Minutes of Meeting of the Sub-Group of Technical Committee of FOR to review the status of Implementation of SAMAST Scheme in Haryana and Punjab

Venue	:	PSERC, Chandigarh
Date	:	19.01.2018
List of participants	:	At Annexure -I (attached)

1. Ms Kusumjit Sandhu, Chairperson PSERC welcomed the Chairman of the Technical Committee and Member CERC Shri A.S. Bakshi, Shri M.K.Iyer, Member CERC, other Members of the Technical Committee and special invitees.

2. Chairman of the Technical Committee Shri A.S. Bakshi thanked the Chairperson PSERC for the invitation and for hosting the meeting of the Technical Committee. He stated that the original ambit of the Technical Committee was to cover 6 renewable rich States for the implementation of SAMAST and helping States in implementing Scheduling, Forecasting and deviation settlement mechanism at the State level. However, now its ambit has been enlarged. He further emphasised the need of introducing ABT at the State level in order to have balancing mechanism and to inculcate despatch discipline. He also lauded the efforts of the PSERC and HERC for taking steps at brisk pace to take forward the implementation of SAMAST and introducing Scheduling, Forecasting and deviation settlement mechanism at the State level.

3. Shri S. C. Shrivastava welcomed all the participants and requested Consultant Shri Ajit Pandit of M/s.Idam to make a presentation on the present status and way forward for implementation of framework on renewables in the State of Haryana and Punjab.

4. Shri Pandit made a detailed presentation on implementation of renewable framework in the State of Punjab and Haryana. A copy of presentation is **attached.** Presentation covered the following:-

Need and approach for ABT implementation at State level

- Technical and Commercial Considerations
- Experience of other state (viz. Madhya Pradesh)

Punjab & Haryana: Status Update of activities and Key Issues for discussion

- Overview of State Profile, State Entities, Interface Points, Metering, regulatory framework
- DPR preparation and Budgetary Cost Estimate for SAMAST implementation in Punjab

- Salient features of Draft F&S Regulations for Punjab
- Way forward for Punjab

5. **DPR for Haryana**:

a. It transpired after the deliberations that single meter at the interface points as budgeted by Haryana SLDC was not adequate. Two meters, one main and another check meter in series can be easily accommodated.

b. In addition, for budgetary cost estimation purposes it was suggested that the future growth in load/substation/OA may be considered rather than just existing requirement.

c. As regards open access metering arrangement, it transpired that only Transmission OA (about 40 no.) should be considered. Haryana desired to cover metering for Distribution OA/embedded (300+) consumers. This was not considered advisable as similar requests from all states are not expected to be covered under PSDF funding.

d. It was decided to revise the DPR considering above and to be submitted after management approval and regulatory approval for further processing to PSDF appraisal committee.

6. **Forecasting & Scheduling (F&S) Regulations for Haryana**:

a. Noted that Draft F&S Regulations have been published for public consultation. To be finalised soon.

7. **DSM Regulations for Haryana**:

a. HERC requested to explore simpler version of draft DSM Regulations for state at introduction stage. Broader principles under Model DSM Regulations at state level may be retained but flexibility to state to adopt simpler arrangement. Require further deliberations with state. Consultant will look into it.

8. **DPR for Punjab**:

a. Proposed dispensation for Segregation of T<>D interface at EHV s/s (i.e. above 66 kV) is noted and confirmed.

b. In addition, for budgetary cost estimation purposes it was suggested that the future growth in load/substation/OA may be considered rather than just existing requirement.

b. It was decided to revise the DPR considering above and to be submitted upon management approval and regulatory approval for further processing to PSDF appraisal committee.

9. **F&S Regulations for Punjab**:

a. Noted that Draft F&S Regulations have been published for public consultation. To be finalised soon.

10. **DSM Regulations for Punjab**:

a. It was informed that the function-wise segregation of accounts (Generation and Distribution business) and accounting/allocation of station-wise costs is necessary and necessary directions issued through Tariff Order by PSERC.

b. However, till then mock-exercise of Deviation (Schedule v/s Actual) and Energy Accounting thereof for each station needs to be initiated.

11. **Training & Capacity Building of SLDC staff**:

a. A need for Training and Capacity Building at SLDC level for DSM/SAMAST implementation at state level was emphasized. It was requested to depute Engineers for Certification/training programmes organised by NLDC.

b. It was also suggested that deputation of SLDC staff for specific tenure may be explored.

c. It also transpired during the deliberations that there is a need for considering a Separate/specialised cadre for Staff of System Operators.

Shri Soonee suggested that a sub-group may be created within the Technical Committee to look in to enhancing the infrastructural capabilities and man power capabilities of load despatch centres in India. Chairman desired that a proposal in this regard be put up in the next meeting of the Technical Committee.

12. **Best Practices of DSM implementation at state level**:

It was also deliberated and decided that a sub-group within Technical Committee may be formed to study/survey the best practices adopted by various states that have implemented (or under implementation) State level DSM framework. (viz. Gujarat, MP, Maharashra, etc).

Meeting ended with vote of thanks to the chair.

Annexure - I

List of participants attended meeting of the Technical Committee for implementation of SAMAST in Haryana and Punjab held on 19.01.2018 at PSERC, Chandigarh

Sl.No.	Name	Designation	Organization
1.	Sh. A.S. Bakshi	Member	CERC
2.	Sh. M.K. Iyer	Member	CERC
3.	Sh. S.C.Shrivastava	Chief (Engg.)	CERC
4.	Sh. S.S. Mal (Er.)	CE	PSTCL
5	Sh. Kusumjit Sidhu	Chairperson	PSERC
6	Sh. S.S. Sarna	Member	PSERC
7	Ms. Anjuli Chandra	Member,	PSERC
8	Sh. Debashish Majumdar	Member	HERC
9	Sh. M.S. Puri	Member	HERC
10	Sh. S.K. Soonee	Advisor	POSOCO
11	Sh. Ajmer Singh	Director Tech.	HVPNL
12	Sh. N.K. Sharma	Director	PSPCL
13	Ms. Shashi Prabha	Director	PSTCL
14	Sh. Rajiv Bhatia	Secretary	PSERC
15.	Sh. A.P.Singh (Er.)	SE/SLDC	PSTCL
16.	Sh. Sandeep Kumar (Er.)	Sr. Xen	PSPCL
17.	Sh. Shashi Bhushan (Er.)	Sr. Xen	PSTCL
18.	Sh. Ashok Kumar Yadav(Er.)	Sr. Xen/OA, SLDC	PSTCL
19.	Sh. Ashok Goyal(Er.)	Addl. SE/OA	PSPCL
20.	Sh. Vineet Verma(Er.)	AEE	PSPCL
21.	Sh. Amrinder Singh(Er.)	AEE	PSPCL
22.	Sh. Goel(Er.)	Sr. Xen	PSTCL
23	Sh. B.S. Sidhu	CE	PSPCL
24.	Sh. Rajender Sabharwal	SE/RA	DHBVN
25.	Sh. Pardeep Gupta	Dy. CE	PSPCL
26.	Sh. Sunil Gupta	AEE	PSTCL
27.	Sh. P.K. Singla	SE	PSPCL
28.	Sh. A.Konj(Er.)	DCE	PSPCL
29	Sh. Harjit Singh Sawa	CE	PSPCL
30	Sh. Shashi Prabha	DIR Technical	PSPCL
31	Sh. N.K. Sharma	Dir.	PSPCL
32	Sh. Rajiv Purwal	DGM	POSOCO
33	Sh. Jai Ram	Xen EC	HVPNL
34	Sh. Abhishek Dixit	Consultant	Idem Infra.
35	Sh. Brhamesh Alipuria	Consultant	Idem. Infra
36	Sh. Ajit Pandit	Director	Idam. Infra
37	Shr. Ashok Kumar Singla	SE/Comm	HVPNL
38	Sh. Vikas Kadian	Joint Director	HERC
39	Sh. Raghubir Sharan	Consultant	HERC
40	Sh. Sanjay Varma	Director Tariff	HERC
41	Sh. Arvind Chaudhary	Xen/SO	UHBVN
42	Sh. Palvinder Kumar(Er.)	Executive Engineer	UHBVN

Idam Infrastructure Advisory Pvt. Ltd.

Status of Implementation of SAMAST Report/Forecasting And Scheduling & DSM Regulations (Haryana and Punjab)

For Discussions at Sub-Group Meeting of FOR Technical Committee

January 19, 2018

The engagement of Consultant for support to FOR and its Technical Committee is supported under USAID/GTG-RISE initiative through Deloitte.

