii. De-pooling shall be based on actual injection by the generators
iv. QCA to provide energy credit statement (monthly / weekly)

3) Funding the deficit in State Imbalance Pool
   i. Designing of state level Imbalance Pool with 'Non-Zero Sum' features is crucial. For covering the deficit in the overall pool, at the end of the year (if any), the SLDC may approach the National Funds such as PSDF or NCEF
   ii. In addition, SERCs may consider creating State level funding support mechanism to manage deficit
      a) Levy of System Benefit charges (paise/MWh) on all STUs
      b) Regulatory charges for shortfall in RPO Compliance

4) Mechanism for DSM for inter-state transactions
   i. Intra-state embedded entities selling inter-state may be managed on separate feeder connected to pooling substationDeviations for Inter-State and Intra-State transactions at Pooling S/S to be accounted for separately
   ii. Virtual Pool Accounting at State level shall exclude such Deviation Accounting for inter-State transactions
   iii. SLDC/State Energy Account shall provide separate Energy/DSM accounts for inter-State and intra-state transactions to QCA
   iv. QCA shall separately settle Deviation Charges with RE Generators for inter-State and intra-State transactions
   v. Reference rate for Deviation Charge computation of inter-State transactions may be APPC of host State

5) Metering Arrangement
   i. Metering infrastructure, metering and accounting practices need to be aligned across the states
   ii. Uniform practice for Energy Accounting for DSM computations should be adopted

3. The Consultant shallreview the revised DPR submitted by Tamil Nadu, the tender document and specifications issued by RVPN.
4. In the next meeting Model DSM regulations at State Level shall be discussed and consultation with RE generators is proposed.

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

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ANNEXURE - I

LIST OF PARTICIPANTS ATTENDED THE SIXTH MEETING OF THE TECHNICAL COMMITTEE FOR "IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"HELD ON 22.08.2016 AT THE NRLDC, NEW DELHI

1	Mr. A. S.Bakshi, Member	CERC
2	Mr. S. K.Soonee, CEO	POSOCO
3	Mr. S.Akshaya Kumar, Chairman	TNERC
4	Mr. P. Rama Mohan, Member	APERC
5	Mr. Raghuvendra S. Rathore, Member	RERC
6	Mr. P. J. Thakkar, Member	GERC
7	Mr. S.C. Shrivastava, Chief (Engg.)	CERC
8	Dr.Sushanta K. Chatterjee, JC(RA)	CERC
9	Ms. Shruti Deorah, Advisor (RE)	CERC
10	Mr.AjitPandit	IDAM INFRA
12	Mr.Jyotish K. Pal	IDAM INFRA
13	Mr. S. C. Saxena	NRLDC
14	Mr. R. K. Narang	NRLDC
15	Mr. S. S. Barpanda	NRLDC
16	Mr.Alok Kumar	NRLDC
17	Ms. SiddhaMahajan	TERI
18	Ms. Snekalatha A.K.	TERI
19	Mr. Ajay Philip	NRLDC
20	Ms. LakhbirKaur	NRLDC
21	Ms. KavitaParihar	NRLDC
22	Mr. Debasis De	NRLDC
23	Mr. H. K. Chawla	NRLDC
24	Mr. S. R.Narasimhan	NRLDC
25	Mr. Ankit Gupta	CERC
26	Mr.TanayTarany	FOR

MINUTES OF SEVENTH MEETING OF "TECHNICAL COMMITTEE FOR IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"

Venue	:	Upper Ground Floor, Conference Hall CERC
Date	:	04-11-2016
List of Participants	:	At **Annexure I(Enclosed)**

1. The seventh meeting of Technical Committee on Implementation of Framework for Renewables at the State level was held under the Chairmanship of Shri A. S Bakshi, Member, CERC on 4th November 2016. Shri Bakshi welcomed all the members and reiterated the need for speedy implementation of SAMAST Report. There has not been significant progress in this regard. Shri Bakshi requested the Committee o deliberate on ways for faster implementation of SAMAST report.

2. Dr. S.K. Chatterjee, JCRA, CERC, briefed the Committee on the agenda items which included the status of the SAMAST report, DPR of Tamil Nadu, Model DSM Regulation – broad principles and Web based RPO tool compliance.

Discussion

3. Shri Ajit Pandit, Director, IDAM made a presentation on Comparison of F&S framework at State Level and the Model DSM Regulation at the State Level. Copies of the presentation are annexed at Annexure-II and Annexure-III. He briefed about the States which have issued the regulations (Draft & Final). The Key design issues of the Model DSM regulation were discussed in details.

Discussion on State Level DSM Design:-

4. There was a broad consensus on the need for identification of State entities, interface boundaries; coverage of entities (Generators (RE/Non RE), DISCOMS, OA Consumers, CPPs) under DSM pool; uniform definition of 'Deviation' and 'Error at inter-state and intra-State Level; Non-Zero Sum based DSM Pool Design, etc.

5. On the point of applicability of this regulation, Shri Soonee proposed that all the generators including Nuclear and Hydro stations should be covered. These generators could also be requested to provide the schedule of their generation even if they are exempt from any charges. It was also emphasized that the accounting settlement must be done on weekly basis.

6. The aspects related to DSM pricing, volume limits, Area Control Error etc were debated and after discussion, it was decided to deliberate on these issues in greater detail in the next meeting.

7. Shri. Soonee also suggested to consider the following points while preparing the model regulation:-

    a. How deviations are calculated worldwide?
    b. Can ACE (Area Control Error) be used in place of deviation?
    c. Impact of deviation on frequency, etc.

8. Dr. Chatterjee informed that more simulations will be carried out before finalizing the model.

9. Shri Bakshi proposed constituting a sub-committee for overseeing implementation of the DSM regulations in States. Shri. S.K Soonee, proposed that there could be representatives from each RLDC, SLDC and from NLDC in the committee. Dr. S.K. Chatterjee added that a representative from RPC, STU and from the FOR Technical Committee could also be included.

10. In order to expedite the process of implementation at the State level, it was agreed that Chairperson, FOR/CERC could be requested to write to Chairpersons of all SERCs/JERCs for implementation of DSM. Thereafter, SERCs/JERCs could either issue Orders or the Secretaries of the SERCs could write to the STUs and SLDCs for the implementation of DSM at the State level, and for this purpose to constitute a committee and submit periodical reports to SERCs.

Presentation on Energy Storage and LVRT:

11. Shri Rajsekhar Budhavarapu, Head Wind Business & CTO (Renewable Investments) IL&FS Energy Development Company Limited, made a presentation to the Committee wherein he discussed the need, relevance and barriers involved in integration of Energy storage with wind and solar PV projects. He elaborated that given the intermittent nature and high targets of Renewables in India, Indian grid operators will have to face huge challenges due to frequent ramping up/down of generation- both at the System level and at the regional level. In this context, Energy Storage provides various benefits for which otherwise CTU/STU/Discoms/System Operators incur cost for reliable power & grid stability. It plays an important role in Ancillary services Spinning reserve, Energy generation Time Shift, Scheduling and Peak demand reduction. It was agreed detailed study would be needed to examine the regulatory intervention needed. The Committee appreciated the presentation

    The detailed presentation is attached at **Annexure –IV.**

12. Dr Pukhraj Singh, Head of Segment, Electrical & Electronics Design, Suzlon discussed upon the "Investment required for Up gradation and Timeframe for Implementation of Project " – Compliance of Wind Turbines. Referring to CERC order dated 5th Jan 2016, w.r.t LVRT feature , it was mentioned that LVRT should be implemented for all wind turbines (except Stall Types) commissioned before 15.04.2014 having installed capacity equal to or more than 500 KW within 2 years. It was also stated that Technical solution development and its testing is expected to be completed not before June 2018 since LVRT testing can only be accomplished during high wind season. It was estimated that 40-50 Lakh/turbine would be needed.

13. The Committee opined that the technical requirements must be guided by CEA and for regulatory requirements, CERC may be approached. The detailed presentation is attached at **Annexure –V**

Other Issues

14. At the end of the meeting, Shri Ajit Pandit, Director, IDAM informed the Committee that their tenure was coming to an end by November 30th, 2016 and requested for an extension in the contract to enable them to complete the tasks.

15. The Committee thereafter deliberated on the Extension of Contract period for the present Consultant (Idam and TERI). It was agreed that scope of TOR has been widened vis-à-vis what was mandated by the Forum of Regulators in its 56th meeting and therefore, the time frame has to be further extended. The committee members expressed that the same Consultant must be allowed to work as to avoid any disconnect from the work progressed till now.

Decisions

a) The consultant could present a detailed analysis of DSM Pricing, Volume Limit, ACE etc in the next meeting. The Model DSM Regulations finalized by the Committee could be taken up in the next meeting of FOR.

b) It was decided that the Chairperson, FOR/CERC could be requested to write to Chairpersons of all the SERCs/JERCs for implementation DSM Regulations. SERCs/JERCs can then either issue orders / write to the STUs, SLDCs for implementation of DSM in their State .

c) A sub-committee be constituted for the implementation of the DSM regulations in states with one Representative each from concerned RLDC, SLDC, NLDC, STU and from the FOR Technical Committee. Shri. S.K Soonee could steer/ coordinate the sub-committee.

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

Annexure-I

LIST OF PARTICIPANTS ATTENDED THE SEVENTH MEETING OF THE TECHNICAL COMMITTEE FOR "IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"HELD ON 04.11.2016 AT THE CERC, NEW DELHI

1	Shri. A. S.Bakshi, Member	CERC
2	Shri. S. K.Soonee, CEO	POSOCO
3	Shri. S.Akshaya Kumar, Chairman	TNERC
4	Shri P. Rama Mohan, Member	APERC
5	Shri.Raghuvendra S. Rathore, Member	RERC
6	Shri. Deepak Lad, Member	MERC
7	Shri A.B Bajpai, Member	MPERC
8	Shri D B ManiwalRaju, Member	KERC
9	Shri P. J. Thakkar, Member	GERC
10	Shri S.C. Shrivastava, Chief (Engg.)	CERC
11	Shri Sushanta K. Chatterjee, JC(RA)	CERC
12	Smt..Rashmi Nair, DC (RA)	CERC
13	Shri Akhil K Gupta DC(Engg.)	CERC
14	Smt..Shilpa Agarwal, DC(Engg.)	CERC
15	Shri AjitPandit	IDAM INFRA
16	Shri. Rajsekhar Budhavarapu	IL&FS

17	Shri Shirish Garud	TERI
18	Smt..Snekalatha A.K.	TERI
19	Shri A.K Saxena	TERI
20	Shri IshwarMangal	SUZLON
21	Shri Sandeep Lonkar	SUZLON
22	Shri Pukhraj Singh	SUZLON
23	Shri Vikalp Vats	SUZLON
24	Shri S. R.Narasimhan	POSOCO
25	Shri Sidhharth Arora	CERC
26	Shri Ankit Gupta	CERC
27	Shri. Tanay Tarany	FOR

MINUTES OF EIGHT MEETING OF "TECHNICAL COMMITTEE FOR IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"

Venue	:	Upper Ground Floor, Conference Hall CERC
Date	:	02-12-2016
List of Participants	:	At **Annexure - I (Enclosed)**

1. The Eighth meeting of Technical Committee on Implementation of Framework for Renewables at the State level was held under the Chairmanship of Shri A. S Bakshi, Member, CERC on 2nd December 2016. Shri Bakshi welcomed all the members and participants of the meeting.

2. Dr. S.K. Chatterjee, JCRA, CERC, welcomed all and briefed that in the last technical committee, there was consensus on most of the design issues of Model Deviation Settlement Mechanism (DSM) regulation except Price Vector and Volume Limit. He informed that these two aspects would be covered in the present meeting. Dr. Chatterjee also briefed about developing Pan India web tool for RPO compliance. USAID has developed a web tool for Rajasthan which can be replicated for other states also with the support of FOR technical committee.

Discussion

Presentation on Model DSM Regulation:

3. Shri Ajit Pandit from Idam Infra presented the Model DSM Regulation for States. On Volume Limits, he highlighted the example of six states namely, Maharashtra, Gujarat, Rajasthan, Tamil Nadu, Karnataka and West Bengal. The concept of Zero crossing (change of sign of deviation for schedule) aimed at controlling gaming by buyer or seller, was also discussed.

4. The issue of deviation limit and Volume Cap was also discussed in detail. The consultant proposed to keep the limit as 150MW / 200MW / 250MW or 12%, whichever is lower, as per CERC regulations. Shri Soonee underscored the need for introduction of the concept of Area Control Error (ACE) which is given by the formula $\Delta P + k\Delta f$ and suggested that going forward this formula should be used to set the Volume Cap for deviation

5. The structure of Model DSM was discussed. Shri Soonee proposed to move all the tables and numbers to the Annexure. He also proposed to include provision of audit of Accounts.

6. Dr. Chatterjee proposed that while the overall principles of DSM at the Intra-State Level should be in sync with the framework at the Inter-State Level, wherever required, flexibility should be provided to the states to adjust keeping in view the number of entities, magnitude of generation and load in the State, etc.

Presentation on Development of Generic Renewable Purchase Obligation Compliance Web-tool

7. Shri Balawant Joshi, Managing Director – Idam Infra presented on Development of Generic Renewable Purchase Obligation Compliance Web-tool which is being developed under MNRE USAID PACE-D TA Program.

8. The issues regarding development of this web tool for all the states were discussed. Different states have different regulations, for example, Maharashtra exempt 1-5 MW OA consumers from RPO Obligation. Shri Shirish Garud, Director – TERI informed that they are developing a similar tool for MNRE but at a National level and not at State Level.

9. It was decided that the consultant will compile data in respect of six RE rich states and develop the model for them. It was also proposed that TERI should work in coordination with the Idam Infra in this regard.

Decisions

Draft Model DSM Regulations are framed by FOR in order to develop model framework at state level that would facilitate scheduling, energy accounting and deviation settlement while ensuring Intra-state Grid discipline. Draft DSM Regulations was discussed during Technical Committee's meetings.

After detailed discussion the model DSM regulations were agreed in principle with the following design parameters:-

1. Objective of model DSM Regulations is to maintain grid discipline and grid security as envisaged under state Grid Code through commercial mechanism for Deviation Settlement through drawal and injection of electricity by users of the grid.

2. Applicable to all Buyers and Sellers which includes Generating Stations – Thermal, Hydel, Renewables, Distribution Licensees, Deemed Distribution Licensees (SEZs, Railways) and Exempt Licensees (RESCOsOpen Access Users,Captive Users .

3. Definition of Deviation and %Error is aligned with CERC DSM Regulations for ensuring compatibility of State DSM Regulations with regional/national level.

4. Limits of Deviation in the model DSM Regulations are as proposed below;
   a. No over-drawal/under-injection when Frequency below 49.9 Hz
   b. No under-drawal / over-injection when frequency is above 50.05 Hz
   c. Volume Cap for Intra-state Entities proposed as under:
      i. For Generators /Sellers : 10 MW or 12% of Schedule, whichever lower

ii. For DISCOMs/Buyers: X Limit or 12% of Schedule, whichever lower

iii. In case of schedule is less than 40 MW, Volume cap of 5 MW or 12% of schedule, whichever higher.

iv. Additional Charges at rate of 20%, 40%, 100% of Applicable Deviation Charges in steps of deviation 12%-15%, 15%-20%, >20% or X+10 .MW, X+ 20 MW, > X+ 20 MW

5. Provisions of State Grid Code and State OA Regulations shall be applicable for Declaration, Scheduling and ensuring elimination of gaming.

