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 FORTechnical Committee for Implementation of Framework for Renewablesat State level was held under chairmanship ofMr. 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.AjitPandit (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 consideredas individual state entities and will be subsumed within Discomas 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 MaharashtraSLDC 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-worthrequirement 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

Implementation Aspects of DSM and F&S framework at state level

Recap of consensus of 5th Meeting of

FOR Technical Committee

22-Aug-2016

FOR Model on forecasting, scheduling and DSM at State level – Salient features (1/3)

- The Forum of Regulators (FOR) promulgated the model regulations on forecasting , scheduling and deviation settlement of wind and solar generating station at the state level in November 2015.

- The regulations comprises of the following parts:

  A. Objective and Applicability

  B. Forecasting and Scheduling Code

  C. Commercial and Deviation Settlement Code

  D. Miscellaneous

FOR Model on forecasting, scheduling and DSM at State level – Salient features(2/3)

Sr. No.	Section of the model regulations	Clauses	Brief Description of the dispensation mechanism
1	**General**	Objective	facilitate large-scale grid integration of solar and wind generating stations while maintaining grid stability and security
2		Applicability	All wind and solar generators connected to the State grid, including those connected via pooling stations, and selling power within or outside the State
3	**Forecasting and Scheduling Code**	Computation of Error Formula	Available Capacity is in the denominator. The formula for computation of the error is as follows: 100x {(Actual generation- Scheduled Generation)/ Available Capacity}
4		Scheduling Requirement	Weekly and day-ahead with maximum 16 revisions during a day
5		Telemetry and Communication Requirement	Data relating to power system output and weather
6		Procedure for data telemetry and communication	Detailed procedure to be evolved by SLDC
7		Responsibility of Providing Telemetry and Communication	Wind and Solar Generators
8		Basis for generator payments undertaking Intra state transactions	Based on actual generation

FOR Model on forecasting, scheduling and DSM at State level – Salient features(3/3)

Sr. No.	Section of the model regulations	Clauses	Brief Description of the dispensation mechanism
9	**Forecasting and Scheduling Code**	Basis for generator payments undertaking Intra state transactions	Based on scheduled generation
10		Tolerance Band for DSM	10% new wind and solar generator. < = 15% existing wind and solar generator
11		Entity responsible for undertaking all commercial settlement on behalf of the generators	Qualified Coordinating Agency
12	**Commercial and Deviation Settlement Code**	Reference Point for DSM	Pooling S/S
		Apportion of Energy Deviations & DSM Charges among RE generators at a pooling S/S	In proportion to actual generated units or available capacity
13		DSM For Sale Outside State Specified /Interstate Transactions	Based on CERC Deviation Settlement mechanism, linked to PPA rates and APPC (i.e. 90%, 80% and 70%) in steps
14		Deviation Charges for Intrastate transactions	fixed amount (Rs 0.50, Rs 1.00 and Rs 1.50/kWh) in steps for deviations between 15-25%, 25-35% and above 35% respectively
14		Accounting Procedures	RE generators shall be treated together as a virtual pool within the State Pool. Deviations for and within this virtual pool could be settled first at the rates and methodology stipulated
		Funding of deficit in the DSM Pool/state imbalance pool	Through national level funds of PSDF and NCEF

Implementation Aspects of State level F&S framework

- Qualified Coordinating Agency (QCA)

- Operationalisation of Virtual Pool and De-pooling Mechanism

- Funding the deficit in State Imbalance Pool

- Metering arrangement

- Treatment for Inter-State RE transactions of State Entities

Detailed procedure on F&S framework to provide for the following

Role of QCA and it's eligibility criteria	Operation-alisation of Virtual pool within the state imbalance pool	Mechanism of deviation settlement at pooling S/S level	Funding deficit of the state imbalance pool	Diverse sets of metering practises being followed across states	DSM mechanism for RE Gen. connected to STU with inter-state transactions
a) Regulatory oversight of QCA in appropriate regulations b) Technical &Financial Criteria of QCA c) Governance mechanism of QCA d) Model Term sheet	a) Mechanism of Operation of virtual pool. b) Entity responsible for operating the virtual pool	a) Principles of de-pooling of deviation charges b) Between RE generators at the pooling S/S	a) Dependence on national level funds for long term and its sustainability. b) Need for creation of state level funds for funding deficit	a) Need for creating standardised metering points in all states b) Devising Uniform metering and energy accounting policy	a) Treatment for RE Generators with multiple transactions at Pooling S/S level

Implementation of Intra-state DSM mechanism, Adopting Standardised IT/communication protocol, Enhanced visibility of RE generators at SLDC Level will provide a facilitative mechanism to the above

Issue-1: Role of QCA (Consensus)

- **Provide schedules with periodic revisions** on behalf of all the Wind/Solar Generators connected to the pooling station(s).