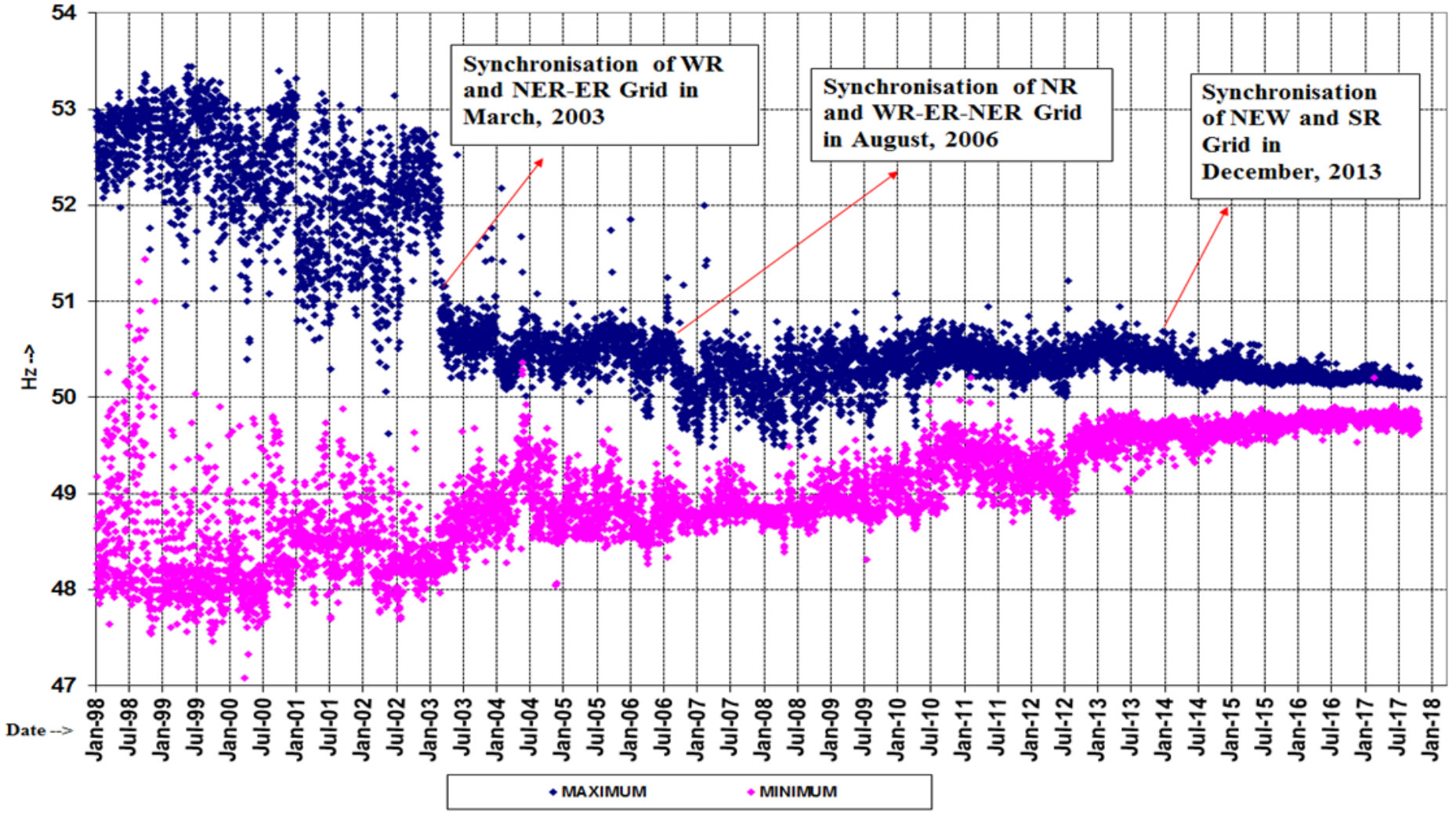
Agenda

- **Need and approach for ABT implementation at State level**
  - Technical and Commercial Considerations
  - Experience of other state (viz. Madhya Pradesh)
- **Punjab : Status Update of activities and Key Issues for discussion**
  - Overview of State Profile, State Entities, Interface Points, Metering, regulatory framework
  - DPR preparation and Budgetary Cost Estimate for SAMAST implementation in Punjab
  - Salient features of Draft F&S Regulations for Punjab
  - Way forward for Punjab
- **Haryana : Status Update of activities and Key Issues for discussion**
  - Overview of State Profile, State Entities, Interface Points, Metering, regulatory framework
  - DPR preparation and Budgetary Cost Estimate for SAMAST implementation in Haryana
  - Salient features of Draft F&S Regulations for Haryana
  - Salient features of Draft DSM Regulations for Haryana
  - Way forward for Haryana

ABT framework at regional level : historical developments

- **ABT mechanism was introduced in various regions in stages**
  - Western (1-Jul-2002), Northern (1-Dec-2002), Southern (1-Jan-2003), Eastern (1-Apr-2003) and North-Eastern (1-Nov-2003)
- **The main objectives of introduction of ABT mechanism at regional level have been:**
  - Encourage grid discipline
  - Economic load dispatch
  - Promote trade in energy and capacity
  - Encourage higher availability
- **Key benefits of ABT mechanism at regional level**
  - Improved grid frequency
  - Reduced frequency variations
  - Reduction of number of interruptions/grid failures
- **Successful implementation of ABT at regional level has firmed up belief that ABT mechanism (similar to mechanism at regional level) should be introduced at the State level.**

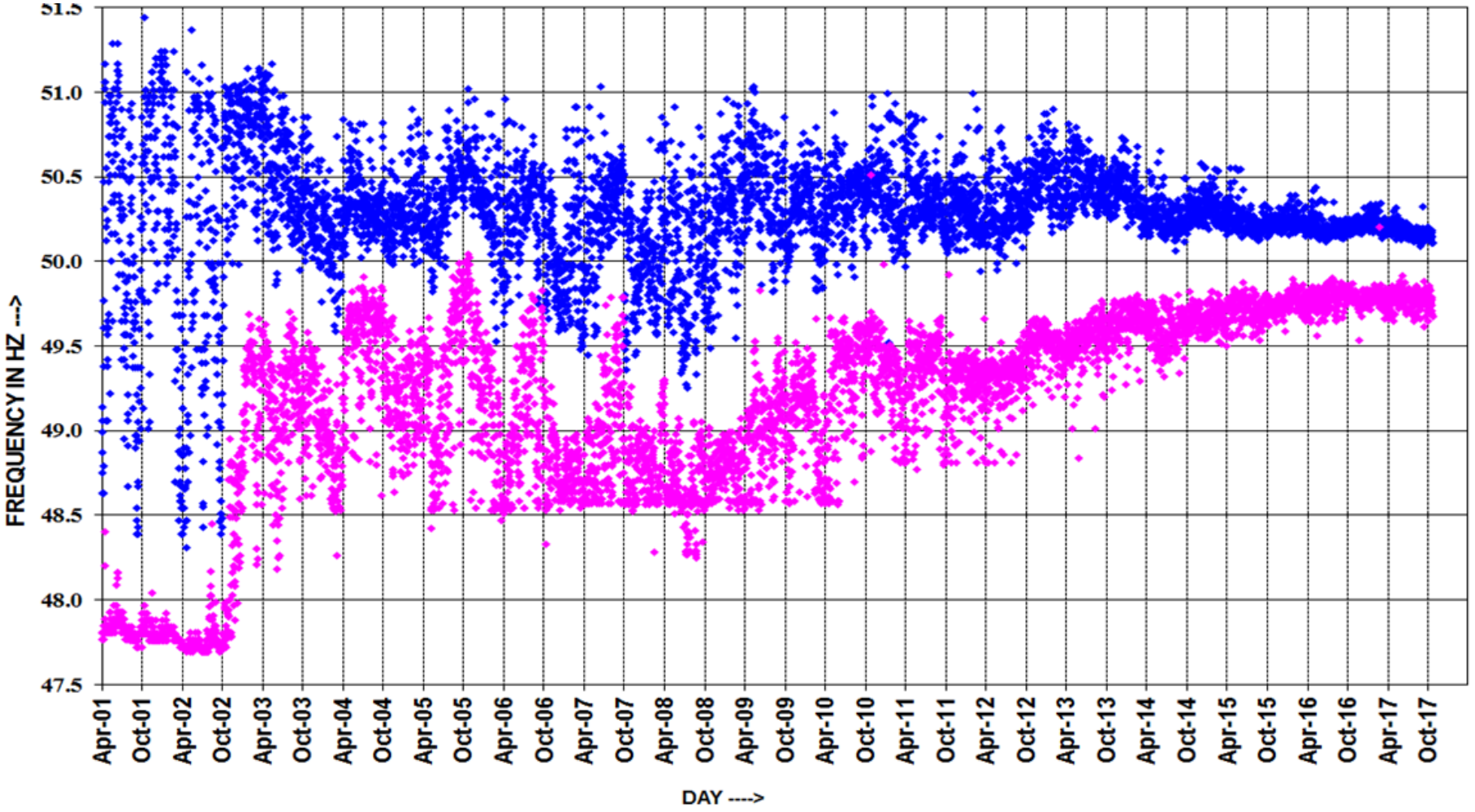
Maximum and Minimum Frequency Profile[7]



[7] – Based on ER / NEW Grid Data

Source : POSOCO and CERC

Maximum and Minimum Frequency Profile Southern Region[8]

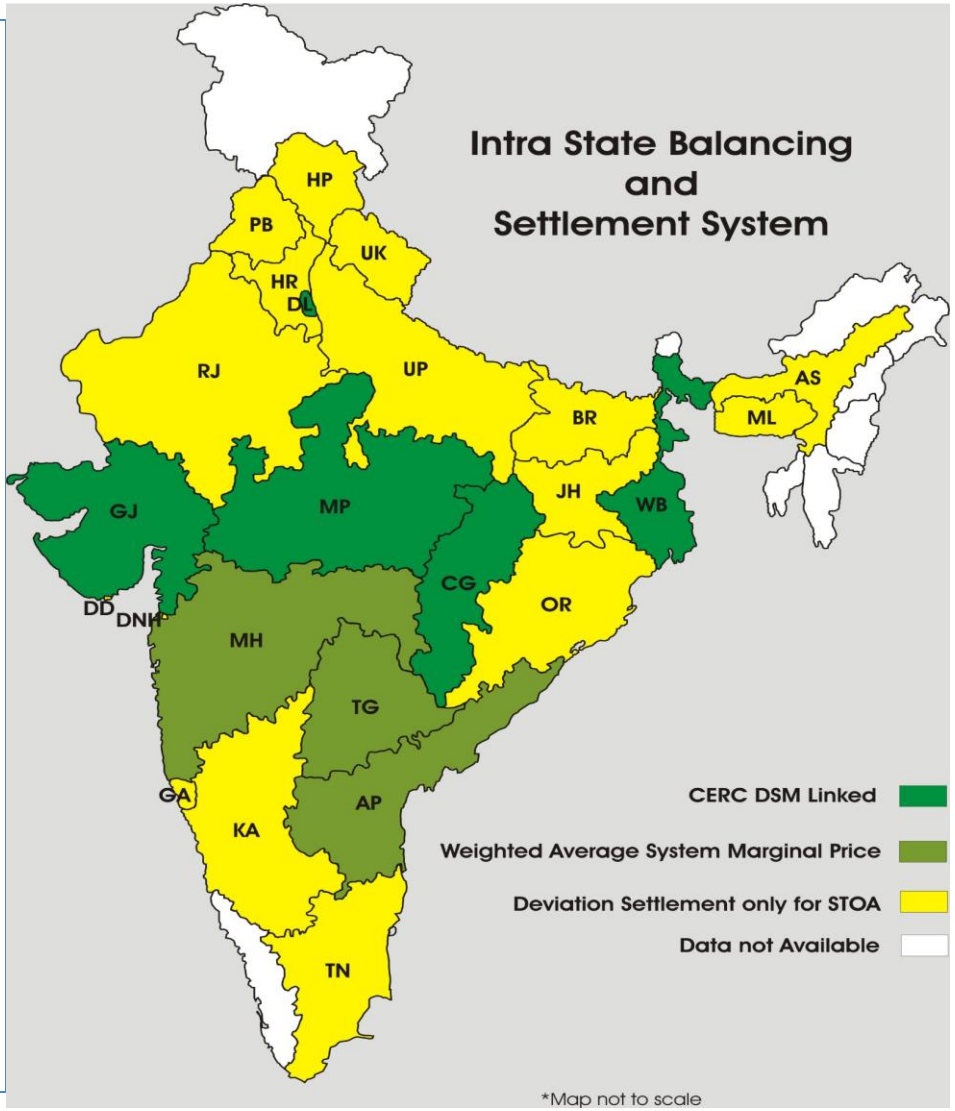


[8] – Based on SR Grid Data till Dec'14 and All India Grid data thereafter

Source : POSOCO and CERC

Intra-state Balancing & Settlement : Mandate and status update

- Section 32 of the Electricity Act 2003
- Section 5.7.1 (b) of National Electricity Policy 2005
- Section 6.2 (1) of Tariff Policy 2006 & 2016
- Recommendations of the Forum of Regulators – June 2006 and 2008
- Regulation 6.4.1 of Indian Electricity Grid Code 2010
- Recommendations of Niti Ayog for Renewable Integration – Feb 2015, Dec-2015
- Para 2.3.2 of the Pradhan Committee – 2008
- CERC Order on Roadmap for Reserves – Oct 2015
- CERC Framework for Forecasting Scheduling and Imbalance Handling for RES- Aug 15



ABT mechanism at State level

– Objectives

- To ensure **secure and reliable grid operations** while bringing in more generation in the system
- To instill **forecasting and load management discipline** amongst Discoms, load serving entities and OA consumers
- To ensure **despatch discipline amongst generators** based on economic/ merit order principles
- To **serve as a balancing mechanism** within the state
- To **facilitate energy accounting and deviation settlement** of transactions in transparent manner

– Key Considerations

- Ensuring Grid discipline – Share of scheduled capacity mgmt at state periphery is ~ 18% to 40% of total capacity/volume handled for intra-state entities. Deviation management (by Volume) for intra-state entities is crucial.
- Cost Principle – Should not have significant **impact on Cost of power** in the state power system as a whole.
- Market Development Principle – The new system (balancing & settlement) should promote the development of market, i.e., **encourage participation by many buyers and sellers**
- Quality and Efficiency Principle - Quality of supply and the **efficiency of various entities/institutions** should improve.
- Should not be prone to Gaming – The devised mechanism **should not be favourable to** any Participant.