6. Pricing Framework for State Entity is proposed as below:-

i. Charges payable (over-drawal/under-injection) and receivable (under-drawal/over-injection) for each time-block with slope of 50 paise/unit per 0.01 Hz

ii. Linked to average frequency for each time block (15 min duration) in steps of 0.01 Hz over range from 49.9 Hz to 50.05 Hz

iii. Change in sign of deviation once every 6 time blocks- violation attracts additional charges @10% of deviation charges applicable for the continuance of violation

iv. Capping of Deviation Charges for Generating Stations regulated by SERC

v. Cap Rate of Paise 303.04/ unit (indicated- to be linked through imported coal power plant)

vi. Charges for deviation for buyer/seller in a time block in excess of 12% of the schedule or 10 MW shall be zero.

vii. If schedule of Buyer /Seller in any time block is less than or equal to 40 MW-charges for deviation in excess of 5 MW shall be zero.

7. State Deviation Pool Account will be operated by SLDC and Surplus will be transferred to 'State Power System Development Fund' at the end of month.

8. State Power Committee shall prepare Statement for Deviation Charges on Weekly basis and State Load Despatch Centres shall operate & maintain 'State Deviation Pool Account Fund.

9. It was decided that the next Technical Committee meeting will be held on **23rd December 2016 at Chennai.**

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

Annexure-I

LIST OF PARTICIPANTS ATTENDED THE EIGHT MEETING OF THE TECHNICAL COMMITTEE FOR "IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL" HELD ON 04.11.2016 AT THE CERC, NEW DELHI

1	Shri. A. S.Bakshi, Member	CERC
2	Shri. S. K.Soonee,	POSOCO
3	Shri KVS Baba, CEO	POSOCO
4	Shri S. R.Narasimhan	POSOCO
5	Shri. S.Akshaya Kumar, Chairman	TNERC
6	Shri P. Rama Mohan, Member	APERC
7	Shri. Deepak Lad, Member	MERC
8	Shri P. J. Thakkar, Member	GERC
9	Shri S.C. Shrivastava, Chief (Engg.)	CERC
10	Shri Sushanta K. Chatterjee, JC(RA)	CERC
11	Smt. Rashmi Nair, DC (RA)	CERC
12	Smt. ShilpaAgarwal, DC(Engg.)	CERC
13	Shri ShirishGarud	TERI
14	Smt.Snekalatha A.K.	TERI
15	Shri A.K Saxena	TERI
16	Shri Ajit Pandit	IDAM INFRA
17	Shri Anant Sant	IDAM INFRA

18	Shri Balawant Joshi	IDAM INFRA
19	Shri Anurag Mishra	USAID
20	Shri Sidhharth Arora	CERC
21	Shri Ankit Gupta	CERC

MINUTES OF NINTH MEETING OF "TECHNICAL COMMITTEE FOR IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"

Venue	:	Upper Ground Floor, Conference Hall, CERC
Date	:	29-12-2016
List of Participants	:	At **Annexure - I (Enclosed)**

1. The Ninth meeting of Technical Committee on Implementation of Framework for Renewables at the State level was held under the Chairmanship of Shri A. S Bakshi, Member, CERC on 29th December 2016.

2. Dr. S.K. Chatterjee, Jt Chief (RA), CERC, welcomed all the participants. He briefed the Committee on the agenda items which included 'Preparedness of RPO Monitoring Web-tool' and 'Update on SAMAST implementation in Andhra Pradesh.'

Discussion

I. Presentation by IDAM and USAID on Development of Generic Renewable Purchase Obligation Compliance Web-tool

1. Shri Balwant Joshi from Idam Infra presented the Generic Web-tool for RPO compliance (**Annexure - II**). Shri Joshi highlighted comparison of 6 States, namely, Maharashtra, Gujarat, Rajasthan, Tamil Nadu, Karnataka and Andhra Pradesh, on their RPO compliance.

2. Various challenges regarding RPO compliance such as ensuring that targets are met, Non-compliance to be brought to notice, absence of monitoring mechanism for Obligated Entities (OE) other than DISCOMs etc., were underlined. The need for an innovative, process-driven and technology based solution to address these challenges, was reiterated.

3. Further, the following issues were discussed:-

a) **RPO as Percentage of Consumption or Input Energy**-The practices followed in States for computation of RPO percentage for OE were discussed. It emerged that RPO is computed as a percentage of sales, in some States while in others it is based on percentage of input energy. It transpired that in so far as DISCOMS are concerned, even if 'sales' are used as reference for RPO computation, the energy at sales level will have to be grossed up by T&D losses to arrive at the purpchase of RE by DISCOMS. This is the same as input energy. As such, it would be desirable to compute RPO for DISCOMS as a percentage of energy input, uniformly across States.

Shri S.K Soonee, Advisor POSOCO, opined that for OA consumers RPO percentage should be based on its schedule.However, it was felt that all OA purchases may not

necessarily be based on schedule. After discussion, it was agreed that for OA and CPP consumers, RPO should be computed as a percentage of metered consumption.

b) **Rooftop Solar Projects as RPO Compliance** - Shri Deepak Lad, Member MERC, raised the point of crediting the generation (Gross) from Rooftop Solar Projects to the DISCOMs for the purpose of their Solar RPO, to which Dr. S.K Chatterjee, Jt Chief (RA), CERC confirmed that FOR model guidelines have already recommended this dispensation. After discussion, it was agreed that the FOR Secretariat could write to MoP to suitably incorporate this in Tariff Policy, to ensure its uniform aplication across the country.

c) **Non-uniformity among States in eligibility of Obligated Entities (OEs) -**In Maharashtra, OEs areDISCOMs, OA consumers with Contract Demand more than 5MVA and CPP having installed capacity of 5MW or above whereas in Rajasthan and Andhra Pradesh, all DISCOMs and OA consumers and CPPs with installed capacity of 1MW and above are termed as OE. Difficulty in monitoring was cited as the reason for such provisions. JC(RA), CERC stated that with the RPO compliance Web-tool, the monitoring would become easy and all DISCOMs, OA and CPP consumers irrespective of any lever of contract demand / Installed capacity should be recognissed as OEs as per the sprit of the Act. The members endorsed the suggestion.

In case of Karnataka, there are different RPO targets for different DISCOMs. The need for uniformity of RPO target in terms of percentage of input energy was highlighted.

d) **RPO Implementing and Monitoring Agencies** - For different States, there are different RPO implementing agencies. For example, for Maharashtra and Gujarat it is MEDA and GEDA respectively and for Tamil Nadu and Andhra Pradesh, it is TANTRANSCO and APTRANSCO respectively.

In Maharashtra, a Grid Coordination Committee (GCC) has been constituted for monitoring RPO compliance. It was felt that the States could choose either of the options-of having a Committee on lines of Grid Coordination Committee (GCC) or an SNA for implementing and compliance monitoring of RPO in States. It was decided that the selected agency / committee should submit a quarterly report on compliance status to the State Commission.

e) **Data Verification by OE** - The issue of verification of data submitted by the OE was discussed. It was informed that in Gujarat, the Electrical Inspectors are verifying the data submitted by CPPs.

It was suggested that Electrical Inspectors could verify the data for CPPs and SLDCs could verify for other OEs. Further, it was decided that the consultant will develop a standard format for data verification as part of the web tool.

f) **Regulatory Intervention** – The consultant proposed Regulatory interventions by way of delegating powers to SNA to levy penalty on OEs under Section 142 (Punishment for non-compliance of directions by Appropriate Commission) of Electricity Act 2003 if they fail to submit the data. However, members felt that this would not be legally feasible. The process under Section 142 can be exercised only by the Commisssion after following due process of law and natural justice.

g) **Web-Tool Hosting** – Discussions were held on the ownership of hosting the web-tool. Shri Soonee argued that it is important to identify the required resources and skill sets like for this activity to which the consultant clarified that they would provide the detailed requirement in next meeting.

Further, it was decided to define the required regulatory changes in the RPO regulation of Rajasthan and Gujarat so that by April 2017, the web-tool is ready for these 2 States (which can act as a role model for other States to follow).

The Consultant confirmed that they could give Live demo for Rajasthan after 10 Jan 2017.

h) **IT Capabilities and Credentials** - It was suggested that the consultant should ensure the robustness of the IT tool being developed. For this, they should clearly articulate their IT capabilities and credentials in terms of security audit and dispsute/error free web-tool.

II. *Presentation on Draft DPR on Implementation of SAMAST Report for Andhra Pradesh*

4. Presentation on Draft DPR on implementation of SAMAST report for Andhra Pradesh was made by the representatives of APTRANSCO.

5. APTRANSCO informed that the Draft DPR has been prepared as per the recommendations made in the SAMAST report and presented Budgetary Cost Estimates under different heads as shown below:

S. No.	Item	Cost in INR Cr.
1	Hardware Component – I & Communication (Including ABT Meters, CTs, PTs, Calibration Meters, AMR Instrumets Facility, Infrastructure, Installation and Testing)	162.35
2	Hardware Component – II	1.91
3	Software Component	5.11
4	Communication Component	3.53
5	Infrastructure Dev. Component	3.43

6	Training & Capacity Building	1.17
	Total	**177.5**

A total budgetary cost of INR 177.5 Cr has been estimated of which about INR 150 Cr. is for replacement of CT/PT resulting from shifting of Substation metering points from LV side to HV side as recommended in SAMAST report.

However, APTRANSCO confirmed that they are already metering at LV side of the transformer and have installed 15 minutes time block wise meters along with CT/PT of required accuracy class.

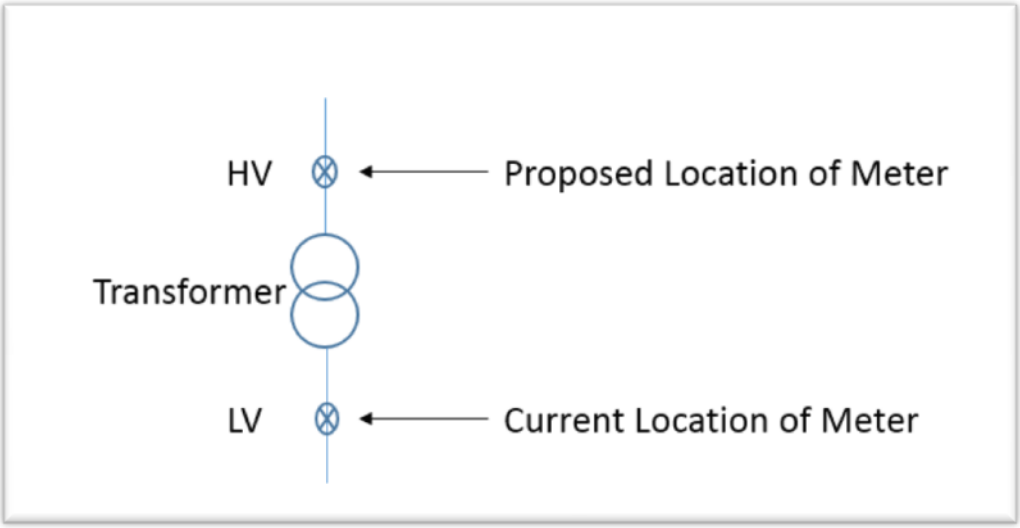
On the issue of location of meters, Member (Technical), MERC stated that in most of the States the losses of transformers are booked to transmission utilities.

The representatives of APTRANSCO clarified that in AP also, transformer losses are currently booked to transmission utilities. However, once the meter is shifted to HV side, that too incurring additional cost of Rs. 150 Cr., the transformer losses would be booked to distribution licensee.

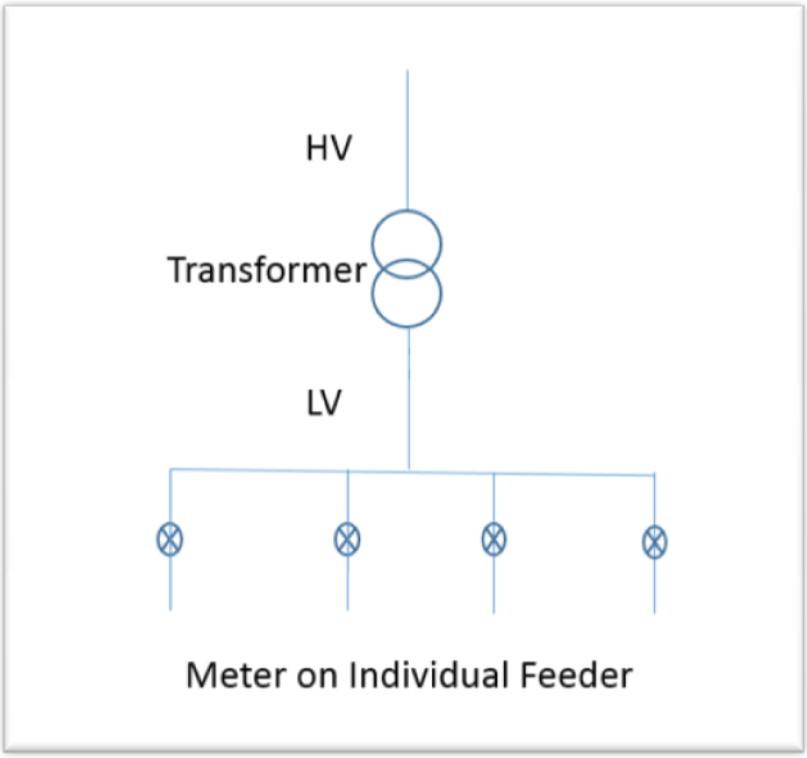
Smt. Shilpa Agarwal, Dy. Chief (Engg.) CERC, enquired about the need for shifting meter to the HV side of the transformer to which ShriSoonee clarified that metering is preferable on HV side of the transformer as there will be less metering points. He stated that in case where there are multiple LV feeders and if metering is done on each LV feeder, then the number of points which are to be metered will increase substantially and will be difficult to monitor. To this, the representatives from APTRANSCO clarified that in their case the number of metering points remains the same as that of metering on HV side as they are metering on LV side of the same transformer and not on individual feeders.

The same has been represented below:

AP System



Other Option



The members of the Committee discussed this issue and it was agreed that shifting of measuring points from LV to HV side is not required in the instant case and hence the replacement of CT/PT is also not required.

It was also decided that a clarification will be issued on the SAMAST report wherein both the options will be given to States - either to follow the method being practiced by Andhra Pradesh or shifting measuring points from LV side to HV side.

It was also agreed that CEA metering standards for procurement and installation of any new meters/equipment at the interface points may be followed.

6. As the current DPR of AP does not include any future RE plans, suggestions were made to factor in the STU's expansion plans and the future addition of RE generation.

7. The following way forward was suggested in the context of the DPR:-

a) Based on the above discussion, the DPR should be revised by APTRANSCO. The revised estimates for Hardware (Including ABT Meters, Calibration Meters, AMR Instruments Facility, Infrastructure, Installation and Testing), Software, Communication Component, Infrastructure Development Component, Training and Capacity Building Component would be around Rs.28 crores.

b) APTRANSCO should write to PSDF for funding and parallely write to APERC for its approval.

c) APTRANSCO should simultaneously initiate the tendering process for procurement of equipment.

Representatives from AP TRANSCO agreed that the above activities will be completed by 15th January, 2017.