- **Responsible for** coordination with STU/SLDC **for** metering, data collection/transmission, communication.

- **Undertake commercial settlement** ~~of all charges~~ on behalf of the generators, of such charges pertaining to generation deviations only including payments to the Regional/State pool accounts through the concerned SLDC.

- **Undertake de-pooling of payments** received on behalf of the generators from the State Pool account and settling them with the individual generators on the basis of actual generation.

Issue-1: Implementation aspects of QCA (Consensus)

> **Operationalising QCAs at a pooling S/S**

a. **Institution**: Each Pooling S/S will have only one QCA.

b. **Regulatory Recognition**: The term 'QCA' will be recognised under respective State Grid Codes as 'State Entity'.

c. Recognition of QCA by State Agencies (SLDCs/REMC). Mapping of QCAs vis-a-vis Pooling S/S.

d. **Procedures**: SLDC to formulate Procedure for Empanelment/Registration of QCAs at state level, upon approval by concerned SERC.

e. **Coordination**: QCA to be single point of contact with the SLDC for energy account, deviation settlement and co-ordination for despatch/curtailment.

f. **Data/Information**: Procedure would also outline the Data/information exchange requirement, protocol for sharing between QCA, SLDC and Generators

Issue-1: Implementation aspects of QCA (Consensus)

> Institutional structure
> and
> Governance
> Mechanism

a. **Legal structure**: QCA to be organised as a legal entity - company or co-op society for registration/empanelment with SLDC

b. **Eligibility Criteria:** Technical Eligibility Conditions and Financial Criteria for registration with SLDC to be laid down by concerned SERC. (*Guidelines for eligibility criteria suggested*)

c. **Governance**: Regulatory oversight over QCA to be exercised through SLDC

d. **Registration Fee**: SLDC to prescribe Fees upon approval by SERC - One time and annual recurring or One time (3 year)

e. **Default & Remedial measures**:

 i. In case of default in Pool settlement, penalty to be levied by SLDC

 ii. Disputes between SLDC and QCA to be resolved by SERCs;

 iii. Blacklisting by SLDC in case of major errors/ frauds, continued default

f. **Revenue Model**: QCA and RE Generators to mutually decide Professional charges for services rendered by QCA (in INR/MWh or MW; one time /annual) and also resolve disputes between themselves.

Issue-1 : Eligibility Criteria for QCA (Consensus)

Technical Criteria

- **Capability** to handle real time communication with SLDC 24X7

- **Demonstrable IT capabilities** : IT Resources (database, manpower, licenses) and Infrastructure (hardware and software)

- **Experience** (at least 2 yrs) of Metering, Billing, Consumer mgmt. in any domain

- **Manpower requirement**: Qualified professionals in min. 3 yr experience in power systems or renewable energy systems – planning or development or operations.

- **Code of Conduct** – adherence to statutory compliances/registrations

Financial Criteria

- **Networth** of the Entity to be related to monetary value of state imbalance pool and/or Capacity at Pooling S/S and state level
  - *Networth requirement of INR 1,00,000/- per MW*
  - *(Est. for Pooling S/S 100 MW with annual generation of 200 MU. Deviation volume estimated @10% 20 MU @ deviation charge Rs 3 pu = Rs 60 p.a. or Rs 5 Mn/month for 100 MW i.e. Rs 50000/MW per month. Networth equivalent to at least 2 month Deviation Charge Volume = Rs 1,00,000/MW.)*

- **Profitable Operations** (past 2 yrs) – Avg. Annual Turnover (INR 5 Crore) and Positive Profit after Tax

- **Asset Base**: Total tangible and intangible assets requirements (Min GFA of INR 25 Lakh)

Operationalising Virtual Pool and De-pooling

- **Clause 3.7 (Virtual Pool)**: Once the accounting procedures as above are in place, all RE generators shall be treated together as a 'virtual pool' within the State Pool. Deviations for and within this virtual pool could be settled first at the rates and methodology stipulated for wind and solar generators.