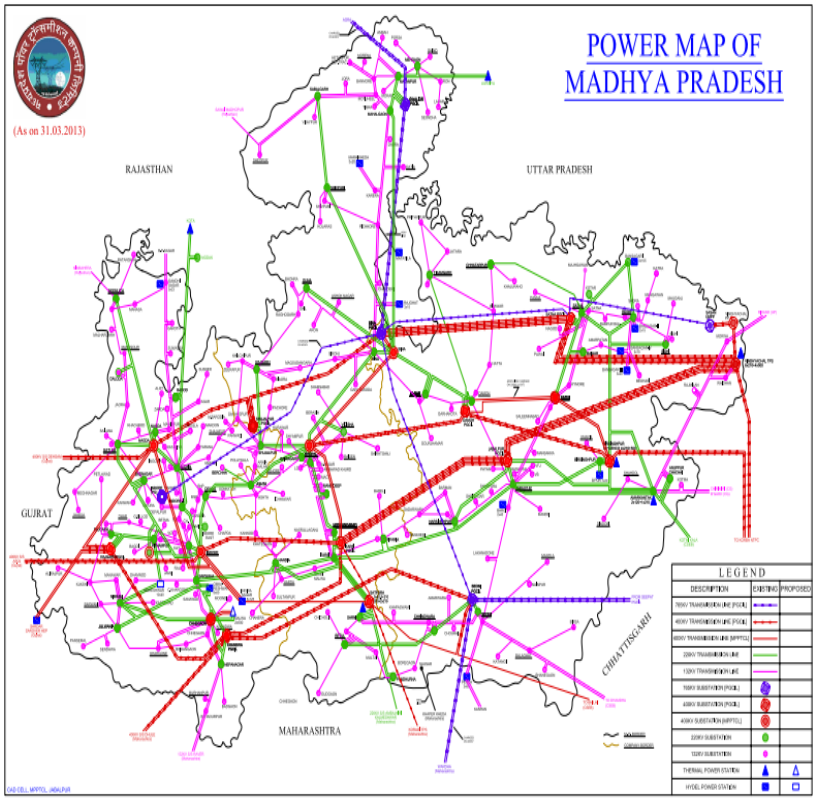
DSM : Experience of other States

- State Specific Details
- Profile of Madhya Pradesh
- Analysis of Deviation Charges for MP

Overview of State Experience: Entities, Deviation Mgmt and costs

State	Madhya Pradesh
Introduction of ABT at State level	Nov 2009
Intra-State Entity Profile	SGS (4080 MW), Hydel (3223 MW), Private generators (9390 MW), RE (3800 MW)
No. of Intra State Entities (As per SAMAST Report)	214
Peal Demand FY16-17 (in MW)	11512
Power share from CGS/ISGS (in MW)	5033 (43.76%)
Deviation limit	150 MW
Total ARR for FY 16-17 (INR Crore)	26,508
Net Deviation Charges for FY16-17 (INR Crore)	(120.56)
Total Deviation charges payable for FY 16-17 (INR Crore)	3.14
Total Deviation Charges Receivable for FY 16-17 (INR Crore)	(123.66)

Profile of Madhya Pradesh



Peak Demand: 11512 MW
Supply: 11501 MW
No. of Transmission S/s: 335 no. of Substations
(Ref.: LGBR 2017-18 Report & MPTRANSCO website)

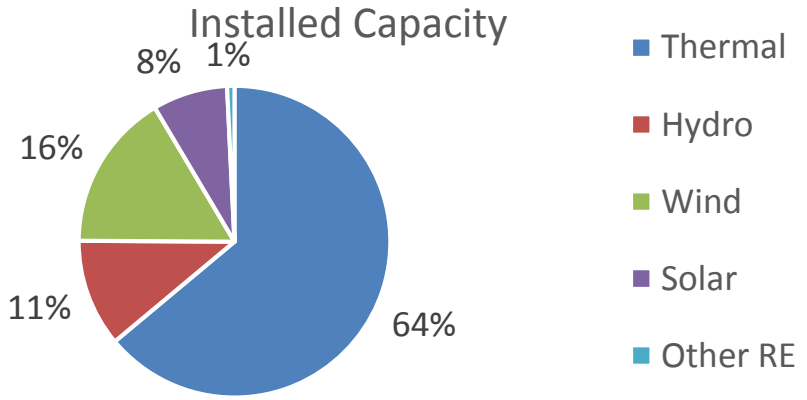
Profile of State

Generation sources	Installed Capacity in MW
Thermal	9754
Hydro	1703
Wind	2498
Solar	1186
Other RE	116

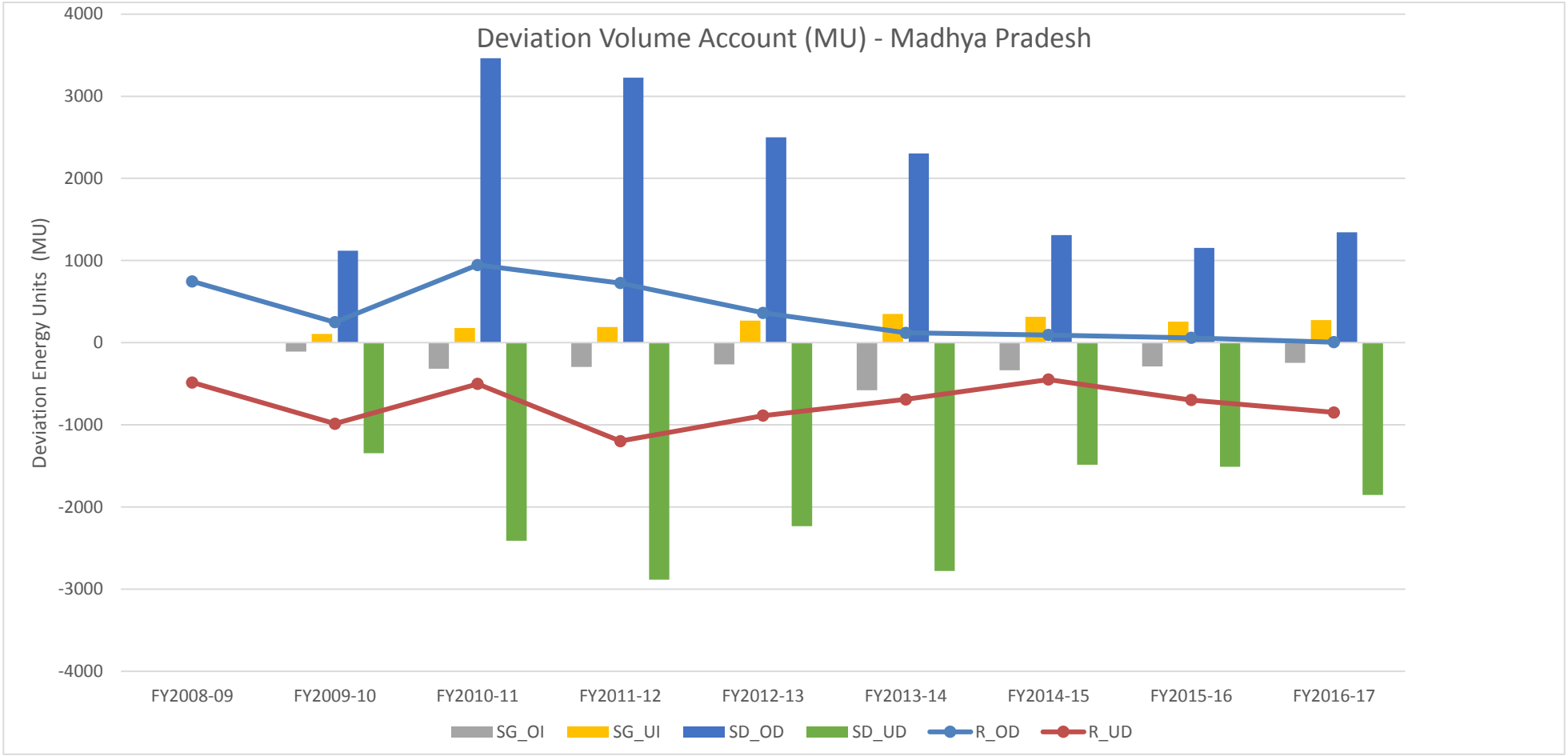
Total Gen Cap. : 15257 MW
IPPs: 2776 MW

(Ref.: CEA Executive Summary Oct 2017 and Madhya Pradesh Power to All, MoP Report, 2016)

No. of Distribution Licensees /SEZ: 3 no. (MPPKVVCL, MPPKVVCL & MPMKVVCL)
No. of Transmission Licensees: 1 no. (MPPTCL)
No. of OA Consumers : 61 no. (LTOA/MTOA/STOA)
(Ref.: FOR - SAMAST Report, 2016)