8. It was suggested that APERC should write to State Government/SLDC to immediately fulfill the man power requirement for better efficiency and management of SAMAST implementation.

III. Impact of RE integration

Dr. Chatterjee informed that FOR in its meeting held on 16th December, 2016 at Raipur referred the matter raised by WBERC Chairperson on impact of RE integration to the Technical Committee for detailed examination. It was decided that this may be discussed in the next meeting. It was also agreed that the balancing and deviation settlement mechanism in the State of West Bengal, including the manner of utilization Purulia Pump Storage for balancing, be discussed in the meeting.

Decisions

a) **RPO as Percentage of Consumption or Input Energy** – For DISCOMS, it would be desirable to compute RPO as a percentage of energy input, uniformly across States.

   For OA and CPP consumers, RPO should be computed as a percentage of metered consumption

b) **Rooftop Solar Projects as RPO Compliance -** FOR Secretariat could write to MoP to suitably incorporate the provision of crediting generation (Gross) from Rooftop Solar Projects to the DISCOMs for the purpose of their Solar RPO in Tariff Policy, to ensure its uniform application across the country.

c) **RPO Implementing and Monitoring Agencies -** States could choose either of the options - of a committee on lines of having Grid Coordination Committee (GCC) of Maharashtra or an SNA for implementing and compliance monitoring of RPO in States. The selected agency / committee should submit a quarterly report on compliance status to the State Commission.

d) **Data Verification by OE -** It was suggested that Electrical Inspectors can verify the data for CPPs and SLDCs can verify for other OEs. The consultant will develop a standard format for data verification as part of the web tool.

e) **Web-Tool Hosting -** To define the required regulatory changes in the RPO regulations of States so that by April 2017, the web-tool is ready for at least 2 States viz., Rajasthan and Gujarat (which can act as a model for other States to follow)

f) **SAMAST Implementation** - A clarification will be issued on the SAMAST report wherein both the options will be given to States - either to follow the method being practiced by Andhra Pradesh (metering on LV side of the transformer and not on individual feeders) or shifting measuring points from LV side to HV side.

g) The issue of Impact of RE Integration' referred by the FOR would be taken up in the next meeting, along with the issue of balancing and deviation settlement mechanism in the State of West Bengal including the manner of utilization of Purulia Pump Storage for balancing.

9. It was decided that the next Technical Committee meeting will be held on **20th January 2017 at Kolkata in West Bengal.**

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

Annexure-I

LIST OF PARTICIPANTS ATTENDED THE NINTH MEETING OF THE TECHNICAL COMMITTEE FOR "IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"HELD ON 29.12.2016 AT THE CERC, NEW DELHI

1	Shri. A. S.Bakshi, Member	CERC
2	ShriD.B.ManiwalRaju, Member	KERC
3	Shri P. Rama Mohan, Member	APERC
4	Shri. Deepak Lad, Member	MERC
5	ShriA.B.Bajpai, Member	MPERC
6	Shri KVS Baba, CEO	POSOCO
7	Shri. S. K.Soonee, Advisor	POSOCO
8	Shri S.C. Shrivastava, Chief (Engg.)	CERC
9	DrSushanta K. Chatterjee, JC(RA)	CERC
10	Shri A.K Sil, Jt Advisor (Engg.)	WBERC
11	Shri S.R.Pandey, Legal Advisor	GERC
12	Smt. ShilpaAgarwal, DC(Engg.)	CERC
13	Shri AKV Bhaskar	APTRANSCO
14	V. Sreedhar Reddy	APTRANSCO
15	Smt. Snekalatha A.K.	TERI
16	Shri A.K Saxena	TERI
17	ShriAjitPandit	IDAM INFRA

18	Shri Balawant Joshi	IDAM INFRA
19	Smt. Ruchi Gupta	IDAM INFRA
20	Shri N.Y.DineshBabu, Consultant	USAID PACE-D Program
21	Shri Siddharth Arora	CERC
22	Shri Ankit Gupta	CERC
23	Shri Tanay Tarany	CERC

MINUTES OF THE TENTH MEETING OF THE "TECHNICAL COMMITTEE" FOR "IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"

Venue : West Bengal Electricity Regulatory Commission (WBERC)
FD-41, Paura Bhavan, 3rd Floor
Sector-III, Bidhan Nagar
Kolkata - 700 106

Date : 20.01.2017

List of Participants : At **Annexure-I** (enclosed)

The Tenth Meeting of the Technical Committee on "Implementation of Framework on Renewables at State Level", was held under the Chairmanship of Shri A.S. Bakshi, Member, CERC on 20.01.2017 at WBERC, Kolkata. Shri A.S. Bakshi, Chairman, Technical Committee extended a warm welcome to all Members of the Committee. He thanked the Chairperson, WBERC for hosting the meeting at WBERC, Kolkata. The Chairperson, WBERC also welcomed all the Members of the Committee and wished fruitful deliberations over the day.

The Joint Chief (RA), CERC, briefed the Committee about the deliberations and decisions taken during the 9th Meeting of the Technical Committee held on 29.12.2016 at New Delhi.

In the context of the draft DPR for Implementation of SAMAST Report for Andhra Pradesh as discussed in the last meeting, the Member, APERC updated the Committee about the revised estimates for the project. It was stated that a sum of Rs. 67 Cr. would be required for implementation of SAMAST in Andhra Pradesh, which includes Rs. 27 Cr. for hardware, software, communication components, infrastructure development components, training and capacity building component etc.; and Rs. 40 Cr. towards CT/PT meters.

Agenda 1: Presentation and Discussion on "RPO web tool by the Consultant, FOR" and "Regulatory changes in State level RPO Regulations; Live demo for the State of Rajasthan".

Representative of the consultants (M/s.Idam Infra) made a presentation (enclosed as **Annexure-II**) highlighting the regulatory interventions required for rolling out the web tool for monitoring compliance of RPO. The consultant also highlighted he hardware and software requirements for rolling out the web tool. Thereafter a demo of the web tool done for

Rajasthan was given and functionalities of the web tool for monitoring compliance of RPO were also explained.

After deliberation, the following were agreed upon by the Committee.

Consensus:

1. **Mandatory RPO compliance reporting through web portal**: Appropriate provisions be incorporated in the RPO Regulations of respective SERCs / JERCs mandating RPO compliance reporting through the web portal. Following clauses may be incorporated in the RPO Regulations by SERC.

   For the purpose of RPO Compliance monitoring and reporting, the State Agency shall formulate procedures and develop RPO Webportal within six months from the date of notification of these Regulations.

   All Obligated Entities shall mandatorily register themselves with RPO Webportal and shall furnish requisite information to State Agency through RPO Webportal in the manner and form, as prescribed under the Procedures to be formulated by State Agency.

   Electrical Inspectorate and Nodal Agency for Open Access (SLDC/STU or Distribution Licensee, as the case may be) or Third Party Verifier appointed by State Agency, shall verify and confirm the data submissions by Obligated Entities from time to time in the manner prescribed under Procedures to be formulated by State Agency.

   The State Agency shall submit Quarterly Report of status of RPO Compliance by Obligated Entities in the State to State Commission.

   Failure to provide necessary information, data, reports by Obligated Entities & stakeholders shall attract penal actions under Section 142 of EA 2003.

2. **RPO as Percentage of Consumption or Input Energy**: It transpired that in so far as DISCOMS are concerned, even if 'sales' are used as reference for RPO computation, the energy at sales level will have to be grossed up by T&D losses to arrive at the purchase of RE by DISCOMS. This is the same as input energy. As such, it would be desirable to compute RPO for DISCOMS as a percentage of energy input, uniformly across States.

   As regards consumption by OA and CPP consumers is concerned, it was agreed that RPO should be computed as a percentage of metered consumption recorded at drawal/consumption point. Following clauses may be incorporated in the RPO Regulations by SERC:

(i) In case of Distribution Licensee as Obligated Entity, RPO target percentage shall be applicable on the Energy Input for concerned Distribution Licensee (i.e. Energy Sales grossed up for transmission and distribution losses).

(ii) In case of any other Obligated Entity (other than Distribution Licensee), RPO target percentage shall be applicable on the actual Electricity Consumption (excluding consumption supplied by Distribution Licensee) recorded at Drawal point or Consumption point of such Obligated Entity.

3. **Rooftop Solar Projects as RPO Compliance** - As regards the point of crediting the generation (Gross) from Rooftop Solar Projects to the DISCOMs for the purpose of their Solar RPO, it was agreed that following Model Conditions may be incorporated in the RPO Regulations/Net Metering Regulations, as appropriate:-

   The quantum of electricity generated by the Eligible Consumer from the Roof-top Solar PV System under the Net Metering arrangement shall, if such Consumer is not an Obligated Entity, qualify towards meeting the Solar RPO of the Distribution Licensee.

   Provided that the quantum of electricity consumed by the Eligible Consumer from the Roof-top Solar PV System under the Net Metering Arrangement shall qualify towards his compliance of Solar RPO, if such Consumer is an Obligated Entity.

   The Eligible Consumer shall install, at his own cost, a Solar Generation Meter conforming to the applicable CEA Regulations at an appropriate location to measure the energy generated from the Roof-top Solar PV system, if he is an Obligated Entity and desires that such energy be counted towards meeting its RPO.

   The Distribution Licensee shall install, at its own cost and with the consent of the Eligible Consumer, a Solar Generation Meter conforming to the applicable CEA Regulations at an appropriate location to measure the energy generated from the Roof-top Solar PV System if it desires that such energy be counted towards meeting its RPO. The Solar Generation Meter shall be maintained by the Distribution Licensee at its cost.

4. Efforts should be made to incorporate these provisions in the State level Regulations at the earliest and the framework of web tool based RPO monitoring and compliance should be rolled out. Technical Committee Members advised that similar RPO Web Portal should be developed for Gujarat, so that RPO Web-tool is ready for at least two states (which can act as model for other states) by April, 2017.

5. In addition, standard requirements for web hosting of web tool / portal may also be specified.

Agenda 2(a): Presentation by WBSLDC on "Balancing and Deviation Settlement Mechanism in the State of West Bengal".

Representative of WBSLDC made a presentation before the Committee on "Balancing and Deviation Settlement Mechanism in the State of West Bengal" (enclosed as **Annexure-III**). It was conveyed that CERC principles of Deviation Settlement Mechanism have been adopted in West Bengal. However, the State has witnessed negative pool on some occasions. The Committee deliberated upon the matter and the following emerged.

1. The Model DSM Regulations already address the issues relating to DSM Pool management including the volume limit, etc, as under:-

The over-drawal or under drawal of electricity by any Buyer during a time block shall not exceed 12% of its scheduled drawal or [X] MW, whichever is lower, when grid frequency is between range of '49.90 Hz and above to below 50.05 Hz.'

The Volume Limit of [X] MW for distribution licensee(s) and Buyers shall be determined as under:-

i. *Minimum of (12% of schedule, (Peak Demand of Distribution Licensee or Buyer / ∑NCPD) x State Volume Limit)*
   Where NCPD (Non-Coincident Peak Demand) represents the sum of Peak Demand of Distribution Licensee(s) and Buyer(s) subject to condition stipulated under following sub-clause (iii).
ii. *State Volume Limit shall be linked to Volume Limit (L) applicable to the State as per CERC DSM Regulations and its amendments thereof*
iii. *Where Peak Demand of the Distribution Licensee shall be recorded Peak Demand in the previous Financial Year or Projected Peak Demand of Buyer in ensuing Financial Year, whichever is higher;*

Provided that no over drawal of electricity by any buyer shall be permissible when grid frequency is "below 49.90 Hz" and no under drawal of electricity by any buyer shall be permissible when grid frequency is "50.05 Hz and above".

The under-injection or over-injection of electricity by Seller shall not exceed following when grid frequency is "49.90 Hz or above and below 50.05 Hz":

i. *12% of the scheduled injection or [10] MW, whichever is lower for a Seller*

Provided that in case schedule of a Seller, in a time block, is less than or equal to [40] MW, under-injection / over-injection in a time-block shall not exceed [5] MW, when grid frequency is "49.90 Hz or above and below 50.05 Hz".

2. The Model DSM Regulations would be circulated to all SERCs shortly and West Bengal could consider the provisions, to address the issues being faced in the State, in the Regulations.

Agenda 2(b): Presentation by WBERC on "Impact of RE Integration".

Representative of WBERC made a presentation on "Accommodation of RE Power by 2022" (enclosed as **Annexure-IV**). In order to meet the revised Solar RPO target of 4223 MW for 2021-22 and to accommodate the RE generation, the conventional thermal generation is required to be flexed by putting 25-year-old thermal units on two shift operation, operating the 15 year-old-plants at 55% of full load capacity during day peak and running the generating stations which are less than 15 years vintage, at 70%. It was stated that the above measures to accommodate RE power would have an impact and raise the power purchase cost by 42.13 paise per unit. In addition, the financial impact owing to implementation of new environmental norms is expected to be around 45 to 55 paise per unit on generation tariff. The Committee deliberated upon the matter and the following emerged.

1. Appropriate load forecast is required to be carried out to arrive at the accurate load duration curve. This would facilitate proper generation unit commitment including backing down or flexing of generation capacity to meet the required load.

2. JC (RA), CERC suggested that the scenario as presented by West Bengal - *of low load during day time in West Bengal and generation of solar power for the same part of the day* - calls for a framework for cooperation among States for effective sharing of resources. The Committee while appreciating the observation suggested that FOR may evolve a blue print in this regard by availing services of a consultant.

3. It was informed that POSOCO and NREL, USA are jointly carrying out a study on similar issues and it was decided that the representatives of POSOCO / NREL may be invited to make a presentation before the Committee in its next meeting.

Agenda 3: Other Issues

TNERC Chair stated that at the State level, the Discoms, OA consumers and CPPs are given separate RPO targets and on certain occasions, some of these OEs (especially CPPs) exceed their RPO target. He suggested that the overall achievement of RPO targets by all OEs may be taken together so as to facilitate the Discoms to take benefit of the excess RPO achieved by the OA consumers and CPPs within their jurisdiction. The Committee noted the proposal for further discussion at a later date.

WBERC Chair suggested that FOR should initiate a study on the measures to reduce the cost of power.

On conclusion of the meeting, Shir A S Bakshi, Member CERC thanked the Chairperson, West Bengal Electricity Regulatory Commission (WBERC) and his team for their painstaking efforts to host the meeting at Kolkata. He also thanked all the dignitaries present in the meeting.

The meeting ended with vote of thanks to the Chair.

Annexure-I

LIST OF PARTICIPANTS ATTENDED THE TENTH MEETING OF THE TECHNICAL COMMITTEE FOR "IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL" HELD ON 20.01.2017 AT WBERC OFFICE, KOLKATA.