- **Clause 3.5 (De-pooling):** The QCA shall also de-pool the energy deviations as well as deviation charges to each generator using one of the following options:

  - In proportion to actual generated units for each time-block for each generator;

  - In proportion to available capacity of each generator

Issue 2 – Computation of Deviation Charges at Pooling S/S (Consensus)

Pooling Station No	Available Capacity (MW)	Schedule (MW)	Actual Injection (MW)	Deviation (MW)	Deviation (%)	Dev. Charges payable by Individual Pooling Stations (F)
	(A)	(B)	(C)	(D)	(E)	
P.S. – 1	140	100	130	30	21%	4,500
P.S. - 2	320	200	210	10	3%	-
P.S. - 3	480	300	360	60	13%	-
P.S. - 4	360	200	190	-10	-3%	-
P.S. - 5	220	150	80	-70	-32%	26,000

a. Mechanism of operationalisation of the virtual pool within the state imbalance pool.
b. **QCA to undertake settlement of only Deviation Charges at Pooling with State Imbalance Pool.**
c. Settlement of Actual /Schedule injection directly between Buyer and Seller.
d. QCA to provide energy credit statement.
   i. Energy accounting & DSM computation shall take place for each time block (15-min) duration
   ii. Settlement period for all energy accounts and DSM accounts on weekly basis
   iii. Adjustment/true-up of DSM accounts for each entity on quarterly basis

Issue 3 – De-pooling of Deviation Charges amongst RE Generators (Consensus)

Pooling Station No (PS-5)	Available Capacity (MW)	Schedule (MW)	Actual Injection (MW)	Deviation (MW)	Deviation (%)	Dev. Charges payable by RE Generators (F)
	(A)	(B)	(C)	(D)	(E)	
RE Gen – 1	20		-			-
RE Gen – 2	50		10			3,250
RE Gen – 3	60		30			9,750
RE Gen – 4	40		20			6,500
RE Gen – 5	50		20			6,500
Grand Total	220	150	80	-70	-32%	26,000

a. QCA to provide energy credit statement (monthly / weekly) and adjustment/true up on quarterly basis.
b. De-pooling of Deviation Charges amongst RE Generators on 'Actual' injection instead of 'Av. Capacity'
   - Report for Energy Credit Statement with actual injection by each RE Generator is readily available.
   - Average Available capacity over deviation settlement period (weekly or monthly) need to be ascertained.
   - Certification of Available Capacity over settlement period would be challenge.

Issue-4 : Funding deficit in state imbalance pool (Consensus)

- **Clause 3.8** : For covering the deficit in the overall pool, at the end of the year the SLDC may approach the National Funds such as PSDF or NCEF

- Meeting the deficit from PSDF/NCEF on a long term basis may not be sustainable.

- Designing of state level Imbalance Pool with 'Non-Zero Sum' features is crucial. **SERCs to address this requirement while formulating DSM Regulations at state level.** *(To be covered under Model DSM Regulations)*

- In addition, SERCs to consider creating State level funding support mechanism to manage deficit

   - Levy of System Benefit charges (paise/MWh) on all TSUs

   - Regulatory charges for shortfall in RPO Compliance

Issue-5: Standard Metering and Accounting practices
(Consensus)