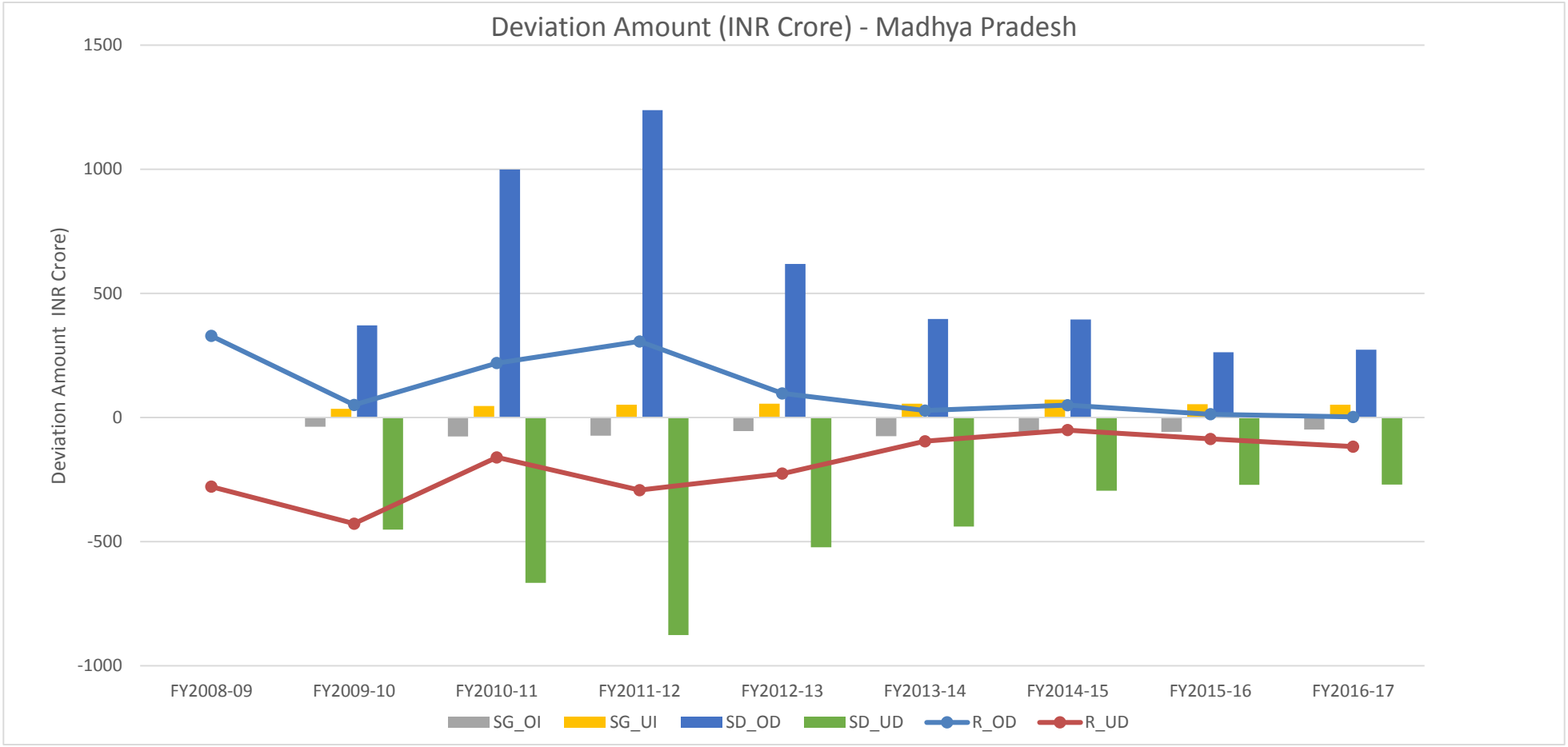


Madhya Pradesh : Deviation Account (MU) FY09 to FY17



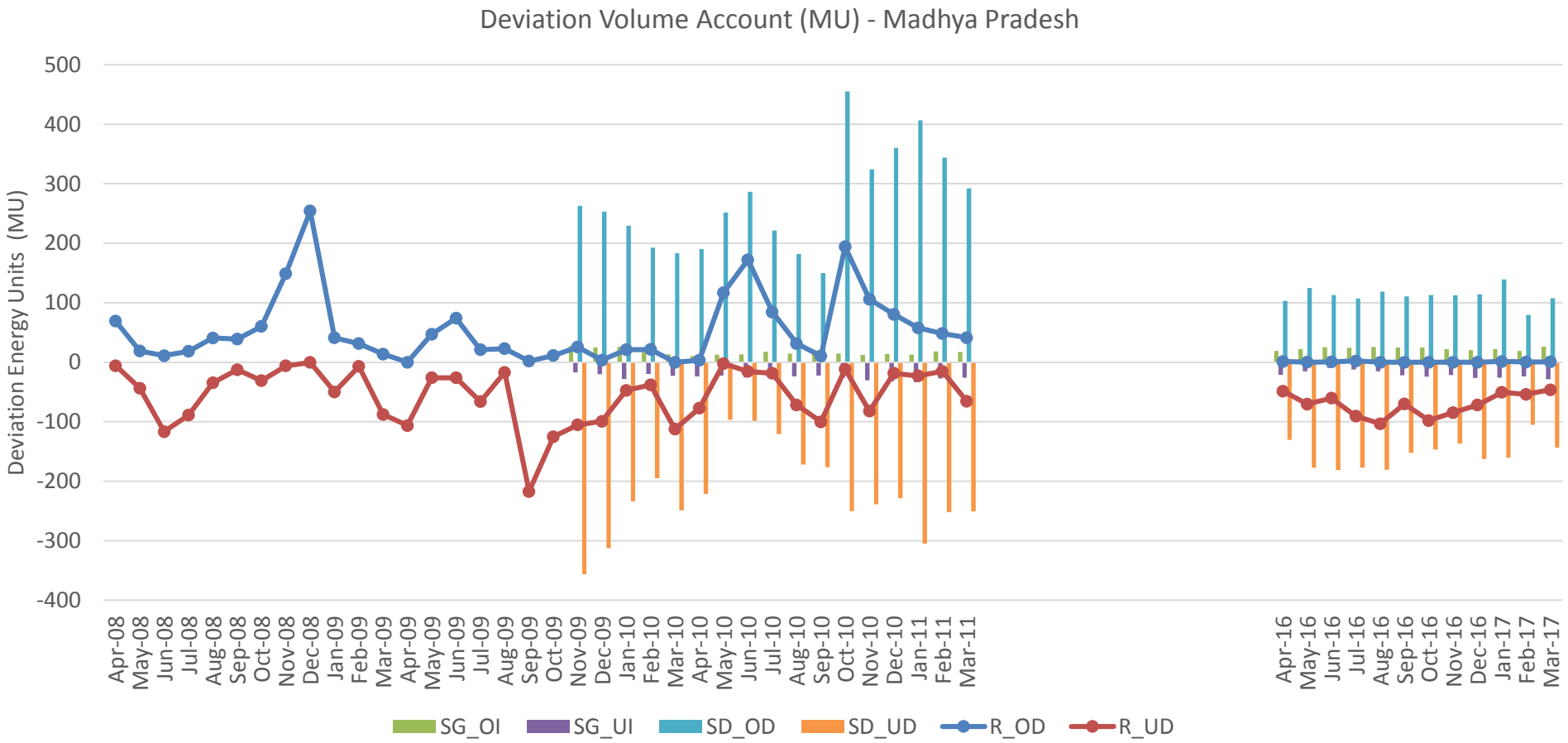
- Pre ABT and Post ABT : significant improvement over the period
- Improvement in Balancing/Deviation management by Intra-state entities over the period
- Share of energy units handled at state periphery is ~ 35% of total energy units handled for intra-state entities

Madhya Pradesh : Deviation Amount (INR Cr) FY09 to FY17



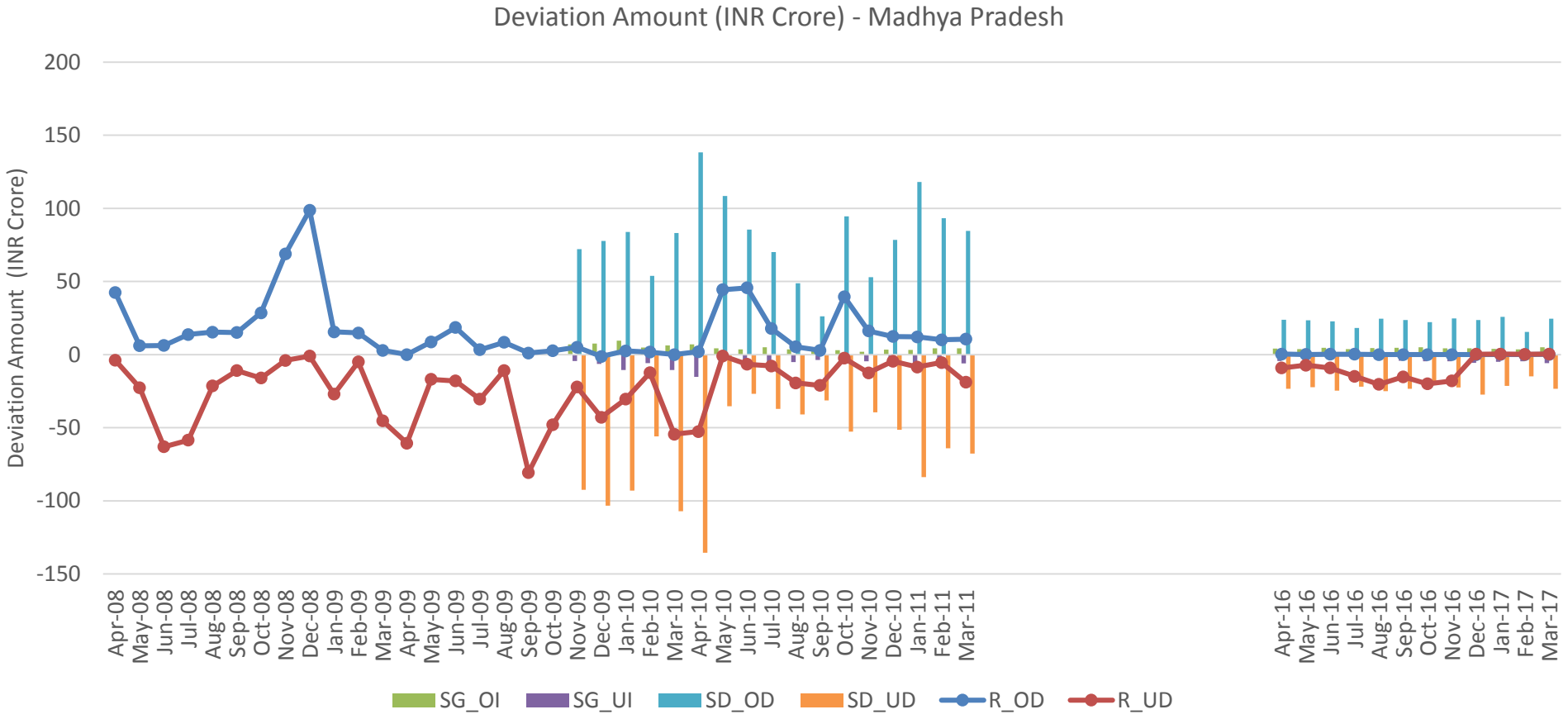
- Pre ABT and Post ABT : Improvement in Regional UI (payable/receivables) management
- No significant cost implications for Intra-state entities.
- Causer pays principle well established.

Madhya Pradesh : Deviation Account (MU) FY09 to FY17



- Pre ABT and Post ABT : significant improvement over the period (Monthly Deviation)
- Improvement in Balancing/Deviation management by Intra-state entities over the period
- Share of energy units handled at state periphery is ~ 35% of total energy units handled for intra-state entities

Madhya Pradesh : Deviation Amount (INR Cr) FY09 to FY17



- Pre ABT and Post ABT : Improvement in Regional UI (payable/receivables) management
- No significant cost implications for Intra-state entities.
- Causer pays principle well established.