1.	Shri A. S.Bakshi, Member	CERC
2.	Shri S. Akshayakumar, Chairperson	TNERC
3.	Shri R.N. Sen, Chairperson,	WBERC
4.	Shri P. Rama Mohan, Member	APERC
5.	Shri P.J. Thakkar, Member	GERC
6.	Shri D.B. Manival Raju,Member	KERC
7.	Shri A.B.Bajpai, Member	MPERC
8.	Shri Deepak Lad, Member	MERC
9.	Dr. Sushanta K. Chatterjee, JC(RA)	CERC
10.	Shri S.S. Barpanda, Additional General Manager	POSOCO
11.	Shri P. Mukhopadhyay, General Manager	WRLDC
12.	Shri Dibyendu Bhattacharya, Superintending Engineer	SLDC, West Bengal
13.	Shri Balawant Joshi, Managing Director	IDAM INFRA
14.	Shri Ajit Pandit, Director	IDAM INFRA

MINUTES OF ELEVENTH MEETING OF "TECHNICAL COMMITTEE FOR IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"

Venue	:	Rajindra Hall, ITC Grand Chola Hotel, Chennai-600032l
Date	:	28-03-2017
List of Participants	:	At **Annexure –I (enclosed)**

The Eleventh meeting of Technical Committee on Implementation of Framework for Renewables at the State level was held under the Chairmanship of Shri A.S. Bakshi, Member, CERC on 28th March 2017. Shri A.S. Bakshi, Chairman, Technical Committee extended a warm welcome to all Members of the Committee. He thanked the Chairperson, TNERC for hosting the meeting at Chennai. The Chairperson, TNERC also welcomed all the Members of the Committee and wished fruitful deliberations over the day.

2. Shri Bakshi expressed his opinion that Technical Committee has been constituted for a specific purpose and success of this Committee lies in demonstrating cases of successful implementation of the activities covered under the mandate namely, Implementation of SAMAST, Forecasting, Scheduling and Deviation Settlement Mechanism for RE, Interstate ABT/ DSM Framework at state level, Ancillary Services at state level and operationalization of web portal for RPO compliance monitoring. It has been more than a year this Committee has been constituted and tangible results in terms of implementation are seen only in couple of states. He urged the members to make sure that the activities detailed as part of the mandate for the Committee be at least implemented in the States that are represented in this Technical Committee.

Discussion

1. Agenda No. 1: Status of Implementation of SAMAST Report

TANTRANSCO/SLDC Tamil Nadu made a presentation (enclosed as **Annexure II**) on detailed status update on implementation of SAMAST recommendations in the State, including ABT meters, Automated Meter Reading (AMR) project, software requirements, etc. It was stated that Rs.11.98 Crores have been already sanctioned from PSDF for implementation of intra-state ABT, and PSDF funding may kindly be granted for the purchase orders placed before the date of sanction of PSDF by MoP. Additional funds for procuring forecasting tools shall be requested in due time.

APERC member informed that APTRANSCO has prepared the DPR with cost estimate, and has written to NLDC on 27th March 2017 seeking support from PSDF for the implementation of SAMAST. Revised estimate indicated in the letter is Rs.52.723 Crores.

Rajasthan and Karnataka members informed that SLDC/STU in their States is initiating action in this regard. Rajasthan member added that LoI has already been issued, and the tender document for implementation shall be finalized by September 2017. Additionally, the State will finalize the Forecasting & Scheduling (F&S) Regulations by June 2017.
Karnataka shall provide detailed updates at the next meeting, scheduled to be held in Bangalore in May 2017.

2. **<u>Agenda No. 2:</u> Status of Implementation of Regulations on Forecasting, Scheduling and Deviation Settlement**

TANTRANSCO/SLDC Tamil Nadu made a presentation (enclosed as **Annexure III**) on grid integration of wind and solar energy in the State, including constraints and associated costs. They underscored that forecasting helps to make renewable energy appear more like conventional power. Tamil Nadu highlighted that they have more than 10000 MW of installed RE in its State and of which the contribution of wind is about 7700 MW (~76%) and about 1580 MW of Solar (~15%). Further they highlighted that the Central Generating Stations maintained PLF of about 80% but the State Generating stations have PLF of about 45%. Accommodation of wind during the high wind season results in high Deviation, Surrendering of CGS, Backing down of power purchased from LTA/MTOA Generator, purchase of high cost power from IPPs, backing down of State run thermal stations. As a result, TANGEDCO has to accommodate wind generation by losing commercially to the tune of about Rs. 622 Cr. and is seeking support from MNRE.

To improve the spinning reserves, TN has about 3000MW of pumped storage in pipeline (in addition to Kadamparai)

TNERC presented on the issues and challenges arising in drafting F&S Regulations for Tamil Nadu (presentation enclosed as **Annexure IV**). ShriAkshaya Kumar, Chairperson TNERC, acknowledged that draft F&S and DSM regulations initiated by TNERC need to be revamped in light of learnings from deliberations of the Technical Committee. Considering large penetration of RE generation at embedded/distribution level, need to review separate treatment for balancing and OA transactions may also be explored. TNERC Chairperson sought support of a Consultant from the Technical Committee in the matter.

The Committee noted the request and discussed various options and agreed that the feasibility for extending support to TNERC as extension of ongoing support & compensation thereof will be explored, upon due process and approvals.

3. **<u>Agenda No. 3:</u> Update on Web Portal for RPO Compliance Monitoring**

The Consultant informed the Technical Committee about completion of security audit and hosting of RPO Webtool on RRECL website for Rajasthan. The Consultant also gave

presentation on status update on development of Generic RPO webtool Beta version. It was informed that upon testing of Generic RPO Webtool, the same can be hosted on FOR website and modalities for the same can be discussed separately with concerned web hosting team of FOR. Further, it was informed that discussions for roll out in Gujarat with concerned agencies GERC/GEDA have been scheduled in early April 2017.

4. **Agenda No. 4: Study on Grid Integration of RE conducted under Indo-US Greening the Grid (GTG) Project**

Shri S.R. Narsimhan,AGM, POSOCO, made presentation (enclosed as **Annexure V**) giving overview of the GTG project, comprehensive analysis using PLEXOS model and key findings of the study were discussed. Impact of 175 GW RE penetration into Indian Grid under different scenarios and its implications on Grid operations and potential strategies to operate thermal/hydel generating stations and resultant outcomes in terms of costs/savings etc. were discussed. The study involved participation by the SLDCs of six RE rich states, CEA, CTU and POSOCO from India and NREL, LBNL and USAID from US.

POSOCO stated that these draft results were shared in a meeting taken by Secretary Power on 15th Feb 2017, by Chairperson CEA on 28th Feb 2017 and by Secretary MNRE on 28th Feb 2017. The suggestions received in these meetings have been taken note of. The final report would also incorporate the increase in Heat Rates on account of part loading of coal fired plants to 55%.

Shri Sen observed that the study should also cover the impact of increase in power purchase cost for Utilities, increase in cost on account of technical performance (part load of thermal) and additional maintenance costs.

The need for factoring in reactive compensation requirement of the transmission grid with high RE penetration and backing down of thermal generating stations at various nodes was also reiterated.

Shri Soonee clarified that this is the first time such a comprehensive modeling exercise covering multiple states/control areas have been undertaken. Under the next stage of study, further detailed exercise addressing above observations can be undertaken.

Members appreciated the studies and felt that fixed costs also need to be factored in either in this or as a separate study. Chairperson WBERC remarked that instead of retiring old thermal units, efforts could be made to modify the same to provide additional flexibility. POSOCO emphasized the need for using tools such as PLEXOS (used in the current study) for further studies such as optimal capacity expansion, transmission planning studies as well as for areas like hydro scheduling etc. at the state and regional level.

5. **Agenda no. 5: Introduction of 5 Minute Time Block – Rationale, Preparedness and Costs (towards metering and related infrastructure) and Benefits, and way forward**

A copy of the presentation made by POSOCO is enclosed at **Annexure- VI**. The presentation covered the need for implementing a 5-minute scheduling and settlement at the Inter State Transmission System (ISTS) level considering the variability of load (particularly at the hourly boundary) and the high Renewable Energy (RE) penetration in the coming years. The issue of 15-minute scheduling and settlement at the ISTS level was settled way back in January 2000 with the landmark Availability Based Tariff (ABT) order by CERC. Subsequently w.e.f. 1st April 2012, the Power Exchanges also moved to a 15-minute price discovery in the Day Ahead Market (DAM) instead of hourly which was a significant shift.

Worldwide, it has been recognized that 5-minute scheduling and settlement offered alot of advantages, particularly in terms of reduction of requirement of reserves, price discovery and bringing out the value of flexibility. Currently, tertiary reserves ancillary services have been implemented at the ISTS level where actions at the power plant happen 16-30 minutes after the same is advised by NLDC. Secondary regulation services through Automatic Generation Control (AGC) are soon expected to be introduced with a pilot project for NTPC, DadriStage-II project scheduled to roll out in May 2017. This would necessitate moving to at least 5-minute settlement for the plants providing secondary regulation through AGC.

It was emphasized that the decision for 5-minute scheduling and settlement at the ISTS level need not come in the way of SAMAST implementation at the intra state level. All that is required is that the states implementing SAMAST at the intra state level factor the 5-minute periodicity in the metering as well as software being procured for scheduling and settlement. Discussions are also on at CEA level for amending the CEA Metering Regulations to this effect.
Members appreciated the need to move to 5-minute scheduling and settlement. For working out the modus operandi, it was decided that a sub-group would be constituted comprising CEA, CTU, RPCs, POSOCO and CERC Staff which would examine these issues in further detail and submit its report to the FOR Technical Committee.

6. <u>Agenda No. 6:</u> Development of Model RPO Regulations for SERCs

Proposed draft for amendment in RPO regulations, as deliberated during the 10th Meeting was tabled. There was general consensus on the proposed draft (the same was circulated under background note for 11th Meeting). It was felt that respective SERCs should incorporate suitable amendments in their RPO Regulations to this effect.

7. <u>Agenda No. 7:</u> Framework for Co-operation among States for Optimum Utilization of their Generation Resources

The issue was discussed amongst the members. However, it was felt that to operationalise such a framework, it is necessary to ensure political support. The same had been raised in the Southern Zonal Council meeting chaired by the Hon'ble Union Home Minister held on 28th Dec 2016 at Thiruvananthapuram. Subsequently, Joint Secretary, Transmission, Union Ministry of Power had taken a meeting on 10th Feb 2017.

After discussion, it was decided that sub-groups could be constituted in the Northern Region, Western Region and Southern Region (the three RE rich regions) headed by the Member Secretaries of the respective Regional Power Committees (RPCs). The Sub-groups should examine the feasibility and modality of co-operation among States in the respective region for ensuring optimum utilization of generation resources with least cost options for balancing across the region. The Sub-groups are to submit their findings before the Technical Committee.

8. **<u>Agenda No. 8:</u> Presentation by NIWE on Wind Forecasting initiatives in Tamil Nadu**

Shri A.G Rangarajan presented on the Wind Power Forecasting Technology (enclosed as **Annexure–VII**). Various approaches and their associated uncertainties for wind power forecasting were discussed. NIWE's indigenous Forecast Model was also discussed during the presentation. The Committee made a note of the presentation by NIWE.

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

Annexure-I

LIST OF PARTICIPANTS ATTENDED THE ELEVENTHMEETING OF THE TECHNICAL COMMITTEE FOR "IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"HELD ON 28.03.2017 AT THE ITC GRAND CHOLA HOTEL, CHENNAI

1	Shri. A. S.Bakshi, Member	CERC
2	Shri S. Akshayakumar, Chairperson	TNERC
3	Dr. M.K Iyer,Member	CERC
4	Shri T.M. Manoharan, Chairperson	KSERC
5	Shri Ismail Ali Khan, Chairperson	TSERC
6	Shri Rabindra Nath Sen, Chairperson	WBERC
7	Shri D.B. Manival Raju, Member	KERC
8	Shri P. Rama Mohan, Member	APSERC
9	Shri P.J. Thakkar, Member	GERC
10	Shri R.P Barwar, Member	RERC
11	Shri S.C. Shrivastava, Chief (Engg.)	CERC
12	Dr Sushanta K. Chatterjee, JC(RA)	CERC
13	Shri S. K.Soonee, Advisor	POSOCO
14	Shri S R Narasimhan, AGM	POSOCO
15	Shri Ajit Pandit, Director	Consultant

MINUTES OF ELEVENTH MEETING OF "TECHNICAL COMMITTEE FOR IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"

CORRIGENDUM

Para 3 of '**Agenda No. 1: Status of Implementation of SAMAST Report'** under Discussion section shall read as under:

Rajasthan and Karnataka members informed that SLDC/STU in their States is initiating action in this regard. Rajasthan member added that LoI has already been issued, and the implementation will be achieved by September 2017. Additionally, the State will finalize the Forecasting & Scheduling (F&S) Regulations by June 2017.

MINUTES OF TWELFTH MEETING OF FORUM OF REGULATORS (FOR) "TECHNICAL COMMITTEE FOR IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"

Venue	:	The Chancery Pavilion 135 Residency Road Bengaluru
Date	:	30th May 2017
List of Participants	:	At **Annexure – I (enclosed)**

The Twelfth meeting of FOR Technical Committee on Implementation of Framework for Renewables at the State level was held under the Chairmanship of Shri A.S. Bakshi, Member, CERC on 30th May 2017. He extended a warm welcome to Chairperson KERC, Members of the Committee, special invitee as well as officers from various institutions. He thanked the Karnataka Commission for hosting the meeting in Bengaluru and for the warm hospitality. He stated that the Committee had come a long way in pursuance of its objectives. He also emphasized the need to implement the recommendations of SAMAST report right away, underlining that majority of the items in the final checklist *(copy of the checklist at Annexure – II)* need minimal monetary resources for implementation.

Thereafter, Chairperson KERC also welcomed the dignitaries and the officers, and wished fruitful deliberations over the day. He acknowledged the benefit of SAMAST roadmap to Karnataka SLDC and other stakeholders. He stated that grid integration of renewable energy (RE) and grid management is a challenge, which can be addressed through appropriate regulations and interventions such as SAMAST. He said Karnataka is enthused by the support received by states such as Tamil Nadu and Andhra Pradesh, and his team will speed up the preparation of DPR. He updated the Committee that Forecasting & Scheduling (F&S) Regulations (for solar/wind generators) and Deviation Settlement Mechanism (DSM) were going to be implemented in the State by June 1st. He also requested the Committee to examine the mismatch between load peak vis-à-vis the supply peak from Solar projects.

Shri A.S.Bakshi thanked Karnataka for leading the States on Regulations for Forecasting, Scheduling (F&S) and Deviation Settlement for Solar/Wind generators. He enlisted the following critical next steps for grid integration of RE in Karnataka and other States:

- Creation of a State Power Committee, on the lines of National Power Committee
- Each State to have a small group to oversee implementation of SAMAST and RE regulations, comprising representatives from SLDC, concerned RLDC and RPC.
- Operationalizing of primary reserves at the State level
- Operationalizing of Ancillary Services at the State level

Discussion

1. Agenda #1: Update on SAMAST for State of Karnataka

Shri R.Thyagaraj, Superintending Engineer, KPTCL, presented the status of implementation of SAMAST framework in Karnataka *(copy of presentation at Annexure-III)*. He updated that SCADA RTU has been provided to 94% of all stations (sub-stations, receiving and generating stations). KPTCL has submitted a DPR for optical fibre communication to all its major generating stations to CEA for PSDF funding. Additionally, DPR for implementation of all SAMAST recommendations shall be submitted to CEA by June 25th, 2017. The target date for completion of implementation of the framework is July 2018.

2. Agenda #2: Karnataka F&S Regulations for Wind/Solar generators

Shri Thyagaraj also shared the challenges of RE integration in the State grid *(copy of presentation at Annexure-IV)*. He elaborated on preparedness of SLDC for rolling out forecasting and scheduling processes. He updated that a State pool account has been opened by SLDC for collection of deviation settlement charges, bids for REMC are in the process of being finalized, and the work is expected to be awarded shortly. It was also stated that real time SCADA data is available from all pooling stations, though manual downloads shall be required for generators. 70 out of 108 state entities are now providing a forecast. Shri Ramakanth, Consultant (Tech), KERC, continued the presentation on important issues of managing RE on the grid, viz control area for balancing, error band, etc. He also presented the demand curve vs RE generation, and brought up associated challenges in the forecasting and scheduling process.