State	AP	GJ	KN	MH	MP	RJ	TN
Billing Meters Position	3&4	3	4	2&3	1	2&4	0&1
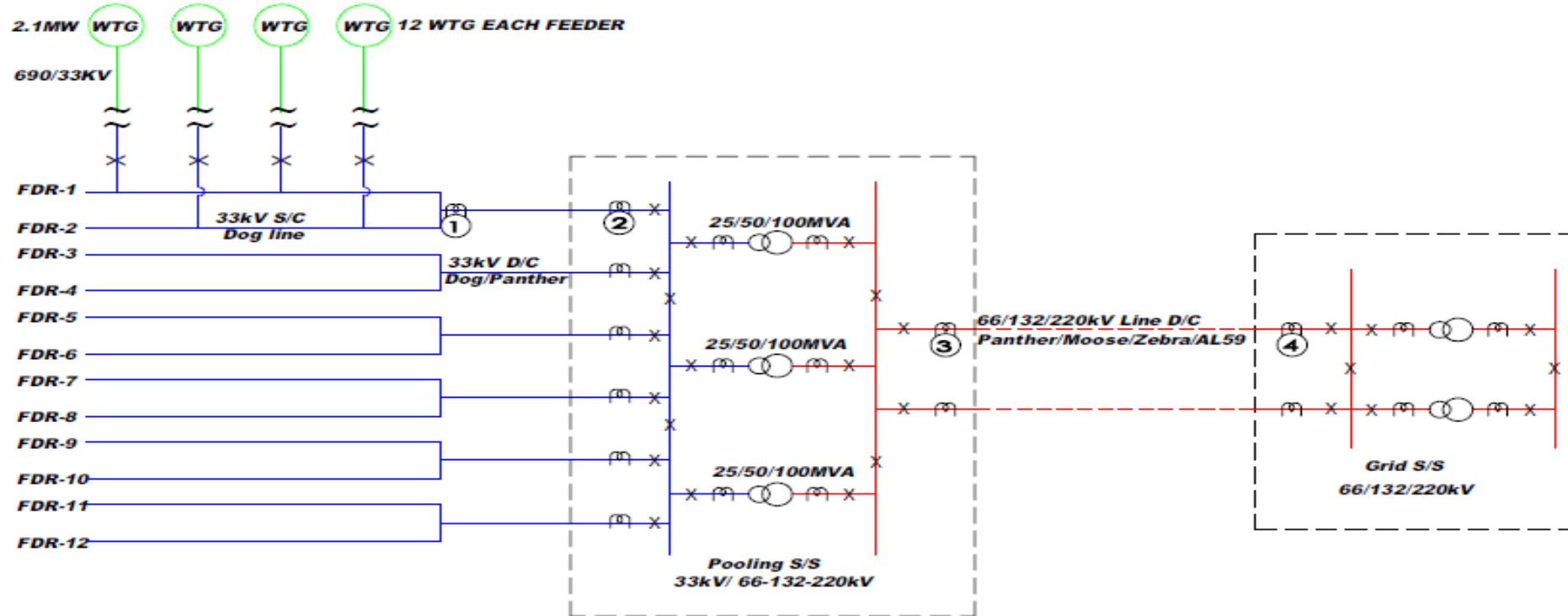
- Uniform practice for Energy Accounting for DSM computations to be adopted. Model DSM Regulations to cover.

Issue-6 : Mechanism for DSM for inter-state transactions (Consensus)

- **Payments to RE Generators** are made on the following basis:
  - Inter-state transactions- Scheduled energy basis
  - Intra-state transactions- Actual energy basis

- **Rates for deviation settlement** for RE generators undertaking **inter-state transaction is based on** percentage of PPA Rate or APPC (i.e. 90%, 80% and 70%) in steps.
- **Rates for deviation settlement** for RE generators undertaking **intra-state transaction** is based on fixed amount (Rs 0.50, Rs 1.00 and Rs 1.50/kWh) in steps

- **Deviation Charge settlement** on the following basis:
  - Inter-state transactions:
    - For Over-injection – Receipt from DSM Pool
    - For Under-injection – Payment into DSM Pool
  - Intra-state transactions:
    - For Over-injection – Payment into DSM Pool
    - For Under-injection – Payment into DSM Pool

Issue-6: Mechanism for DSM for intra/inter-state transactions (Consensus)

-@130% PPA	-@120%PPA	-@110%PPA	-@PPA rate	+@PPA rate	+@PPA -10%PPA	+@PPA-20%PPA	+@PPA-30%PPA
1.50/unit	1.00/unit	0.50/unit	Nil	Nil	0.50/unit	1.00/unit	Actual kWh 1.50/unit
S-35% of AvC	S-25% of AvC	S-15% of AvC	S	S+15% of AvC	S+25% of AvC	S+35% of AvC	