Key Inferences

- With introduction of ABT at state level, there has been overall improvement in system operations and it has facilitated SLDCs to ensure **secure and reliable grid operations** while bringing in more generation in the system
- It has helped SLDC to instill **forecasting and load management discipline** amongst Discoms, load serving entities and OA consumers
- **Cost implications** for the sector is not significant as it has ensured **despatch discipline amongst generators** based on economic/ merit order principles. (*SGS deviations receivables/payouts are not significant, Regional Deviation Cost management has improved)*
- DSM framework at state level has **served as a balancing mechanism** within the state
- It has facilitated **energy accounting and deviation settlement** of transactions in transparent manner

Overview of State Experience: Entities, Deviation Mgmt and costs

State	Madhya Pradesh	Haryana	Punjab
Introduction of ABT at state level	Nov 2009	-	-
Intra-State Entity Profile	SGS (4080 MW), Hydel (3223 MW), Private generators (9390 MW), RE (3800 MW)	SGS (6951 MW), Hydel (1284 MW), Private generators (4578 MW), RE (366 MW)	SGS (2770 MW), Hydel (2570 MW), Private Generators (6481 MW), RE (1206 MW)
No. of Intra State Entities (As per SAMAST Report)	214	384	251
Peal Demand FY16-17 (in MW)	11512	9262	11408
Power share from ISGS (in MW)	5033 (43.76%)	2579 (27.8%)	2281 (20%)
Deviation limit	150 MW	150 MW	150 MW
Total ARR for FY 16-17 (INR Crore)	26508	22467	25378
Net Deviation Charges for FY16-17 (INR Crore)	(120.56)	13.91	24.91
Total Deviation charges payable for FY 16-17 (INR Crore)	3.14	57.78	78.63
Total Deviation Charges Receivable for FY 16-17 (INR Crore)	(123.66)	(43.87)	(53.72)

Punjab

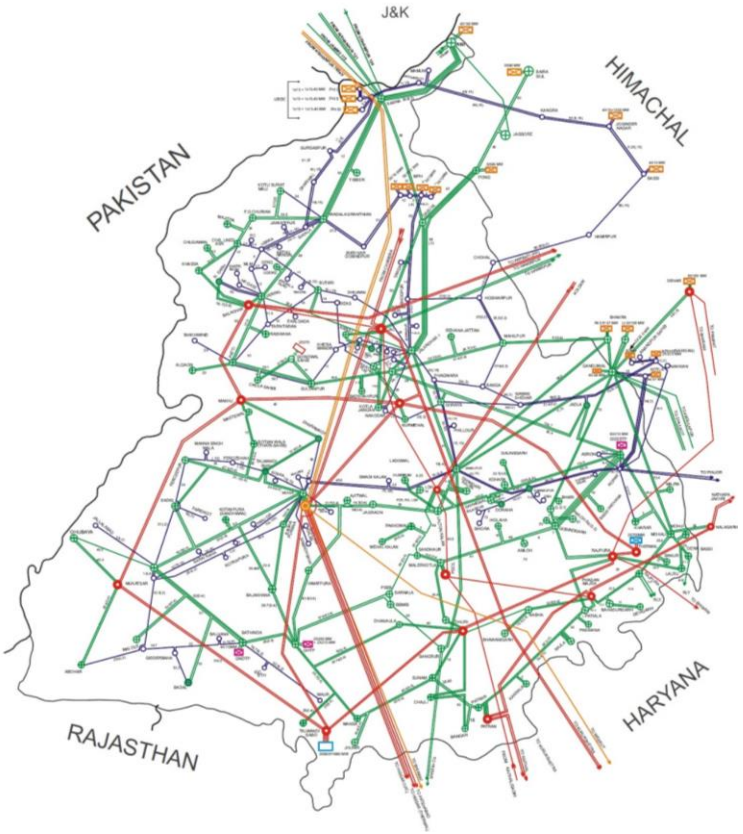
- Draft DPR for SAMAST Implementation in Punjab
- Draft F&S Regulations for Punjab
- Way forward

Status update of DPR for SAMAST Implementation in Punjab

- During meeting on 4th Jan 2018, detailed presentation on contours of DPR and overall approach was presented to the Commission/ staff/ PSTCL/SLDC and PSPCL.
- Draft data templates and copies of sample DPRs were shared with PSETCL/SLDC
- Preliminary information for preparation of DPR shared by PSETCL/SLDC on 12th Jan.
- Working draft DPR is prepared and shared with PSETCL/SLDC on 15th Jan 2018

- **Ascertaining interface points/ metering requirement is under discussion**
- **Segregation of T<>D interface between PSETCL and PSPCL is crucial.**
- **Interface points at 66 kV and above (to be considered) for Tx loss accounting.**
- **PSETCL /SLDC is finalising the Draft DPR and same will be submitted for management approval.**
- **Upon receiving Management Approval, DPR is be submitted to PSDF appraisal committee for further scrutiny.**

Profile of Punjab



Peak Demand: 11408 MW
Supply: 11408 MW
No. of Sub-stations: 280 no. of Substations
(Ref.: LGBR 2017-18 Report & PIUNJABSLDC website)

Profile of State

Generation sources	Installed Capacity in MW	No. of Units
Thermal	7885	21
Hydro	2858	31
Wind	-	-
Solar	896	
Other RE	638.55	

Total Gen Cap. : 12277 MW
IPPs: 1819 MW
Total RE : 1534.55 MW

(Ref.: CEA Executive Summary Oct 2017; PUNJABSLDC & PEDA websites)

No. of Distribution Licensees /SEZ: 1 no. (PSPCL)
No. of Transmission Licensees: 1 no. (PSTCL)
No. of OA Consumers : 6 no. (LTOA/MTOA/STOA)
(Ref.: As per info provided by SLDC)

Regulatory Developments:

- Falls under **Category 'B'** of SAMAST report
- Generators payment on actual basis
- MYT Regulations, 2014 and its amendments, specifies provision determination of Capacity Charge, Energy Charge and Deviation Charges of generators
- State Electricity Grid Code, 2013 and its amendments, specifies Scheduling and Despatch code
- Intra-State Open Access Regulations, 2011 and its amendments, specifies treatment to the Deviation of OA generators/consumers

Existing Metering/data acquisition process at Punjab

Meter data acquisition

- Data from the boundary meter interface points received in Centralized Energy Centre using Individual modems installed at these meters using GPRS communication.
- The data gets inserted in the database using Multidrive Software of EDMI and after that the data can be extracted in Excel/Text format.
- Data from IPPs and Open Access Customers is being received at SLDC using Mail/ CD/ DVD.

Meter data processing

- Meter data is being processed by using in-house software and then data validation is carried out through different validation process and subsequent corrections are carried out if required.
- The data is finalized block wise and feeder wise for preparation of deviation bill and other energy accounting reports and certificates.

Scheduling

- Presently real-time block wise, constituent wise Scheduling is being done manually (through email) for preparation of Implemented DC, Implemented Schedules and monthly Energy Account of 3 nos. large IPPs.
- Scheduling of Intra-State Open Access Customers is also being done in line with prevailing intrastate Open Access regulations

Regional UI Energy Accounting

- At present Northern Regional UI bill is being prepared by NRPC (POSOCO) based on the Special Energy Meters (SEMs) installed by it on the interstate boundaries.
- However for intrastate entities, Master frequency information is uploaded in excel based program for preparation of monthly UI/ Deviation Settlement Accounts of IPPs and Open Access Customers by Punjab SLDC.

Deviation Bill for state entities

- The computation of block-wise deviation charges of IPPs is in line with the DSM stipulated by CERC through CERC (DSM and Related Matters) Regulations, 2014,
- The computation of block-wise deviation charges in respect of OA customers is in line with the Imbalance Charges Mechanism stipulated by PSERC through PSERC (Open Access) Regulations,2011.

Gap Analysis and Issues Identified in Existing Energy Accounting Process of Punjab

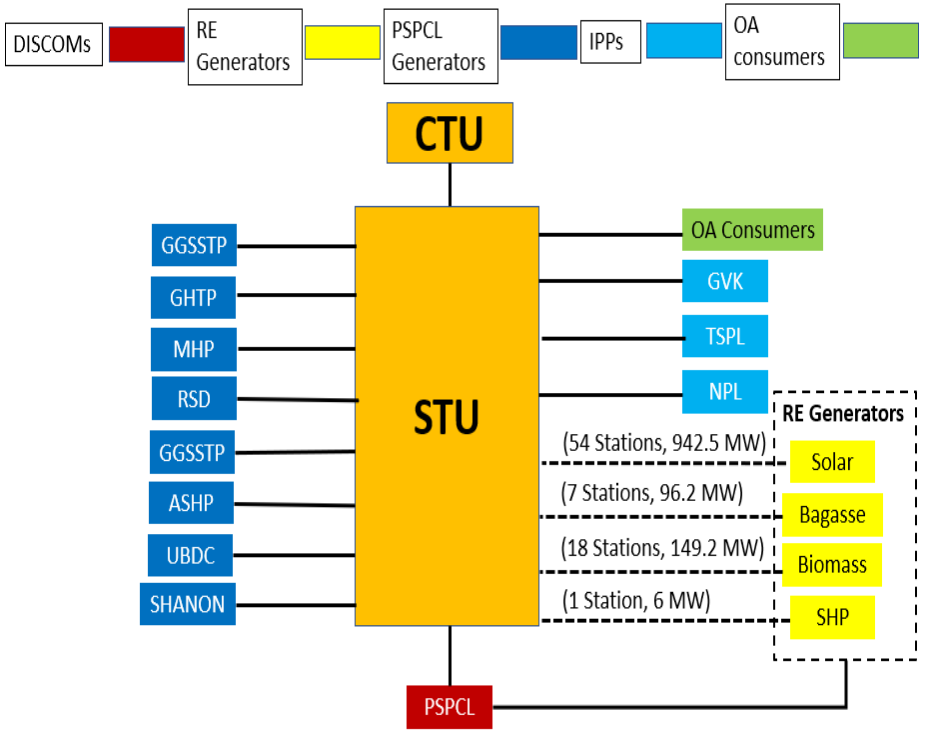
- **Interface energy meters** as per requirement of CEA Metering Regulations (Main, Check and Standby) are yet to be installed at all the interface points; particularly, with reference **to Standby meters**.
- At present, the ABT data of **Open Access customers and 3 nos. large IPPs** is being downloaded **manually** and supplied to SLDC in hard copy as well as soft copy for preparation of UI/ DSM accounts.
- Raw meter data is received at Punjab SLDC from IPPs and OA Customers through **E-mail/ CD/ DVD**.
- At present, the generation data of RE power is being downloaded **manually** supplied to the office of ISB in hard copy for preparation of monthly energy account for billing purposes.
- **Day-ahead Scheduling**, load-generation balancing and **intra-day rescheduling processes** need to be streamlined particularly, in light of **upcoming F&S and DSM Regulations** at state level that are likely to be notified in line with national level Modal F&S framework.
- Real time block wise, constituent wise Scheduling of IPPs & intrastate OA Customers is being done **manually (through email)**. Scheduling for SGS owned by PSPCL and RE Projects installed by various developers is not being done by SLDC.
- The **Reactive Energy account** is only being done for OA Generators and OA Consumers, who are not consumers of PSPCL (irrespective of voltage level).
- UI/Deviation accounting is not being done for **SGS owned by PSPCL** and RE Projects installed by various developers. At present, Deviation Bill of only 3 nos. large IPPs is being prepared.