Shri Bakshi appreciated the progress made by the State on both fronts. Some concerns brought up during the presentation were addressed, such as benefit of aggregation and regional cooperation for balancing. Shri Ajit Pandit, Consultant to the Technical Committee, and Shruti Deorah (Advisor-RE, CERC) also highlighted that going forward, it would be advisable to have in the KERC F&S Regulations specific provisions for QCA, treatment of embedded state entities selling power outside the state, and a path to more aggressive deviation bands for new generators.

Other member States also provided an update on the above issues. Tamil Nadu Chairperson Shri. Akshayakumar stated that the State has made progress on implementation of SAMAST. The DPR has been finalized and approved. The tender process would be complete in 3-6 months. Communication infrastructure needs more work. The State wants to ensure that the SLDC is fully equipped before the F&S Regulations for RE are rolled out.

Rajasthan Chairperson Shri Hiremath and member Shri Barwar apprised the Committee that a proposal of INR 11.8 crores for implementation of SAMAST has been approved by PSDF. The F&S Regulations are in advanced stage of finalization.

Telangana State Commission Chairperson Shri Ismail Khan stated that the State is yet to initiate efforts on both fronts. He also requested the Committee for some assistance in preparation of DPR and framing DSM Regulations.

West Bengal Chairperson Shri Rabindra Nath Sen mentioned that the State primarily has biomass and cogeneration plants, and is yet to initiate deployment of solar and wind projects on a large scale. He apprised the Committee about the workshop held in Kolkata on cycling of thermal power plants. Several stakeholders, including companies like GE, Siemens, BHEL etc participated in deliberations on how to operate coal plants in two-shift mode, or at 50%/20% PLF. In this regard, Shri A.S.Bakshi suggested that it is important to adopt a holistic approach to this topic. One way forward is to identify units that are capable of meeting new environmental norms from Ministry of Environment and Forests (MoEF) while operating at low PLFs.

It was also emphasized by Shri Bakshi that an ongoing dialogue with all States needs to be established for keeping track of their progress on these fronts. Specifically a status update on SAMAST and F&S Regulations for RE should be sought from all States before the next meeting. It was reiterated that DPR preparation at the State level should be prioritized, and for implementation, the States shall surely be supported from the Centre via PSDF funding. Additionally, Shri Bakshi and Shri Soonee concurred that implementation of SAMAST in States shall be coordinated and tracked by the Forum of Load Dispatchers (FOLD).

3. Agenda #3: Update on web portal for RPO compliance

Shri Ajit Pandit,of Idam Infra, updated the Committee on the progress of implementation of the RPO tool in Gujarat *(copy of presentation at Annexure-V)*. He outlined the new features that have been included as per request from GEDA, as well as state-level peculiarities that have necessitated the tool to be more flexible. He underscored that ownership by the State is paramount, and that use of RPO tool must be made mandatory for it to achieve the objectives. Members also debated whether carry forward of RPO allowed by some states should be reflected in the interface. While there was a general consensus that carry forward of RPO was not desirable, Shri S.C.Shrivastav and Shri S.K.Soonee suggested that this capability may be incorporated in the software, which can remain hidden to begin with. They expressed that it would be difficult to add such a requirement retrospectively, in case a State Commission so requires. Nevertheless, it was concluded that this feature should be removed.
The members of the Committee expressed their consent for roll-out of the tool to their States and promised their support for implementation in respective States. Additionally, Shri A.S.Bakshi asked the Consultant to revert with modalities of possible way forward for

deployment in all States. This shall be further discussed at the next meeting of the Technical Committee.

4. Agenda #4: Status Update on Sub-Groups

4.1. Sub-group on Regional cooperation for Optimum Utilization of Generation Resources

Shri S.R.Bhat, Member Secretary, SRPC, apprised the Committee on the first meeting held by SRPC in this regard *(copy of presentation at Annexure-VI)* He shared the challenges for regional cooperation under the current framework of merit order dispatch within a control area. Specifically, the issue of audit objection was raised if state-level merit order is not followed or a price for trading power is adopted, which is not linked to the market. Pros and cons of banking amongst states were discussed. Similarly, balancing across the region needs regulatory provisions. He suggested that large wind plants could also be considered as a regional entity.

4.2. Sub-group on 5-minute Scheduling, Metering, Accounting and Settlement

Shri S.K.Soonee, Advisor POSOCO, shared a draft paper *(copy at Annexure- VII)* on imperatives for moving and issues to be tackled while moving from 15-minute to 5-minute dispatch. Specifically, he stated that with a 5-min time-block, ramps will become more manageable, load and RE forecasts will be more accurate and that a 15-min block would be too long to run Automatic Generation Control (AGC) in an effective manner. He recounted that several benefits were obtained by moving from hourly to 15-min dispatch, similarly we expect more efficiency by transitioning to a 5-min time-block. He explained the changes that will be required on forecasting, markets, gate closure, metering standards, various regulations etc. He said that the settlement cycle would continue to be weekly, while the settlement period would now be 5 minutes. He stated that the first meeting of the sub-group is scheduled to be held in June 2017. He sought assistance from CERC staff in obtaining nominations from various member institutions on this sub-group.

5. Agenda #5: Pilots under Greening the Grid (GtG) project

Mr. Mark Newton, Dy. Director USAID presented the overview of goals, project components and progress-to-date under the GtG project *(copy of presentation at Annexure-VIII)*. He then handed over to Chief of Party of GTG-RISE program, Mr. Shubranshu Patnaik to give an overview of the six grid integration pilots being planned under the Renewable Integration and Sustainable Energy (RISE) initiative. Mr. Patnaik gave a brief outline of the six pilots:

(i) Grid Connected Storage System- under this pilot, partnership is proposed with PGCIL to implement and test techno-economic use cases in PGCIL's BESS facility under development at Puducherry, wherein the objective is to conduct technical feasibility and systemic value assessment of energy storage as a solution for India's requirements.

(ii) Dynamic Compensation for Large RE Integration- the pilot envisages load flow study (detailed State level network modeling with regional interconnections), stability study and other technical studies to evaluate impact of grid integration of large solar park such as Bhadla in Rajasthan. It will also evaluate dynamic compensation through inverter specifications and deployment of STATCOMS.

(iii) Coal based flexible generation for Gujarat State Electricity Corporation Ltd. (GSECL) Ramp rate achieved by coal plants in India is lower than CEA's standard of 3% and much lower than international benchmarks. Strategies to improve flexibility of coal plants, such as changes to configuration and control systems shall be examined.

(iv) Automatic Generation Control- a pilot on evaluating AGC in providing secondary response in southern India, which will include development of a suitable compensation mechanism and assist CERC in framing requisite regulations.

(v) Real-time monitoring of DERs- this pilot will entail real-time monitoring of DERs on a pilot basis and improving net load forecasting ability of Discoms

(vi) Regional platform for day-ahead and intra-day coordination in dispatch. This pilot shall design a mechanism & implement a platform for coordination on day ahead basis with joint dispatch (or similar least cost dispatch mechanism) in intra day timescales for two or more states. The objective is to devise a possible framework but first demonstrate a business case through simulation.

It was observed that the pilot on regional cooperation has a lot of synergy with the objectives and plan of action of the sub-group on optimum utilization of regional resources. Since the Southern Region has already kicked off its activities in this sphere, it was concluded that the same could be undertaken as a pilot under RISE. It was suggested that a joint meeting be held on this so as to brainstorm on a possible framework for the Southern Region.

Furthermore, given the alignment of certain objectives between the GtG program vis-à-vis those of the Technical Committee, and taking into account the request from few members for continued consultancy/professional support on framing regulations pertaining to grid integration of renewables among other activities, USAID offered to provide technical assistance to the Committee and the States on this front. The Committee appreciated this.
A vote of thanks was made by Dr. Siddharamiah, Secretary KERC. Shri A.S.Bakshi thanked Shri D.B.Manival Raju, Member(Technical) and staff of KERC for hosting the meeting.

Annexure – I: List of Participants at the Twelfth Meeting of the Technical Committee for "Implementation of Framework on Renewables at the State Level" held on 30.05.2017 at The Chancery Pavilion, Bengaluru

Sl.No.	Names of Members, Invitees & other participants	Designation
1.	Mr. A.S. Bakshi, Member, CERC	Chairman-Technical Committee
2.	Mr. S. Akshayakumar, Chairperson , TNERC	Member
3.	Mr. Ismail Ali Khan, Chairperson, TSERC	Member
4.	Mr. P.J. Thakkar, Member, GERC	Member
5.	Mr. R.P. Barwar, Member, RERC	Member
6.	Mr. D.B. Manival Raju, Member, KERC	Member
Special Invitees		
7.	Mr. Vishvanath Hiremath, Chairperson, RERC	
8.	Mr. Rabindra Nath Sen, Chairperson, WBERC	
9.	Dr. M.K. Iyer, Member, CERC	
10.	Mr. S.K. Soonee, Advisor, POSOCO	
11.	Mr. S.R. Bhat, Member Secretary, SRPC, Bangalore	
12.	Mr. Ajit Pandit, Director Consultant – FOR	
13.	Mr. S.C. Shrivastava, Chief (Engg.), CERC	
14.	Ms. Shruti Deorah, Advisor RE, CERC	
15.	Mr. Arun Kumar H.D., Member, KERC	
16.	Dr. Siddaramaiah, Secretary, KERC	
17.	Mr. A.K. Saxena, Director & Senior Fellow (Electricity and Fuels Division), TERI	
18.	Mr. Mark Newton, Dy. Director, Clean Energy & Environment Office, USAID	
19.	Mr. Shubhranshu Patnaik, Chief of Party (Lead), GTG-RISE Team	

20.	Mr. Chandrasekhar Reddy Alta, Technical Specialist, GTG-RISE	
21.	Mr. Anish Mandal, Senior Manager, GTG-Rise	
22.	Mr. M.T. Manjunath, Chief Engineer, SLDC, KPTCL	
23.	Mr. P.S. Jagannath Gupta, Consultant (Tech), KERC	
24.	Mr. J. Ramakantha, Consultant (Tech), KERC	
25.	Mr. Safiulha Khan, Director (Tariff), KERC	
26.	Mr. G. Anbunesan, AGM(I/c), SRLDC, POSOCO	
27.	Mr. V. Balaji, DGM, SRLDC, POSOCO	
28.	Mr. V. Suresh, AGM, SRLDC, POSOCO	
29.	Mr. R. Thyagaraj, KPTCL	
30.	Mr. S.B. Chandrashekar, KPTCL	

MINUTES OF THIRTEENTH MEETING OF FORUM OF REGULATORS (FOR) "TECHNICAL COMMITTEE FOR IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"

Venue	:	Hotel JehanNuma Palace 57, Shamla Hill, Bhopal, Madhya Pradesh 462013
Date	:	4th August 2017
List of Participants	:	At **Annexure (enclosed)**

1. Madhya Pradesh Chairperson Shri Birdi welcomed all attendees at the meeting. Shri A.S.Bakshi, Member CERC, thanked the Chairperson, Member and officials of MPERC for their warm hospitality and seamless logistics for the meeting. Shri Bakshi stated that the Committee has come a long way since its inception, and conveyed the progress achieved to Chairperson MPERC.

2. He mentioned that as various States issue Draft Forecasting & Scheduling Regulations for renewables, FOR Secretariat should send in comments on the drafts to the State Commissions. He also stated that review of implementation of regulations by States should be done at regular intervals.

3. Shri S.K.Chatterjee underscored the need for consistency in regulations at the Central and State level. Regulations on Forecasting & Scheduling, Ancillary Services and Reserves should be complimentary at the inter-State and State level.

4. He also updated the Committee regarding the technical support offered by USAID under the Greening the Grid program. USAID will be hiring a consultant who will provide ongoing technical assistance to the Committee.

Discussions on the Agenda

I. Update on SAMAST implementation, Forecasting & Scheduling Regulations

1) MP SLDC made a presentation (attached as ***Annexure-I***) on the status of implementation of ABT and DSM at the State level. The presentation included statistics on ABT meters, accounting, scheduling, etc.
2) ABT Meters: MP SLDC informed that about 1120 Nos. of ABT meters of 0.2s accuracy class have been installed at different interface as summarized in their presentation.

3) Scheduling & Despatch: MP SLDC performs scheduling of Intra State entities and also coordinates scheduling of Inter State Generating Stations (ISGS) &IPPs in which they have share. DSM framework in MP has been in effect since 2008. Deviation for every intra-state entity is determined at rate as per CERC DSM Regulations. MP has a surplus of Rs.500 crores in the State DSM pool.
4) Given apprehensions of West Bengal on state pool potentially going into negative, it was decided that Shri Soonee will coordinate a meeting of WB and MP SLDCs/SERCs, so MP can illustrate solutions to gaps in implementation of DSM at the state level.
5) MP SLDC also informed that they are in the process of commissioning new integrated ABT, OA and MIS system which is expected to be completed by end of November 2017.
6) State of MP has submitted a DPR to PSDF to update the software for accounting, and has received a funding to the tune of INR 3.6 crores.
7) Further, they highlighted that as on 1 July 2017, total grid integrated RE installed capacity in MP is 3567 MW.
8) The State has also implemented metering for 106 out of 112 RE pooling stations. Forecasting and scheduling is taking place for 87 of these pooling stations. Solar plants selling inter-state are following CERC Regulations in this regard (presentation at ***Annexure-II***).
9) Shri Bajpai, Member MPERC, stated that Draft Ancillary Services Regulations are ready. Shri Bakshi appreciated leadership of Madhya Pradesh in implementation of various regulations. Shri Bakshi also said that establishment of State Power Committees should be prioritized.
10) Andhra Pradesh member Shri Rao said that the DPR for implementation of SAMAST costing Rs. 52.7 Crores was submitted. The State has been informed that the PSDF Committee has approved allocation of Rs. 11 crores. POSOCO representatives were requested to examine afresh and facilitate disbursement of funds from PSDF as per request of AP Transco.
11) Karnataka member Shri Raju stated that the State SLDC would like to visit Gujarat and MP to understand various aspects of implementation as well as preparation of DPR.
12) Maharashtra member Shri Lad said that the DPR has been approved and tender has been announced. He also said that the draft of forecasting-scheduling regulations is ready and shall be issued soon.
13) MPERC Secretary Shri Saxena updated the Committee that the public hearing on forecasting-scheduling regulations was held on 20th June. The final regulations are under process and shall be finalized soon.
14) Andhra Pradesh member Shri Rao also states that the State is ready to issue the final regulations on this front, expected to be notified by 16th August 2017.
15) Gujarat member Shri Thakkar stated that Gujarat shall issue the final regulations for RE forecasting & scheduling soon.
16) It was discussed that FOR Secretariat shall write a letter to other states to speed up the process on these two fronts. The Committee requested to Shri Soonee that he lead sub-groups at the State level to oversee implementation of SAMAST.

17) It was concluded that in future meetings, other States of the region where the meeting is held may be invited as special invitees.