Exiting ABT system under operation in Punjab

Boundary meters considered for preparation of Deviation Bill

	Constituent	No. of feeders/ Transformers	Installed Main meters	Installed Check meters	Installed Stand by meters
Thermal Generating Stations (PSPCL)	GNDTP, Bathinda	6	6	6	6
	GHTP, Lehra Mohabbat	9	9	9	8
	GGSSTP, Ropar	12	12	12	10
Hydro Generating Station (PSPCL)	Shanan HEP	2	2	2	3
	Anandpur Sahib HEP1	1	1	1	2
	Anandpur Sahib HEP2	4	4	4	2
	Mukerian HEP 1& 2	2	2	2	6
	Mukerian HEP 3& 4	2	2	2	6
	RSD HEP	4	4	4	4
	UBDC 3	4	4	4	2
	UBDC 1,2	0	0	0	4
	Sarna	2	2	0	0
IPP/CPPs (Private Generators)	GVK	6	6	6	4
	TSPL	6	6	6	5
	NPL	4	4	0	4
Distribution License (PSPCL)	220/66kv (LV side)	180	180	0	0
	132/66kv (LV side)	66	66	0	0
	132/33kv	6	6	0	0
	132/11kv	155	155	0	0
	Res-T	4	4	0	0
	Independent feeders	19	19	0	0
ISTS	InSTS	66	66	0	0
Total		**560**	**560**	**58**	**66**

Details of Interface points, meters and Substations considered for budgetary cost estimation	
Total no. of Interface Points	575
Total no. of Meters	1232
Total no. of substations	280
Total no. of Data Concentrator Units	183



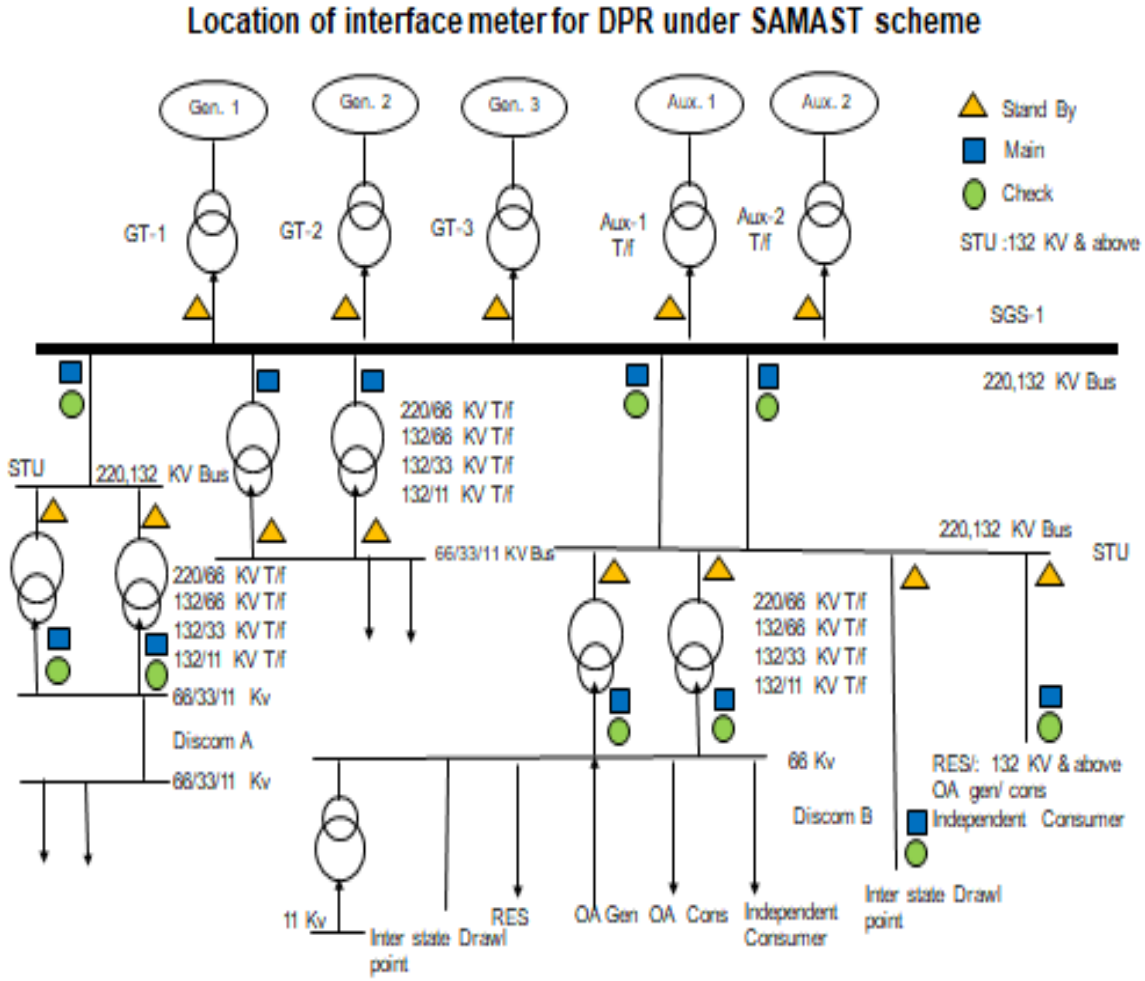
Existing ABT Metering arrangement

Defining T<>D Interface boundary and metering point(s)

Voltage level wise distribution for T<>D interface points	
220/66kv (LV side)	180
132/66kv (LV side)	66
132/33kv	6
132/11kv	155
Total	**407**

Key Issue(s):

- Segregation of T<>D interface between PSETCL and PSPCL is major challenge (point of debate between PSETCL and PSPCL).
- Interface points at 66 kV and above (to be considered) for Tx loss accounting.



CEA Metering Regulations, 2010 (Location of meters)

- Metering arrangement at T<>D interface points
  - At both ends of line : only Main meter required
  - At Interconnecting transformer: Main on HV side and Standby meter at LV side required

Sl. No.	Stages	Main meter	Check Meter	Standby meter
(1)	(2)	(3)	(4)	(5)
1.	Generating Station	On all outgoing feeders	On all outgoing feeders	(i)High Voltage (HV) side of Generator Transformers (ii)High Voltage side of all Station Auxiliary Transformers
2.	Transmission and Distribution System	At one end of the line between the substations of the same licensee, and at both ends of the line between substations of two different licensees. Meters at both ends shall be considered as main meters for respective licensees.	-	There shall be no separate standby meter. Meter installed at other end of the line in case of two different licensees shall work as standby meter.
3.	Inter-Connecting Transformer	High Voltage side of Inter-Connecting Transformer	-	Low Voltage side of Inter-Connecting Transformer

Details of Interface points, meters and Substations considered for budgetary cost estimation for Punjab	
Total no. of Interface Points	575
Total no. of Meters	1232
Total no. of substations	280
Total no. of Data Concentrator Units	183

Cost Estimate : Key components

Hardware Components-I	Hardware Components-II	Software Components	Communication Components	Training, Cap. Building and Infra Dev. Components
• ABT Meters • Instrument Transformers (CT/PT) • Calibration of Meters • Automated Meter Reading Instruments (CMRI) • Installation & testing	• Servers (database, application, domain, web, anti-virus) • Storage SAN • UPS/firewall/Rack for Server, • Laptops/Desktops Printers, Monitoring Screens • Installation & testing	• Operating Systems and Software Licensing • Scheduling s/f Module • OA s/f Module • Energy Accounting Module • Billing & SLDC Report Module • Financial Accounting and Statutory Compliance • Testing/Trial runs	• Modems • DCUs at field • GPRS/GSM connectivity for sites • MPLS communication lines • Internet & telephone connectivity • Installation & testing	• Training & Capacity Building • AMC for Hardware & Software • Office space within Building/ Premises • Furniture & Fixtures • Air-conditioning system • Project Mgmt/IT consultant

Summary of Preliminary Budgetary Cost Estimation for Punjab DPR:

S. No.	Item Description	Cost Estimate (INR Lakh)	Cost Estimate incl. Contingency (INR Lakh)
1	**Summary of Key Cost Components**		
1.1	Hardware component-I	948	976
1.2	Hardware component-II	193	203
1.3	Software component	536	563
1.4	Communication component	261	274
1.5	Infrastructure component	236	248
1.6	Training, Capacity Building & Annual Operating Cost	118	124
1.7	Contingency (est @ 3% on Metering and @5% on other cost)	96	
	GRAND TOTAL	**2,388**	**2,388**

Item Description	Cost Estimate (INR Lakh)
Cost-Estimate - Hardware-Metering infrastructure	976
Cost-Estimate - Communication Component	274
Cost-Estimate - Software, Hardware-II, Infrastructure, Training & Capacity Building - SAMAST	1,138
COST ESTIMATE GRAND TOTAL	**2,388**

INR 1412 Lakh

Status update on Draft PSERC F&S Regulations

- Draft F&S Regulations prepared and circulated to PSERC on 1st Dec and updated on 12th Dec, 2017 in line with the Model F&S Regulations
- Meeting/discussions with Commission on 4th Jan 2018
- Deliberations covered definition of Interconnection Point, definition of Pooling Substations, Applicability for minimum capacity, QCA and its role, treatment for gaming etc.
- Punjab has ~ 950 MW+ installed solar generation capacity (with individual solar generating stations cap. ranging from < 1 MW to 20 MW+)
- Proposed to undertake Mapping of Solar Generating Station to Pooling/Grid S/S to understand the current interconnection of RE (Solar) before stipulating condition (of Min MW and Voltage level) to which F&S shall apply

PSERC has published draft F&S Regulations for public consultation and invited comments till 22nd Feb, 2018 .

Applicability of F&S to Solar (Min Capacity and visibility)

RE Source	< 5MW		5 MW to < 10MW		>= 10 MW		Overall	
	No. of Stations	Cum. Capacity	No. of Stations	Cum. Capacity	No. of Stations	Cum. Capacity	**Total no. of Stations**	**Total Capacity (MW)**
Solar	11	41	3	22.52	40	879	**54**	**942.52**
Biomass	5	11.7	6	37	7	100.5	**18**	**149.2**
Bagasse	0	0	2	13	5	83.2	**7**	**96.2**
SHP	0	0	1	6	0	0	**1**	**6**
Total	**16**	**52.7**	**12**	**78.52**	**52**	**1062.7**	**80**	**1193.92**

- Mapping of Solar Generating Station to Pooling/Grid S/S to understand the current interconnection of RE (Solar) before stipulating condition (of Min MW and Voltage level) to which F&S shall apply.
- Need for enabling provisions with reference to Aggregator arrangement to be discussed.

PSERC draft F&S Regulations – 1/2

Sr.	Particulars	FOR Model F&S Regulations	PSERC F&S Regulations (draft)
1	**Applicability**	Wind and solar generators selling power within or outside the state	• Wind and solar generators individually 5 MW and above connected to the InSTS selling power within or outside the State, • If connected via pooling stations combined capacity of Pooling Station 5 MW and above.
2	**Forecasting and Scheduling 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 to be accepted
3	**Computation of Error Formula**	Available Capacity in denominator	Absolute Error = 100x {(Actual generation- Scheduled Generation)/ Available Capacity(AvC)}
4	**Tolerance Band for DSM**	10% new wind and solar generator. < = 15% existing wind and solar generator	• Uniform Tolerance for Wind and Solar • < =10%, 20%, 30% for new wind and solar generator. • < = 15%,25%,35% existing wind and solar generator
5	**Scheduling Requirement**	Weekly and day-ahead with maximum 16 revisions during a day	Weekly and day-ahead with maximum 16 revisions during a day
6	**Generator Payouts linked to**	• On Schedule basis (inter-state) • On Actual basis (intra-state)	• On Schedule basis (inter-state) • On Actual basis (intra-state)
7	**Deviation Pricing**	• Linked to Fixed Rate/PPA (inter-state) • PU INR 0.50, 1.0, 1.50 (intra-state)	• Linked to Fixed Rate/PPA (inter-state) • PU INR 0.50, 1.0, 1.50 (intra-state)

PSERC draft F&S Regulations – 2/2

Sr.	Particulars	FOR Model F&S Regulations	PSERC F&S Regulations (draft)
8	**Reference point for DSM**	Pooling station	Pooling station or individual Wind/Solar Generator > 5MW connected to the InSTS.
9	**Apportion of Energy Deviations & DSM Charges among RE generators at a pooling S/S**	In proportion to actual generated units or available capacity	In proportion to actual generated units or available capacity
10	**Telemetry and Communication Requirement & Responsibility for providing telemetry and Communication**	Data relating to power system output and weather By Generator	Data relating to power system output and weather By Generator
11	**Procedure for Data Telemetry and Communication**	Detailed procedure to be evolved by SLDC	Contours of Detailed procedure by SLDC have been outlined in Regulations
12	**DSM For Sale Outside State Specified**	Yes	Yes
13	**Meeting Shortfall of DSM Pool**	PSDF and NCEF	PSDF/ NCEF/ from the alternative funding mechanism, as may be approved by the Commission
14	**Provision for Gaming**	Symmetrical deviation charges around zero ensure that there is no perverse incentive for gaming or mis-declaration of schedule by the generator.	liable to action under appropriate provisions of the Act or the Regulations.