II. Optimization of Hydro Resources

1) Shri Soonee from POSOCO presented(***Annexure-III***) on Optimization of Hydro Resources, in the context of balancing the grid with large scale integration of renewable energy. In this context, POSOCO has released a Report on "Operational Analysis for Optimization of Hydro Resources & facilitating Renewable Integration in India".
2) He emphasized the need for tariff framework that values flexibility, and specifically in context of hydro resources, peaking of the hydro plants. He stated that hydro should be given some incentive for peaking. Out of 45 GW of installed hydro capacity in the country at present, 16 GW are ISTS projects and currently have tariff signals for this.
3) The balance capacity in States needs appropriate tariff framework. If done right, he estimated that country as a whole can get significant peaking hydro capacity. This would also enhance load factors of thermal plants by ensuring that hydro plants are not run during off-peak hours. For this, States need to adopt CERC principles of two-part tariff for hydro along with provision for reckoning target availability based on declared capacity at least for three hours during the peak period.
4) Shri Soonee recommended that hydro plants should be allowed to provide ancillary services.
5) It was discussed that CEA should provide technical advice on procuring turbine types. Shri Soonee mentioned that Pelton turbines are most grid-friendly.
6) It was deliberated that Model Regulations for Hydro Plants for the States should be evolved, that'll include the revised tariff structure, including that for pumped storage. POSOCO will facilitate and present the status in the next meeting.
7) It was discussed that POSOCO should organize a meeting with hydro generators to discuss silt and inflow forecasting.
8) It was also requested that in future meetings, analysis of hydro resources of the host state may be presented for a fruitful discussion and finalization of next steps.

III. Reduction of losses and maintaining Grid Stability by Active Network Management – Presentation by SGS/Enzen

1) A presentation was made by SGS/Enzen (***Annexure-IV***) highlighting grid balancing with the help of their product 'Active Network Management (ANM)'. It has been designed for Real time, fast acting and coordinated control of flexible network elements like renewables and Distributed Energy Resources (DERs) for increasing the overall network efficiency and maintaining grid balance.
2) Various benefits of ANM were highlighted like:
    - Reduction in technical losses
    - Minimizing curtailments of RE
    - Avoid network augmentation

- Increasing hosting capacity
- Time reduction in connecting new RE
- Improving system balance

3) Further, they highlighted various case studies covering topics like technical losses, reverse power flows (due to rooftop), reactive power from solar farms, flexible connections for new wind capacity with transmission optimization, etc.
4) The presentation was appreciated by the Committee.

IV. **Demand Pattern Analysis**

1) Shri Soonee presented detailed analysis of demand patterns at the national level followed by a deep dive for the State of MP (placed at ***Annexure- V***).
2) He highlighted how demand patterns vary across different States, as well as by season and time-of-the-day within a State. This knowledge and insight can help the States better plan their generation capacity as well as ensuring quality of supply.
3) He demonstrated plots offering insight into the shifting morning/evening peak times for the State of MP over the last several years. Several other charts on demand met, peak and lean demand as % of peak demand, daily load factor, etc. were presented.
4) With examples, he demonstrated how complementarity between two states can be utilized for better utilization of generation sources,e.g. peak demand of MP vs peak demand of Delhi.
5) He also emphasized the importance of examining the Load Duration Curve for every State at the time of decision-making for new procurement of power. Market trends should also be analyzedbefore power procurement planning. He expressed concern over signing of PPAs by states without a thorough analysis, in which case they suffer from heavy fixed charge payment while not purchasing power from the extra plants.

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

Annexure: List of Participants at the Thirteenth Meeting of the FOR Technical Committee held on 04.08.2017 at The Jehan Numa Palace, Bhopal

Sl.No.	Names of Members, Invitees & other participants	Designation
1.	Mr. A.S. Bakshi, Member, CERC	Chairman-Technical Committee
2.	Mr.A.B.Bajpai, Member, MPERC	Member
3.	Mr.D.B.ManivalRaju, Member, KERC	Member
4.	Mr. P.J. Thakkar, Member, GERC	Member
5.	Mr. Deepak Lad, Member, MERC	Member
6.	Mr.P.Rama Mohan, Member, APERC	Member
Special Invitees		
7.	Mr.DevrajBirdi, Chairperson, MPERC	
8.	Dr. M.K. Iyer, Member, CERC	
9.	Mr. S.K. Soonee, Advisor, POSOCO	
10.	Mr. S.C. Shrivastava, Chief (Engg.), CERC	
11.	Dr.S.K.Chatterjee, Joint Chief(Regulatory Affairs), CERC	
12.	Ms. Shruti Deorah, Advisor RE, CERC	
13.	Mr.K.K.Parbhakar, Chief Engineer, MP SLDC	
14.	Mr.S.S.Patel, Superintendent Engineer, MP SLDC	
15.	Mr.VivekPandey, Chief Manager, WRLDC, POSOCO	
16.	Mr.HyltonBenett, Smart Grid Solutions	
17.	Ms.PreetiMalhotra, Enzen Global	
18.	Mr.ShravanaHansari, Enzen Global	

MINUTES OF FOURTEENTH MEETING OF "TECHNICAL COMMITTEE FOR IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"

Venue	:	Upper Ground Floor, Conference Hall CERC
Date	:	13-09-2016
List of Participants	:	At **Annexure – I (Enclosed)**

1. The Fourteenth meeting of Technical Committee on Implementation of Framework for Renewables at the State level was held under the Chairmanship of Shri A. S Bakshi, Member, CERC on 13th September 2017. Shri Bakshi welcomed all the participants and the special invitees. He further informed the Committee that in the 13th Technical Committee meeting it was decided that at every meeting, all States in the particular region shall be invited so that implementation of SAMAST and other critical elements can be ensured in all States. He emphasized that the objectives of the Committee need to be undertaken in mission mode.

2. Dr. S.K. Chatterjee, Jt Chief (RA), CERC, welcomed all participants on behalf of the FOR Secretariat and welcomed Members of State Commissions of Haryana and Punjab, who'd been invited as special invitees for the meeting. He highlighted that the intent of this Committee is to implement the SAMAST Framework and Forecasting, Scheduling and Deviation Settlement Mechanism across all the States. Further, he informed that Idam Infra Ltd shall continue to support the Technical Committee, for which it is being funded by USAID.

Discussions on the Agenda

I. Update on SAMAST implementation and DSM – West Bengal Haryana and Punjab

Discussion

1) The Consultant (Idam Infra) made a presentation (attached as Annexure-II) on the status of implementation of SAMAST in West Bengal, Haryana and Punjab.

2) **West Bengal:** Idam stated that West Bengal is a Category A State as identified in the SAMAST Report, for which they took stock of current status, gap analysis as well as challenges. Idam has prepared a Draft DPR for West Bengal. The presentation included the Status of ABT meters installed by the State/Central run generating stations and by the Distribution Licensees.

3) The existing ABT system where the entire process of Meter data acquisition, Meter data processing, Scheduling, Regional Energy Accounting and Deviation Bill for state entities was explained.

4) Various challenges like lack of IT resources were highlighted as the energy accounting by SLDC is done on an excel based software, Completion of boundary metering and AMR system, software protocol and compatibility issue of existing meters with open source software were highlighted. It was also highlighted that once the DPR is prepared and funding is arranged, it will be the responsibility of STU to go for the tendering process for procurement, installation etc., and given their limited bandwidth, it might be a challenging task for them.

5) Shri Soonee, Advisor – POSOCO, informed the Committee that they are procuring meters which are only compatible with AMR and have feature of 5 minutes metering.

6) Both options of complete replacement as well reconfiguring existing meters were discussed. Chairman, WBERC highlighted that it can be decided to opt for which option once the DPR is finalized. Also, he asked the consultants to prepare a table listing out the information required from the STU.

Haryana:

7) Idam stated that both Haryana and Punjab are Category B States, wherein partial implementation of SAMAST has happened. Idam team held a meeting with HERC along with key stakeholders from SLDC/STU on 7 Sept 2017.

8) Intra-state load and generation entities prepare schedules. Intra-state settlement is done on actual basis. Therefore, currently no commercial implication of scheduling is there.

9) Idam also mentioned that accounting of Open Access transactions needs to be streamlined with an Open Access Registry.

10) It was discussed that PPA allocation to DISCOMs was mandated in Electricity Act 2003, but is currently pending in the State. The Committee emphasized the need to prioritize the same.

11) Shri Soonee underscored the importance of integrity of accounts. He said that the acid test of the settlement mechanism is that the State should be able to figure out losses for every 15-min time-block.

Punjab:

12) It was acknowledged that deviation accounting is a challenge as PSPL is a consolidated generation and transmission company. Functional segregation is a pre-condition to establish proper accounting.

13) Punjab currently does not have any intra-State deviation settlement. Punjab Member expressed that the State is keen to implement SAMAST.

14) Ownership of DSM Pool account was also discussed by the stakeholders. It was clarified by POSOCO that while the DSM account is owned by the SLDC, it needs regulatory sanction so it can be operated independently.

Consensus

The Members of West Bengal, Haryana and Punjab agreed that they will take necessary actions in a time bound manner to implement SAMAST in their respective states and will keep the Committee posted about the progress.

II. Status of implementation of Regulations on Forecasting, Scheduling and Deviation Settlement

Discussion

1) The Members from States updated on the status of Forecasting & Scheduling and DSM Regulations in their respective States.

Andhra Pradesh: Forecasting & Scheduling Regulations for Solar & Wind plants have been recently notified by APERC, as shared with the Committee and DSM Regulations are under preparation.
Gujarat: Forecasting & Scheduling Regulations to be finalized soon. Dr. Chatterjee requested Member Gujarat to check their regulations vis-à-vis the FOR Model Regulations, and examine any major points of difference.
Maharashtra: Forecasting & Scheduling Regulations under preparation (at final stage) and a revised DSM Framework has been prepared and is under review.
Telangana: DPR for SAMAST has been submitted to PSDF and is currently under process.
Tamil Nadu: Forecasting & Scheduling Regulations are under Draft stage, and shall be finalized soon with the assistance of consultant Idam Infra.
It was agreed unanimously that MOP, POSOCO and CEA would be requested to allow the cost of interface meters also under PSDF funding and matter would be taken up in the upcoming meeting of FOR for its approval. If approved by FOR, Chairman, FOR would be requested to write to the concerned in this regard.

III. Issues pertaining to Grid Integration of Renewables and RPO- presentation by special invitee

Discussion

1) Renew Power, made presentation (attached as Annexure-III) on Issues pertaining to Grid Integration of Renewables and RPO. He highlighted that RE is emerging as cost effective option and getting competitive day by day, solar and wind have witnessed drop in cost by 44% and 29% during last one year. Further, he mentioned that few states are meeting their RPO possibly due to lenient implementation- rollover/ exemption from meeting current RPO targets.

2) Chairman, TNERC said that cost of RE technologies is decreasing significantly and now it's almost same as conventional power.

Renew Power stated on grid integration of Renewables that states cannot absorb the targeted capacity and will have to export power outside the states. Further, he said that

forecasting &scheduling mechanism is not effective in most of the states as on date. He also recommended an intra-day market to handle imbalances. He requested that State regulators be proactive in forcing the effectiveness of these regulations at the earliest.

IV. Status update on Sub-group for Regional co-operation for Optimum Utilization of Generation Resources

Discussion

1) Dr. Chatterjee presented on Load/Generation Management- Intra Day (Options for handling Variation including in RE) (attached as Annexure-IV). He proposed 7 options (as listed below) for Intra Day/Hour Ahead transactions. The pros and cons of all these options were discussed

   - Option 1: Banking – Already taking place between states. When there is higher generation in one State, it banks its power with the other and gets the same quantum of energy when it has high demand.
   - Option 2: Power Exchange (DAM price as reference) - The reference price in this case is taken as the Day Ahead price on the power exchange.
   - Option 3: Pool based on Variable Cost (VC) as approved by the Regulator and on payment of variable cost
   - Option 4: Pool based on VC as approved by the Regulator and on payment of Marginal Cost

   Options 5, 6 and 7 are based on the auction

   - Option 5: Pool based on auction for intra-day for the rest of the day
   - Option 6: Pool based on auction for intra-day on hourly basis
   - Option 7: Pool based on auction for intra-day on intra-hour basis i.e for 15 min. block-wise

2) To prevent any gaming, the schedule of DAM is not to be altered and only generators with surplus power beyond their Day-ahead schedule will be allowed to participate in this market. For the purpose of DSM, net schedule will be prepared and the settlement will be done accordingly.

Consensus

The Members of the Committee appreciated the presentation and consensus was arrived in taking this discussion forward. Dr. Chatterjee highlighted that above presentation has been shared with the RPCs for their feedback. Further deliberations and final recommendation shall be undertaken in the subsequent meetings of the technical Committee. Any required changes

in the Power Market Regulations will be done through recommendation from the Technical Committee to CERC to operationalize this market.

V. Model Regulations for tariff Determination & other related matters for intra-State hydro Generating Stations

Discussion

1) Shri S.k Soonee, Advisor – POSOCO, presented on this subject (attached as Annexure –V). He highlighted that the Installed capacity of hydro is around 44GW but the utilization is not more than 31- 32GW only. Wherever there is two-part tariff, those plants are delivering better than other

2) He underscored that it is required to incentivize the plant for showing peaking and also to incentivize the pumped storage. Member - Telangana highlighted that the water of hydro plants is in the hand of plant operator but he has to honor other departments like irrigation etc. Sh. Soonee clarified that all the quantities of all constraints like hydrology, flood control, irrigation, drinking water etc will be honored first and after that if any margin is available that will be utilized in a better way.

3) Dr. Chatterjee also emphasized that the optimal utilization of hydro should be made through a tariff signal and States should adopt it.

4) Shri Soonee further highlighted that the ramping of thermal plants for ancillary services takes up lot of time and hydro can be used for this purpose. Scheduling process for this purpose also needs to be developed.

5) Incentivizing of Synchronous condenser operation and Blackstart was also discussed

Consensus

The Technical Committee endorsed the Model Regulations and recommended for consideration by FOR.

VI. Status update on RPO web-tool

Discussion

1) Idam Infra made a presentation (attached as Annexure-VI) on Status of Generic Renewable Purchase Obligation (RPO) Compliance Web-tool, wherein following points were covered in detail:

   - Background
   - Developments with Gujarat on RPO deployment
   - Discussions with TERI-MNRE regarding coordination for National Level Portal
   - Rolling out web tool in other states

- Status on mandatory use of RPO - amendments in RPO regulations

2) Idam Infra also circulated dossier for RPO compliance monitoring framework and web tool describing key features, need, process flow, software requirement and approach of submission information of RPO tool.

3) Member, PSERC asked whether rooftop is covered under the current framework of RPO tool or not, on which the consultant explained about the entities covered in the current framework.

4) It was discussed that FOR will write to all SERCs regarding mandatory implementation of RPO tool in respective States and amend the necessary regulations accordingly.

Annexure-I

LIST OF PARTICIPANTS ATTENDED THE FOURTEENTH MEETING OF THE TECHNICAL COMMITTEE FOR "IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"HELD ON 13.09.2017 AT CERC, NEW DELHI

1	Shri. A. S. Bakshi, Member	CERC
2	Shri S. Akshaya kumar, Chairperson	TNERC
3	Shri Ismail Ali Khan, Chairperson	TSERC
4	Shri Rabindra Nath Sen, Chairperson	WBERC
5	Shri A. B Bajpai, Member	MPERC
6	Shri M. S Puri, Member	HERC
7	Shri D.B. Manival Raju, Member	KERC
8	Shri P. Rama Mohan, Member	APSERC
9	Shri P.J. Thakkar, Member	GERC
10	Shri R.P Barwar, Member	RERC
11	Shri Deepak Lad, Member	MERC
12	Shri Debashish Majumdar, Member	HERC
13	Smt. Anjuli Chandra, Member	PSERC
14	Shri S.C. Shrivastava, Chief (Engg.)	CERC
15	Dr Sushanta K. Chatterjee, JC(RA)	CERC
16	Smt Shruti Deorah, Advisor – RE	CERC
17	Shri S. K.Soonee, Advisor	POSOCO

18	Shri K.V.S Baba, CEO	POSOCO
19	Shri K.V.N Pawan Kumar, Dy. Manager	POSOCO
20	Shri Siddharth Arora, Research Officer	CERC
21	Shri Ajit Pandit, Director	Consultant
22	Shri Anant Sant	Consultant
23	Shri Abhishek Dixit	Consultant
24	Shri Parag Sharma (Special Invitee)	Renew Power
25	Shri Ishan Nagpal (Special Invitee)	Renew Power
26	Shri Neeraj Gupta (Special Invitee)	Renew Power

MINUTES OF FIFTEENTH MEETING OF "TECHNICAL COMMITTEE FOR IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"

Venue	:	Hotel Park Hyatt, Banjara Hills, Hyderabad
Date	:	30-10-2017
List of Participants	:	At **Annexure – I (Enclosed)**

1. The Fifteenth meeting of Technical Committee on Implementation of Framework for Renewables at the State level was held under the Chairmanship of Shri A. S Bakshi, Member, CERC on 30th October 2017. Shri Bakshi welcomed all the participants and the special invitees. He thanked the Chairperson of host state Telangana as well as the Chairperson of APERC for their presence. He appreciated the initiatives taken by both the SERCs to advance the objectives of the Committee in their respective states.

2. Dr. S.K. Chatterjee, Jt Chief (RA), CERC, welcomed all participants on behalf of the FOR Secretariat. He highlighted that the intent of this Committee is to implement the SAMAST Framework and Forecasting, Scheduling and Deviation Settlement Mechanism across all the States. Further, he informed that Idam Infra Ltd shall continue to support the Technical Committee, for which it is being funded by USAID.

Discussions on the Agenda

1. Agenda Item No. 1:Update on the decisions taken in Technical Committee Meetings

Discussion

Dr. Chatterjee apprised the Committee and other participants regarding major initiatives and decisions of the Committee:

- Implementation of Scheduling, Accounting, Metering and Settlement of Transactions in Electricity (SAMAST) Report
- Implementation of State Level Forecasting & Scheduling Framework
- Model Deviation Settlement Mechanism (DSM) Regulations
- RPO Web-tool
- Regional Co-operation for Optimum Utilization of Generation Resources
- Introduction of 5 Minute Time Block

2. Agenda Item No. 2& 4

a. Status of implementation of SAMAST Report and F&S Regulations- presentation by Telangana SLDC

Discussion

1) Chief Engineer, TelanganaSLDC, shared the status of implementation of SAMAST, including identification of intra-state entities, metering points, etc.

2) He shared that DPR has been prepared and has been approved by TSTRANSCO, having a budget of INR 85 Crores. Dr. Chatterjee stated that the budget is very large, and is anticipated to be around 25-30 Crores. He requested representative of Idam to assist the State in this process.

3) Shri Bakshi stated that the DPR may include the cost of interface meters, as agreed upon by the Committee, and also recommended by the FOR.

4) An overview of DSM Regulations was presented- these regulations have been in force since 2014 as per CERC's DSM Regulations, but do not cover the generators.

5) Regarding the RE Framework, couple of issues were highlighted. First was eligibility of QCA and whether separate pool account should be opened for RE generators only.

6) Telangana SLDC also shared that 500 MW of spinning reserves are being maintained in the State, for which fixed charges are being made. Most of these resources are based on hydro power, but in case of low water levels, even thermal plants are deployed. The Committee members appreciated this planning.

7) It was mentioned that a technical minimum of 70% is currently used for thermal plants, which may be brought down to 55% in accordance with CERC Regulations.

8) Load forecasting errors of about 5% are observed on a daily basis, and maximum inaccuracy is observed during the monsoon season.

Decisions

i) Consultant to assist the State of Telangana to re-examine the DPR and the requested funding support.

ii) Load forecasting to be improved further. NLDC to help in the matter.

b. Status of implementation of SAMAST Report and F&S Regulations- presentation by Andhra Pradesh SLDC

Discussion

1) Director, APTRANSCO, shared the status of implementation of SAMAST for Andhra Pradesh, including implementation of ABT at the State level.

2) Draft DPR on SAMAST, which was approved by APTRANSCO in November last year had estimated a budget of Rs. 177.5 Cr. In the 9th Meeting of the Technical Committee held on 29th Dec 2016 at CERC, New Delhi, the issue of location of meters was discussed. In

the meeting, it was clarified that the shifting of measuring points from LV side to HV side was not required and hence the replacement of HV side CT/PT and the associated cost was also not required in the Draft DPR.

3) APTRANSCO applied for the PSDF funding for an amount of Rs. 52.727 Cr. on 20th Feb 2017. Based on feedback from NLDC, the cost estimates have been revised and funding request of about Rs. 11Cr will be submitted to PSDF once approved by APTRANSCO.

4) An overview of Forecasting, Scheduling and DSM Regulations, which were notified on 21st Aug. 2017, was presented. Formation of State Pool Accounts for Intra-state and Inter-state transactions shall be undertaken.

5) At present, Deviation Mechanism is considered between the two DISCOMs only. GENCO and other private developers and consumers are not included in the Deviation Settlement process

6) Legal issues related to QCA were discussed- whether it is a valid legal entity, and how to handle a case where any one of the generators doesn't give his consent for a particular QCA. POSOCO suggested to have concept of an aggregator.

7) APTRANSCO held a meeting with wind and solar generators on 27th Oct. 2017 regarding the notified Forecasting & Scheduling Regulations. The queries raised by the generators were presented/discussed.

8) APERC Chairperson Shri Bhavani Prasad brought up the topic of jurisdiction of SERC for regulating business of SLDCs. The powers arising from the Act as well as from Electricity Rules, Tariff Policy, etc were discussed. It was also debated that creation of a new legal entity such as a QCA can be accomplished by Regulations as per the powers conferred in Rules & Policy.

Decisions

i) On the question of legality of the concept of QCA, there was a consensus on the following legal interpretation that the FOR Model Regulations allow a generator the option to interface with SLDC directly or through a QCA. Hence, rights of the generator are protected as he has choice in this matter.

ii) Further, the cardinal principle of law is that 'what is not prohibited is permitted'. It was concluded that the Act does not forbid creation of such an entity as QCA, therefore, it is legally tenable.

c. Update in respect of other States

Discussion

1) **Gujarat –** Shri. P.J Thakkar, Member, GERC informed the Committee that SAMAST is in place in the State of Gujarat. He has also submitted that the Forecasting & Scheduling Framework shall be notified within couple of weeks.

2) **Madhya Pradesh –** Shri A. B Bajpai, Member, MPERC informed the Committee that the DPR has been prepared and submitted to the PSDF. The State has received funds of about Rs. 3.6 Cr. from PSDF. He further informed that State has received legal confirmation on its Draft Forecasting & Scheduling Regulations and the final approval from the State Govt. is awaited.

3) **Maharashtra –** Shri Deepak Lad, Member, MERC informed the Committee that the Forecasting & Scheduling Regulations are ready and the SOR preparation is in progress.

3. Agenda Item No. 3: Status of implementation of SAMAST Report/Forecasting & Scheduling and Deviation Settlement for Tamil Nadu, West Bengal and Haryana

1) The Consultant (Idam Infra) made a presentation on the status of implementation of SAMAST in West Bengal, Tamil Nadu, Haryana and Punjab.

2) **West Bengal:** Intra-State ABT, Energy Accounting and Deviation Settlement is in place since 2008. Scheduling and Deviation Settlement is done through an excel based tool. DSM liability has been transferred to DISCOMs however, the interface metering needs ownership.

3) The consultant gave brief of the existing ABT mechanism which is under operation in West Bengal. Based on that, issues in existing Energy Accounting system and the Gap analysis was presented.

4) The cost estimates which have been built in the DPR were presented. The total estimated cost is about Rs. 26 Cr which includes the Hardware – Metering infrastructure, Software, Communication Components, Training & Capacity building.

5) **Tamil Nadu:** The Consultant studied and revised the draft Forecasting & Scheduling Regulations of TNERC and presented to the State Commission. The State Commission suggested to the consultant to also prepare the Draft DSM Regulations.

6) A snapshot of both the Draft F&S Regulations and the DSM was presented. The State Commission may notify two separate Regulations for RE F&S and DSM. The regulatory process for finalization of both Regulations will be taken up simultaneously.

7) The draft regulations have proposed uniform tolerance band of +/- 10%, +/-20% and +/-30% for both existing and new wind and solar projects.

8) Similar Deviation prices of 50 paisa, 1 Rupee and 1.5 Rupees have been devised for both Inter-State and Intra-State projects. This is at variance with the FOR Model Regulations wherein the deviation rate is a function of the PPA rate. The rationale behind this structure is the schedule-based-payment system that is in operation at the inter-state level. If there is a small flat rate for deviation, that might give developers a perverse incentive to deviate.

9) **Haryana:** HERC Grid Code Regulations does not specifically cover Scheduling and Despatch Code. It will be prepared first and then the F&S and DSM Regulations will be prepared.

10) **Punjab:** The consultant updated that the State of Punjab needs functional segregation between the Generation and Transmission before proceeding towards the SAMAST implementation. Tamil Nadu has recently accomplished the same and hence can provide a good example on how to plan the segregation. It was decided that a special meeting be held for the same, assisted by the Consultant, to study the Tamil Nadu model.

Decisions

i) Two separate Regulations may be drafted for DSM vs Forecasting & Scheduling Framework, process for which workmay be taken up simultaneously

ii) Functional segregation of Punjab (based on Tamil Nadu) shall be undertaken with the help of consultant.

iii) It was decided that a letter from the Chairman of the Technical Committee will be sent to NLDC for providing funds under PSDF to States with approximate budget of Rs. 15-20 Cr, which should include cost for interface metering in addition to costs for hardware, software and training purpose. The release of funds needs to be expedited. It shall also be stated that States should prioritize implementation of SAMAST.

iv) Shri Bakshi will also write to all the States while copying to the respective SERCs to expedite the process of preparing DPR for SAMAST and spending the grant in a swift manner.

4. Agenda Item No. 5: Presentation by POSOCO on

a. Analysis of Hydro Resources in Telangana and Andhra Pradesh

b. Demand Pattern Analysis/Load Forecasting for Telangana and Andhra Pradesh

Discussion

1) Shri S.K Soonee, Advisor, POSOCO presented on this agenda. He highlighted that the Southern Region has about 12GW of installed capacity of Hydro power but the maximum which can be generated is about 6GW only. This is mainly because the scarcity of water in the SR. Telangana member stated that while for last 5 years, average annual production was 3200 MUs, it is only 290 MUs for the last year.

2) He impressed on the proper planning on the release of water and should also be programmed for the peak load.

3) Shri Soonee further highlighted that "Value of Water" needs to be reflected in the tariff design of Hydro. It should be Multi-part tariff to incentivize flexible characteristics and also there is a need for Regulatory Framework for incentivizing of Pumped Storage Plants (PSP) and Reactive Support Ancillary Services.

4) Shri Soonee presented the key features of the "Model Regulations for Tariff Determination & other related matters for Intra-State Hydro Generating Station" which was endorsed in the 61st meeting of FOR held on 22nd Sept. 2017 and stressed on its expeditious implementation at intra-state level.

5) Shri Soonee demonstrated with charts that the peak is growing faster than lean for both Telangana and Andhra Pradesh. This has various repercussions for capacity planning.

6) As A/C load increases during summer, the duration curve for Telangana is also changing.

Decisions

Value of hydro capacity needs to be recognized. The need for commercial signal for utilization of hydro generating stations during peak hours, was appreciate. This could be implemented subject to special constraints of multi-purpose hydro projects regarding water requirements, of water etc.

5. Agenda Item No. 6: Roll-out Plan for Smart Meters – Suggested way forward

Discussion

1) Ms. Shilpa Agarwal, Joint Chief (Engineering), CERC, presented on the proposed implementation plan for roll out of Smart Meters.

2) The background and the major concerns raised at the CERC meeting with meter manufacturers were briefly discussed. The features of Smart Meters like real-time measurement of electrical parameters, two way communication, remote connect-disconnect/load limiting features were also presented.

3) As per the research by ISGF there are about 5 crore consumers having consumption of more than 200 units per month. The total number of installed meters are about 25 crores in the Country. With manufacturing capability of about 2.5 crore/year, it is envisaged that the total time required to replace all the meters will take about 3-10 years including communication.

4) The benefits and cost implication of Smart meters weredebated. The cost of the meter is not only part of the cost of metering, as communication links, requisite hardware and software at the Discom shall constitute a big part of the cost as well. Remote connect/disconnect as a feature may be disabled

5) The presentation also included the snapshot of EESL bid which was invited for 50 lakh smart meters for the State of Haryana and UP.

6) West Bengal Chairperson underscored the importance of having an Open Protocol for Communication in the new meters that are being planned. Currently, it is proprietary and hence depends on the utility. He also stated that AMR is currently not successful because of lack of reliability in communication

7) Kerela Chairperson suggested that leasing of meters should be considered because Discoms are poor.

8) It was clarified by Shri Bakshi that grant from Central Govt. would not be possible.

9) TSSPDCL Chairman shared his views on the topic. He stated that currently AMR is being used for all HT Consumers in the Discom area. He suggested that pre-paid meters with the benefit on tariff may be introduced, analogous to pre-paid packages for mobile users.

10) Pros and cons of capturing real time data were discussed. It was submitted that real time data is necessarily not required and one will need huge space, data centre and analytical processes for capturing and analyzing the same. He advocated using remote connect/disconnect feature in the case of pre-paid meters.

11) It was agreed that TOD feature shall be essential to manage peak load – 8 hours incentive for off peak may be provided.

Decisions

The Committee members unanimously agreed that the roll-out of smart meters should be undertaken in a phased manner. This will provide precious time to ascertain whether the benefits are commensurate with the costs. It was concluded that a letter from Chair, CERC or Shri Bakshi be sent to the Ministry voicing this opinion and including the report as prepared by the FOR Secretariat.

6. Agenda Item No. 7: Any Other Item by the permission of the Chair

Ms. Shilpa also presented on the Communication Regulations of CERC, which are applicable at the State level until the respective States notifies its own Regulations in this regard. It was noted by all members of the Committee.