Way forward - Punjab

1. **Operationalising Intra-State ABT at state level :**
   - State Generating Stations (thermal and hydel) to be brought under ABT regime.
   - For three-part tariff operationalisation for SGS, functional segregation and accounting/allocation of station-wise fixed cost and energy charges is necessary.
   - Recently, PSERC in its MYT Order has given directions to PSPCL to undertake the same.
   - Until separate accounting in put in place, allocation matrix/principles (on basis of capacity) can be evolved.

2. **Preparation of DSM Regulations for Punjab State:**
   - PSERC to take up draft DSM Regulations at state level.
   - Timeline for development of DSM Regulations at state level.

Haryana

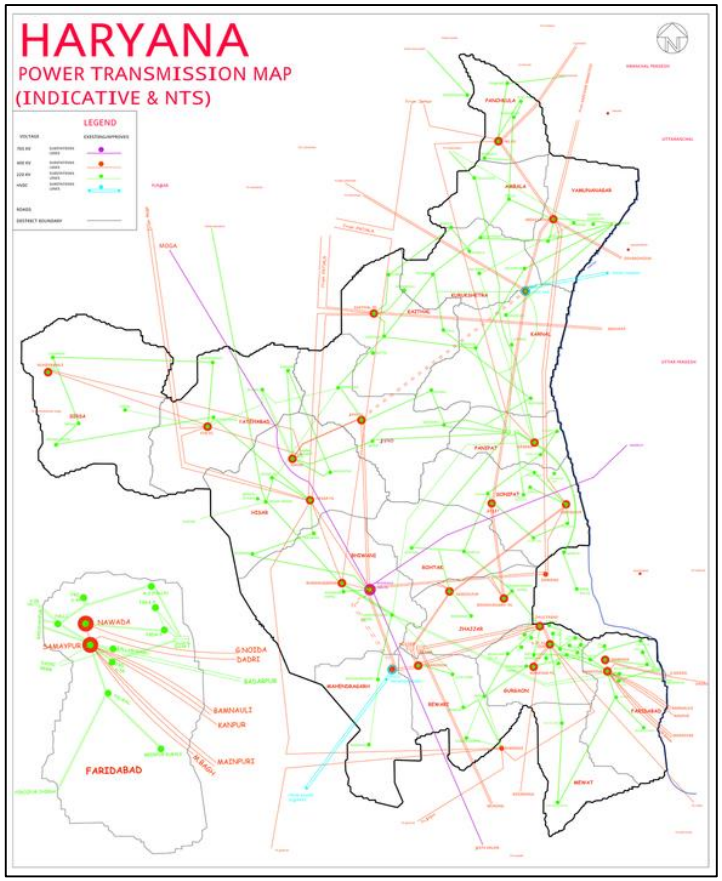
- Draft DPR for SAMAST Implementation in Haryana
- Draft F&S Regulations for Haryana
- Draft DSM Regulations for Haryana
- Way forward

Status update of DPR for SAMAST Implementation in Haryana

- During meeting on 13th Nov 2017, detailed presentation on contours of DPR and overall approach was presented to team of Commission/ staff/ HVPN/SLDC/Energy Centre and DISCOMs.
- Draft data templates and copies of sample DPRs shared with HVPN/SLDC/Energy Centre
- Preliminary information for preparation of DPR shared by HVPN/SLDC on 29th Nov 2017.
- Working draft DPR is prepared and shared with HVPN/SLDC on 6th Dec 2017
- Follow up and coordination with HVPN team to finalise DPR.

- **HVPN/SLDC is finalising the Draft DPR and management approval is in process.**
- **Upon receiving Management Approval, DPR is be submitted to PSDF appraisal committee for further scrutiny.**

Profile of Haryana



Peak Demand: 9262 MW
Supply: 9262 MW
No. of Transmission S/s: 422 no. of Substations
(Ref.: LGBR 2017-18 Report & HVPNL website)

Profile of State

Generation sources	Installed Capacity in MW	No. of Units
Thermal	6951	20
Hydro	1284	11
Wind	-	-
Solar	12.8	9
Other RE	353.2	-

Total Gen Cap. : 11180 MW
IPPs: 3106 MW
CPPs: 352 MW

(Ref.: HERC Annual Report 2014-15 & CEA Executive Summary Oct 2017)

No. of Distribution Licensees /SEZ: 3 no. (UHBVN, DHBVN & Railway)
No. of Transmission Licensees: 1 no. (HVPNL)
No. of OA Consumers : 349 no. (LTOA/MTOA/STOA)
(Ref.: FOR - SAMAST Report, 2016)

Regulatory Developments:

- Falls under **Category 'B'** of SAMAST report (DSM only for OA)
- Generators payment on actual basis
- MYT Tariff Regulations, 2012 specifies determination of Capacity Charge and Energy Charge of generators
- State Electricity Grid Code,2009 and its amendments
- HERC Open Access Regulations 2012, specifies treatment to the Deviation of OA generators/consumers
- Scheduling and Despatch Code yet to be notified

Existing Metering/data acquisition process at Haryana

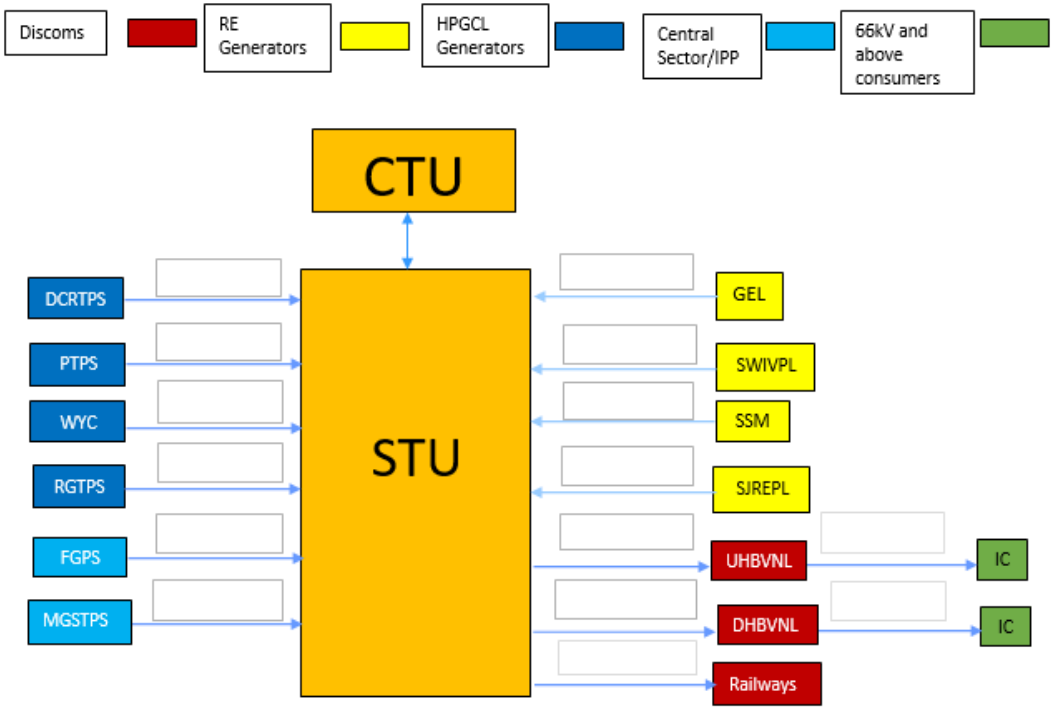
Meter data acquisition	Meter data processing	Scheduling	Regional UI Energy Accounting	Deviation Bill for state entities
The downloaded raw meter data of the SEMs meters installed at interface with HVPNL is being received through email and CMRI. Currently the system includes an old software for energy accounting of M/s Secure meter Ltd. and has no server to upload the acquired meter data	• Meter data is processed in the software and then the data is validated with manual statements received from field offices. . Currently the energy bills of Discoms are being prepared with deviation as no intra-state ABT has been implemented in the state. • However, the imbalance charges of CLP, Jhajjar (IPP), Northern Railways Delhi division (Distribution licensee), GBTL (CG) and deviation account of FGPS (CGS) and deviation statements of energy consumption of open access customers are being prepared.	• Presently the scheduling of state owned generators is nor being done. • However, the real time 15 minutes slot-wise scheduling of CLP, Jhajjar (IPP), Northern Railways Delhi division (DL), FGPS (CGS) is being done	• Regional Energy accounting is done by NRLDC, however intra-state ABT is yet to be implemented in the state	• As intra-state ABT is yet to be implemented in the State, presently the deviation bills for state entities are not being prepared.

Exiting ABT system under operation in Haryana

Boundary meters considered for preparation of Deviation Bill

	Constituent	No. of feeders	Installed Main meters	Installed Check meters
HPGCL Generating Stations	DCRTPS	8	8	8
	PTPS	11	4	4
	RGTPS	4	2	0
	FGPS	4	4	4
	MGSTPS	4	4	4
HPGCL Hydro Generating Station	WYC	3	3	3
IPP/CPPs	Gemco (RE)	1	1	1
	Star Wire India (RE)	1	1	1
	Shahbad sugar mill (RE)	1	1	1
	Sri Jyoti (RE)	1	1	1
Distribution Licensees	UHBVN	523	523	298
	DHBVN	522	522	321
	66kV and above	40	40	19
	Railways	8	8	4
Total		**1131**	**1122**	**669**

Details of Interface points, meters and Substations considered for budgetary cost estimation	
Total no. of Interface Points	1131
Total no. of Meters	1326
Total no. of substations	422
Total no. of Data Concentrator Units	410



Existing ABT Metering arrangement

Premise for cost estimation for SAMAST implementation in Haryana

- Estimation of quantities for Metering and Communication infrastructure is based on no. of Interface points, no. of intra-state entities as identified by HVPN.
- At present, **40 OA Entity** has been identified as connected to **transmission interface**. However, the same could increase in future.
- While **ABT meters are in place at interface points**, the cost of Metering infrastructure has been considered taking into account requirements to be compatible with future standards and communication.
  - Replacement of entire metering arrangements (New meters - ~ 1300+)
- Cost Estimate of **Hardware Component-II** (Servers, storage, laptops etc), Software Component and Training and Capacity building is based on assumptions on similar lines for other States (AP, TN).
- **Preparation of DPR** by HVPN is in process. After preparation of DPR, **approval of Management** will be sought and then DPR will be submitted to PSDF appraisal committee for approval.

Cost Estimate : Key components

Hardware Components-I	Hardware Components-II	Software Components	Communication Components	Training, Cap. Building and Infra Dev. Components
• ABT Meters • Instrument Transformers (CT/PT) • Calibration of Meters • Automated Meter Reading Instruments (CMRI) • Installation & testing	• Servers (database, application, domain, web, anti-virus) • Storage SAN • UPS/firewall/Rack for Server, • Laptops/Desktops Printers, Monitoring Screens • Installation & testing	• Operating Systems and Software Licensing • Scheduling s/f Module • OA s/f Module • Energy Accounting Module • Billing & SLDC Report Module • Financial Accounting and Statutory Compliance • Testing/Trial runs	• Modems • DCUs at field • GPRS/GSM connectivity for sites • MPLS communication lines • Internet & telephone connectivity • Installation & testing	• Training & Capacity Building • AMC for Hardware & Software • Office space within Building/ Premises • Furniture & Fixtures • Air-conditioning system • Project Mgmt/IT consultant

Summary of Budgetary Cost Estimation for Haryana DPR:

S. No.	Item Description	Cost Estimate (INR Lakh)
	Summary of Key Cost Components	
1.1	Hardware component-I	942
1.2	Hardware component-II	233
1.3	Software component	544
1.4	Communication component	475
1.5	Infrastructure component	25
1.6	Training, Capacity Building & Annual Operating Cost	216
1.7	Contingency (est @ 3% on Metering and @5% on other cost)	103
1.8	Project Management and consultancy (6% of total project cost).	152
1	**GRAND TOTAL**	**2690**

Cost Estimate - Hardware-Metering infrastructure			970
Cost Estimate - Communication Component			498
Cost Estimate - Software, Hardware-II, Infrastructure, Training & Capacity Building – SAMAST			**1069**
Project Management and consultancy		6% of Total cost	152
COST ESTIMATE GRAND TOTAL			2690

Draft HERC F&S Regulations

- Draft F&S Regulations prepared and circulated to HERC on 17th Nov, 2017 on the lines of Model F&S Regulations
- Meeting/discussions with Commission on 13th Nov 2017, 23rd Nov 2017 and 22 Dec 2017.
- Haryana do not have significant solar installed capacity (< ~ 50 MW with individual solar generating stations cap. ranging from < 1 MW to 5 MW)
- Deliberations covered definition of Interconnection Point, definition of Pooling Substations, Applicability for minimum capacity, QCA and its role, treatment for gaming etc.
- HERC is contemplating to stipulate Min capacity of Wind and Solar for applicability of F&S as 1 MW and above.

HERC has published draft F&S Regulations for public consultation and invited comments till 12th Feb, 2018 .

HERC draft F&S Regulations – 1/2

Sr.	Particulars	FOR Model F&S Regulations	HERC F&S Regulations (draft)
1	**Applicability**	Wind and solar generators selling power within or outside the state	• Wind and solar generators connected to the InSTS, connected via pooling stations • selling power within or outside the State • installed capacity at Pooling S/S of 1 MW and above.
2	**Forecasting and Scheduling Responsibility**	Wind and solar generator or by QCA Or forecast by SLDC to be accepted	• Wind and solar generator or by QCA • Forecast by SLDC accepted
3	**Computation of Error Formula**	• Absolute Error = 100x {(Actual generation- Scheduled Generation)/ Available Capacity(AvC)}	• Absolute Error = 100x {(Actual generation- Scheduled Generation)/ Available Capacity(AvC)}
4	**Tolerance Band for DSM**	10% new wind and solar generator. < = 15% existing wind and solar generator	• Uniform tolerance band for Wind and Solar (+/-10%, +/-20%, +/-30%) • No distinction between Existing or New
5	**Scheduling Requirement**	Weekly and day-ahead with maximum 16 revisions during a day	• Weekly and day-ahead with maximum 16 revisions during a day
6	**Generator Payouts linked to**	• On Schedule basis (inter-state) • On Actual basis (intra-state)	• On Schedule basis (inter-state) • On Actual basis (intra-state)
7	**Deviation Pricing**	• Linked to Fixed Rate/PPA (inter-state) • PU INR 0.50, 1.0, 1.50 (intra-state)	• Linked to Fixed Rate/PPA rate (inter-state) • PU INR 0.50, 1.0, 1.50 (intra-state)

HERC draft F&S Regulations – 2/2

Sr.	Particulars	FOR Model F&S Regulations	HERC F&S Regulations (draft)
8	**Reference point for DSM**	Pooling station	• Pooling Station (incl. Discom S/S) • Existing RE Gen. need to be mapped. • Definitions of Interconnection Point and Metering Point considering existing practices
9	**Apportion of Energy Deviations & DSM Charges among RE generators at a pooling S/S**	In proportion to actual generated units or available capacity	In proportion to actual generated units
10	**Telemetry and Communication Requirement & Responsibility for providing telemetry and Communication**	Data relating to power system output and weather By Generator	Data relating to power system output and weather By Generator/QCA
11	**Procedure for Data Telemetry and Communication**	Detailed procedure to be evolved by SLDC	Contours of Detailed procedure by SLDC have been outlined in Regulations
12	**DSM For Sale Outside State Specified**	Yes	Yes, subject to conditions
13	**Meeting Shortfall of DSM Pool**	PSDF and NCEF	Shortfall in the aggregate amount of Deviation Charge payable by Solar and Wind Energy Generators at the State periphery and the amount receivable from them by the State Deviation Pool Account shall be accounted for separately

Draft HERC DSM Regulations

- Draft DSM Regulations prepared and circulated to HERC on 29th Nov 2017.
- Further, draft Scheduling and Despatch Code/Guidelines were also prepared and circulated to HERC.
- Discussions on implementation of ABT for Haryana SGS .
- The deliberations on, whether to treat Genco as whole v/s each Generating station v/s Generating Unit.
- It was concluded that Deviation Accounting should cover at Generating Station level (and not Genco as whole).
- HERC is working on finalising the draft DSM Regulations for further regulatory process.

- **At present, deviation accounting for only Open Access transactions is carried out (Category-B)**
- **Need for Operationalising the Intra-State ABT at state level**
- **HERC to publish draft DSM Regulations for public consultation.**

Draft HERC DSM Regulations, 2017 – Salient features(1/3)

Sr. No.	Ref of Draft Regulations	FOR Model DSM Regulations	Proposed Draft HERC DSM Regulations
1	Objective	To maintain grid discipline and grid security as envisaged under the Grid Code through the commercial mechanism for Deviation Settlement through drawal and injection of electricity by the users of the grid	To maintain grid discipline and grid security as envisaged under the Grid Code through the commercial mechanism for Deviation Settlement through drawal and injection of electricity by the users of the grid.
2	Applicability	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), as the case may be.	• All Seller(s) including OA Generating Station(s) but excluding Wind and Solar Generating Station(s) connected to InSTS or Distribution system in accordance provisions of HERC(Grid Connectivity and Intra-State Open Access Regulations), 2012. • Buyers(s) other than Distribution Licensees and Full Open Access Consumer(s) shall be governed in accordance with the provisions of Haryana Electricity Regulatory Commission (Grid Connectivity and Intra-State Open Access Regulations), 2012.

Draft HERC DSM Regulations, 2017 – Salient features(2/3)

Sr. No.	Ref of Draft Regulations	FOR Model DSM Regulations	Proposed Draft HERC DSM Regulations

3	Limits for Deviation	• No over-drawal/under-injection when Frequency below 49.8 Hz.
		• No under-drawal / over-injection when frequency is above 50.05 Hz
		• Volume Cap for Intra-state Entities proposed as under:
		  • For Generators /Sellers : 10 MW or 12% of Schedule, whichever lower
		  • For DISCOMs/Buyers: X Limit or 12% of Schedule, whichever lower
		  • In case of schedule is less than 40 MW, Volume cap of 5 MW or 12% of schedule, whichever higher.
		• 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
			• No over-drawal/under-injection when Frequency below 49.7 Hz
			• No under-drawal / over-injection when frequency is above 50.05 Hz
			• Volume Cap for Intra-state Entities proposed as under:
			  • For Generators /Sellers : 10 MW or 12% of Schedule, whichever lower
			  • For DISCOMs/Buyers: X Limit or 12% of Schedule, whichever lower
			  • In case of schedule is less than 40 MW, Volume cap of 5 MW or 12% of schedule, whichever higher.
			• 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

Draft HERC DSM Regulations, 2017 – Salient features(3/3)

Sr. No	Ref of Draft Regulations	FOR Model DSM Regulations	Proposed Draft HERC DSM Regulations
4	Charges for Deviation	• 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 • Linked to avg. freq (15 min duration) in steps of 0.01 Hz over range from 49.9 Hz to 50.05 Hz • Change in sign of deviation once every 6 time blocks- violation attracts additional charges @10% of deviation charges applicable for the continuance of violation • Cap Rate of Paise 303.04/ unit (indicated- to be linked through imported coal power plant) • Charges for over injection / under drawal in excess of 12% of the schedule or 10 MW shall be zero.	Charges shall be accordance to CERC (DSM Regulations), 2014 • Charges payable (over-drawal/under-injection) and receivable (under-drawal/over-injection) for each time-block with slope of 35 paise/unit per 0.01 Hz • Linked to avg freq (15 min duration) in steps of 0.01 Hz over range from 49.7 Hz to 50.05 Hz • Change in sign of deviation once every 6 time blocks- violation attracts additional charges @10% of deviation charges applicable for the continuance of violation • Cap Rate of Paise 303.04/ unit (indicated- to be linked through imported coal power plant) • Charges for over injection/ under drawal in excess of 12% of the schedule or 10 MW shall be zero.
5	Institutional Arrangement	• State Power Committee to prepare Statement for Deviation Charges on Weekly basis • State Load Despatch Centres to operate & maintain 'State Deviation Pool Account Fund'	• Haryana SLDC to prepare and maintain State Deviation Pool Account • State Power Committee to co-ordinate and facilitate intra-state energy exchange • SPC to monitor compliance of DSM Regulations by State Entities.

Way forward for Haryana (for discussion)

- Finalisation of DPR for SAMAST implementation with Management approval for further process
- Final notification of F&S Regulations upon public consultation at state level (Haryana)
- Initiation of Regulatory Process for formulation and public consultation for Draft DSM Regulations at state level (Haryana)
- Review of Grid Code and approval of Scheduling and Despatch Procedures/Code

Idam Infrastructure Advisory Pvt. Ltd.

Thank You

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Haryana deviation payment to Regional Pool Account

Year	Quantum (in Mus)					Amount (in Rs Crore)		
	Over-drawal	Under-drawal	Absolute deviation	Power Procured through Regional Grid	Deviation at regional level (%)	Payable	Receivable	Net payable/ Receivable
2014-15	221.36	-203.52	424.89	28314	1.50%	158.93	-14.23	144.70
2015-16	402.54	396.58	799.13	29800	2.68%	272.20	-75.42	196.77
2016-17	546.78	-34.22	581.01	29161	1.99%	57.00	-48.56	8.43