Annexure-I

LIST OF PARTICIPANTS AT THE FIFTEENTH MEETING OF THE TECHNICAL COMMITTEE FOR "IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"HELD ON 31.10.2017 AT PARK HYATT, HYDERABAD

1	Shri. A. S. Bakshi, Member	CERC
2	Dr. M.K Iyer, Member	CERC
3	Shri S. Akshaya Kumar, Chairperson	TNERC
4	Shri Ismail Ali Khan, Chairperson	TSERC
5	Shri Rabindra Nath Sen, Chairperson	WBERC
6	Shri G. Bhavani Prasad, Chairperson	APERC
7	Shri Preman Dinaraj, Chairperson	KSERC
8	Shri A. B Bajpai, Member	MPERC
9	Shri P. Rama Mohan, Member	APSERC
10	ShriP.J. Thakkar, Member	GERC
11	Shri Deepak Lad, Member	MERC
12	Shri H. Srinivasulu, Member	TSERC
13	Dr. K. Srinivas Reddy, Secretary	TSERC
14	Shri S.C. Shrivastava, Chief (Engg.)	CERC
15	Dr Sushanta K. Chatterjee, JC(RA)	CERC
16	Smt Shilpa Agarwal, JC (Engg.)	CERC
17	Smt Shruti Deorah, Advisor – RE	CERC

18	Shri S. K.Soonee, Advisor	POSOCO
19	Shri K.V.S Baba, CEO	POSOCO
20	Shri A. Gopal Rao, CMD	TSNPDCL
21	Shri D. Prabhakar Rao, CMD	TSGENCO/TSTRANSCO
22	Shri. G Narsing Rao, Director (Projects & Grid operations)	TSTRANSCO
23	Shri G. Raghuma Reddy, CMD	TSSPDCL
24	Shri Ajit Pandit, Director	Consultant

MINUTES OF SIXTEENTH MEETING OF "TECHNICAL COMMITTEE FOR IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL"

Venue	:	The Fern Gir Forest Resort, Sasan Gir,Gujarat
Date	:	24-11-2017
List of Participants	:	At **Annexure – 1(Enclosed)**

1. The Sixteenth meeting of Technical Committee on Implementation of Framework for Renewables at the State level was held under the Chairmanship of Shri A. S Bakshi, Member, CERC on 24th November 2017. Shri Bakshi welcomed all the participants and the special invitees. He thanked the Chairperson of host state Gujarat as well as the Members of GERC for the arrangements. Shri Anand Kumar, Chairperson GERC, welcomed everyone to the venue and the meeting. He expressed his continued support to the activities of the Committee and those being undertaken in his State.

2. Ms. Shruti Deorah, Advisor- RE, CERC, welcomed all participants on behalf of the FOR Secretariat. She apprised the Committee of the actions taken since the 15th Meeting. Specifically, she updated the participants that- (i) Report on Smart Meters along with a letter on behalf of Chairperson, FOR was sent to Secretary MoP, highlighting the recommendations of the Committee; (ii) Letter was sent to all Chairpersons of SERCs to expedite the preparation of SAMAST DPR and implementation; and (iii) Letter was sent to CEO POSOCO to include cost for interface metering in SAMAST DPR and prioritize SAMAST funding.

3. Ms. Shruti also highlighted the States of Assam, Odisha, UP and Uttarakhand which are not members of the Committee but have taken concrete steps towards SAMAST implementation in their respective States.

Discussions on the Agenda

1. Agenda Item No. 1: Status of implementation of SAMAST Report- presentation by Gujarat SLDC

Discussion

1) Shri B.B.Mehta, Chief Engineer, Gujarat, SLDC, shared the status of implementation of SAMAST, sharing point-wise status of every activity. Most recommendations of the report have been implemented in the State. His presentation is attached as ***Annexure-2***.

2) Shri Mehta said that the organization structure suggested in the report will be the backbone of SLDC, and must be deployed.

3) He said that 75% of meters have AMR feature, for which existing meters were upgraded instead of purchasing new ones. He stated that in future, all new meters shall be procured based on new specifications. Some members highlighted that CEA should be requested to come out with the technical standards as soon as possible. Shri Bakshi supported and said a meeting will be organized with CEA to take this forward.

4) Infosys is the technical partner for Gujarat SLDC for metering automation and various software upgrades.

5) Shri Mehta requested that till LTA capacity exists for a State, the State should be given freedom on using it for short-term transactions as well. Shri Bakshi responded that the new GNA Regulations will address this issue. He also requested all members to provide comments on the draft regulations.

6) Shri Mehta shared that intra-State ABT has been in place since 2011, and that the State had implemented a zero-pool system at the time-block level. He shared a set of other initiatives undertaken by Gujarat, and invited other States to visit the State SLDC.

7) It was mentioned that once corridor availability is checked, issuance of OA clearance happens online in a transparent automated fashion. He said that number of STOA transactions have dropped.

8) He said that 100% of RE generators above 5 MW capacities are connected to SCADA system of the SLDC. Real-time data is available at the three sub-SLDCs, and sent to the SLDC post processing.

9) Shri Mehta stated that creation of SPC is still pending, though the matters are addressed at the state operations meeting. Shri Bakshi reiterated that SPC should have government approval or mandate. Shri Vishwanath Hiremath, Chairperson RERC, stated that creation of SPC in Rajasthan has been mandated in the State Grid Code, and hence it has statutory standing.

10) He said that Gujarat SLDC has a lot of certified professionals. Shri K.V.S. Baba, CEO POSOCO acknowledged the participation of the State in various specialist courses that are offered by NPTI and recognized by POSOCO. He also requested all regulators to encourage their SLDC for more participation.

Decisions

i) A meeting to discuss revisions to technical standards of meters shall be organized by FOR Secretariat under chairmanship of Shri Bakshi.

ii) Members of the Technical Committee to peruse the Central Electricity Regulatory Commission (Grant of Connectivity and General Network Access to the inter-State transmission system and other related matters) Regulations, 2017 and send their comments to the Commission.

iii) A letter to be sent to all SERCs requesting support for higher participation in specialist courses for SLDC officials.

iv) A note to be prepared by Gujarat SLDC detailing additional initiatives undertaken beyond the recommendations of SAMAST report, which shall be shared for reference of other members of the Committee.

v) Other State representatives to coordinate with Shri Mehta for further exchange of information and best practices, including visits by SLDC officials.

vi) The format used by Mr Mehta for presenting the status of implementation of Samast report was appreciated by everyone. It was agreed that this format shall be used in future by each state making presentation on the status of Samast implementation.

2. Agenda Item No. 2:

a. Status of implementation of F&S Regulations- presentation by GERC

Discussion

1) Shri S.R. Pandey, Legal Advisor, GERC, shared the status of implementation of Forecasting & Scheduling Framework for Renewables in the State (presentation attached as ***Annexure – 3***).

2) He updated the Committee that the Regulations have been finalized, and the Statement of Reasons (SOR) document is under preparation. The same is expected to be complete soon.

3) It was stated that a tri-partite agreement among the generator, QCA and SLDC shall be prescribed. A sample agreement will form an annexure to the Regulations.

4) Shri Preman Dinaraj, Chairperson KSERC cautioned the Committee that such a contract needs to be worded very meticulously as otherwise it could become a source of litigation. He offered his expertise to examine the sample contract.

5) While Shri P. Rama Mohan, Member, APERC stated that the Regulations as notified by APERC provided a generic structure but left the precise agreement to SLDC, it was also brought up that the QCA cannot be termed as a 'state entity'.

Decisions

i) It was decided that the sample agreement as endorsed by Shri Dinaraj may be shared as a Model Agreement with the Committee, and the same may be annexed to the Model Regulations.

b. Update in respect of other States

Discussion

1) **West Bengal –**ShriR.N. Sen, Chairperson, WBERC informed the Committee that DPR for SAMAST has been completed and has obtained the Board approval. The same is in the process of being sent to POSOCO. He also stated that the State is running a pilot for smart meters (~1000 nos.) in a couple of districts, in which several communication protocols are being evaluated. He suggested that outcomes of NTPC's study regarding cycling of thermal plants be shared with the Committee.

2) **Rajasthan** – Shri R.P.Barwar, Member RERC, apprised the Committee that 85% of SAMAST work has been done. The Forecasting & Scheduling framework has been notified in the State for which the implementation shall commence from Jan 1st, 2018. He also stated that corresponding procedures are under preparation.

3) **Andhra Pradesh** – The State has already applied for funds to the tune of Rs. 12.81 crores under SAMAST. F&S Framework shall be implemented starting 1/1/18, while the commercial implication will begin on 1/7/18.

4) **Karnataka** – Shri Manival Raju, Member KERC, stated that the State SLDC is not responding on next steps on the RE framework. KERC is planning to hold a meeting with the Head of SLDC as well as DISCOMs.

5) **Madhya Pradesh –** Shri Dev Raj Birdi, Chairperson MPERC, informed the Committee that Forecasting & Scheduling Regulations shall be notified within a month as soon as final approval from the State Govt. is obtained. SAMAST is under implementation.

6) **Kerala** – Shri PremanDinaraj, Chairperson KSERC, submitted that work on RE Framework shall be taken up starting January 2018.

7) **Maharashtra –** Shri Deepak Lad, Member, MERCinformed the Committee that the Forecasting & Scheduling Regulations are ready and the SOR preparation is in progress.

3. Agenda Item No. 3: Status of implementation of SAMAST Report/Forecasting & Scheduling and Deviation Settlement for Tamil Nadu, Haryana and Punjab

1) The Consultant (Idam Infra) made a presentation (attached as ***Annexure- 4***) on the status of implementation of SAMAST inTamil Nadu, Haryana and Punjab.

2) **Tamil Nadu:** The Consultant had detailed discussions withthe State Commission regarding draft Forecasting &Scheduling Regulations as well asDraft DSM Regulations.

3) The Consultant updated the Committee on the final decisions made w.r.t outstanding issues on the RE Framework. For example, for inter-state transactions by state entities, deviation charges will now be linked to the PPA rate (instead of a flat rate), while the interface point for metering shall be on L.V. side of the pooling station. DSM Regulations are in line with the Model Regulations. The regulatory process for finalization of both Regulations will be taken up simultaneously. Implementation time of six months shall be provided.

4) Further amendments to bring the Open Access Regulations and State Grid Code in alignment with the DSM Regulations shall be carried out subsequently.

5) **Haryana:** Scheduling and Despatch Code is under preparation. Draft F&S and DSM Regulations are both in final stages.

6) **Rajasthan:** The consultant updated that the RPO web-tool for the State of Rajasthan is complete and the launch of the same is scheduled for 27th Nov. The RPO tool for Gujarat is in final stage of security audit.

7) Shri Bakshi along with Shri AnandKumar ,Shri Hiremath and Shri M.K.Iyer unveiled a brochure on the Generic RPO Tool as prepared by the Consultant. Copies of the same were handed over to all participants.

Decisions

i) Work for Tamil Nadu and Haryana will continue at a fast pace and the Consultant shall keep the Committee updated on the same.

4. Agenda Item No. 4: Presentation by POSOCO on:Update on Sub-Group for 5-Minute Scheduling, Metering, Accounting and Settlement

Discussion

1) Shri K.V.S. Baba, CEO POSOCO, updated the Committee regarding proceedings of the sub-group on 5-minute metering (presentation attached as ***Annexure- 5)***. He stated that three meetings have been held so far.

2) At the first meeting, the participants discussed whether the shift to 5-minute metering is really required, and what the advantages shall be. Shri Baba underscored the importance of this vision, that moving to 5-minute grid management will be beneficial for improving reliability and security of the grid. He said that along with variable RE power, the variability in load is increasing too as on-demand power becomes increasingly available.

3) He appreciated the efforts of Gujarat SLDC for coordinating the testing exercise at the 2nd Meeting of the sub-group.

4) He stated that all future procurements of meters should be compatible with 5-minute resolution. He also informed the Committee that most meters procured post 2014 can be upgraded to 5-minute format through change of firmware only.

5) Shri B.B. Mehta submitted that the 4-block time-interval for revision of schedule can be shrunk now that the whole process is online. Ms Shilpa Agarwal, JC(Engg) CERC, agreed and further said that this would be crucial to get any benefit from moving to 5-minute metering and settlement.

6) Shri Lad mentioned that a mandate has to be made so that all future procurements of meters are done accordingly.

Decisions

ii) The Committee members reiterated the need for firming up of technical standards by CEA and making it mandatory to purchase only the meters with 5 minute recording capability in future.

Agenda Item No. 5: Presentation by POSOCO on

a. Analysis of Hydro Resources in Gujarat

b. Demand Pattern Analysis/Load Forecasting for Gujarat

Discussion

1) Shri Baba also presented analysis on hydro resources and demand patterns of the State (***Annexure- 6*** and ***Annexure- 7*** respectively). He highlighted that the State has about 7.5GW of installed capacity of Hydro power but the maximum that is generated is about 5GW only.

2) He impressed on the need to use hydro resources for ramping needs, given that the State is RE rich and well-equipped to plan all available resources. He specifically underscored the importance of better management of Sardar Sarovar project, and operationalizing pumping mode at the plant.

3) He also stated that hydro plants are good resources to provide Reactive Support Ancillary Services.

4) Shri Baba demonstrated with charts that the peak is growing faster than the lean for the State, and that there is a 4000 MW gap between the maximum and minimum load. This needs to be accounted for during capacity planning for future.

5. Agenda Item No. 6: View of RPCs on Options for Intra-Day / Hour Ahead Market Transactions

1) Ms. Shruti updated the Committee regarding the deliberations on Intra-Day Market Framework. She summarized that with increasing penetration of renewables, the increased requirement of balancing resources closer to real-time has necessitated that new intra-day market products are made available to the States.

2) Shri Bakshi added that states like Kerala with good hydro resources would like to value their resources while making them available to other states for balancing of infirm RE power. While inter-State banking has been used so far, moving forward, that will not suffice as number of transactions between States increase.

3) Ms. Shruti apprised the Committee of the feedback received from Regional Power Committees on the various options presented by Dr. S.K. Chatterjee, JCRA CERC, at the 14th Technical Committee Meeting. Feedback has been received from NRPC, WRPC and SRPC. All three of them have recommended Option #5 as a starting point. Option 5 refers to 'Pool based on auction for intra-day for the rest of the day'.

4) It was noted that further discussions are needed to evolve the details of operationalizing this option.

With this, the Meeting was concluded, and Shri Bakshi thanked all the Committee members and the special invitees for fruitful discussions.

Annexure-1

LIST OF PARTICIPANTS AT THE SIXTEENTH MEETING OF THE TECHNICAL COMMITTEE FOR "IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL" HELD ON 24.11.2017 AT SASAN GIR, GUJARAT

1	Shri. A. S. Bakshi, Member	CERC
2	Dr. M.K Iyer, Member	CERC
3	Shri Ismail Ali Khan, Chairperson	TSERC
4	Shri Anand Kumar, Chairperson	GERC
5	Shri Dev Raj Birdi, Chairperson	MPERC
6	Shri Rabindra Nath Sen, Chairperson	WBERC
7	Shri Vishwanath Hiremath, Chairperson	RERC
8	Shri Preman Dinaraj, Chairperson	KSERC
9	Shri P. Rama Mohan, Member	APSERC
10	ShriP.J. Thakkar, Member	GERC
11	Shri Deepak Lad, Member	MERC
12	Shri K.M. Shringarpure, Member	GERC
13	Shri R.P. Barwar, Member	RERC
14	Shri D.B. Manival Raju, Member	KERC
15	Shri K.V.S Baba, CEO	POSOCO
16	Ms. Shilpa Agarwal, JC (Engg.)	CERC
17	Ms. Shruti Deorah, Advisor – RE	CERC

18	Shri Vivek Pandey	WRLDC
19	Shri Aditya Das	WRLDC
20	Shri. B.B Mehta, Chief(Engg)	Gujarat SLDC
21	Shri S.R.Pandey, Legal Advisor	GERC
22	Shri Sanjay Anada, Joint Director (Engg)	GERC
23	Shri Ajit Pandit, Director, Idam	Consultant