<S: schedule>
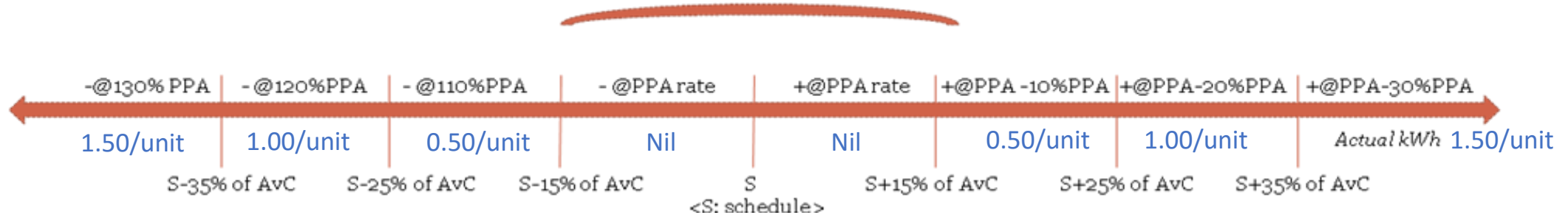
- Error definition: [(Actual generation – Scheduled generation)/Available Capacity] x 100

- Payment as per schedule @PPA Rate

- Deviation Settlement within tolerance band (+/- 15%):
  - Receipt from/payment to pool @PPA rate (i.e. in effect, payment as per actuals)

- Beyond 15%, a gradient band for deviation charges is proposed as follows:

Abs Error (% of AvC)	Deviation Charge	Deviation Charge
15%-25%	110% or 90% of PPA rate	0.50/unit
25%-35%	120% or 80% of PPA rate	1.00/unit
>35%	130% or 70% of PPA rate	1.50/unit

- 16 revisions allowed, one for every one-and-half-hour block, effective from 4th time-block.

Issue-6 : Mechanism for DSM for inter-state transactions – 1/2

Key Issues

- Some RE generators connected to a particular pooling S/S may undertake intra-state transaction while others may wish to undertake inter-state transactions

- As schedules are prepared at pooling S/S level, carrying out deviation settlement poses challenge.

- Rules for Treatment for such transactions needs to be defined.

Issue-6 : Mechanism for DSM for inter-state transactions – 2/2

<u>Suggestion:</u>

- All inter-state transactions at a pooling S/S to be allowed if connected through separate feeder.

- Deviations for Inter-State and Intra-State transactions at Pooling S/S to be accounted for separately.

- Virtual Pool Accounting at State level to exclude such Deviation Accounting for inter-State transactions

- SLDC/State Energy Account to provide separate Energy/DSM accounts for inter-State and intra-state transactions to QCA.

- QCA to separately settle Deviation Charges with RE Generators for inter-State and intra-State transactions.

- In case of shortfall in amount at QCA level or for variation in weekly/monthly cycle, QCA may set rules for pro-rata settlement of inter-State and intra-state transactions of RE Generator(s).

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

Way forward

- Addressing implementation aspects of F&S Framework is crucial from operationalising F&S for variable RE.

  - **Institutional aspects of QCA** to be recognised through suitable amendments in IEGC and State Grid Code. *(QCA as Registered Entity).* Other aspects to be covered in the detailed procedure to be prepared by SLDC with approval of SERC.

  - **Model DSM Framework/Regulations** at State level to be formulated (*To address rules for virtual pool operationalisation, de-pooling arrangement, clarity on rules/treatment for intra-State and inter-state wheeling transactions of State Entities)*

  - **Clarity on Procedures/Rules** for claiming shortfall in State DSM Pool due to RE *(Treatment for funding deficit in state level DSM Pool or Amendment to existing Regulations to create State level funding support)*

  - **Model Procedures /Code for** Metering, Communication, Energy Accounting for RE to accomplish uniformity across states. *(To address Energy Accounting, Communication, Data telemetry, Metering and Loss accounting)*

Thank You

Example 1:   (Within tolerance band of +/- 15%)

		Scenario I: Intra-state wheeling	Scenario II: Inter-State wheeling
	Schedule (MWh)	100	
	PPA Tariff (Rs/Unit)	5	
	Available Capacity (MWh)	100	
	Scenario	Scenario I: Intra-state wheeling	Scenario II: Inter-State wheeling
	Actual Generation	110	110
	% Absolute Error	10%	10%
	Buyer Pays	5*110*1000 = 550,000 (on actual basis)	5*100*1000 = 500,000 (on schedule basis)
	Seller Receives	550,000	500,000
Seller to DSM	Add: Seller Receives from DSM Pool or pays into pool for Deviation upto 15%	None	5*(110-100)*1000 =50,000
	Add: Deviation Charge @ Rs 0.50/unit or @ 90% of Fixed rate for Deviation Between 15%-25%	-	-
	Add: Deviation Charge @ Rs 1.00/unit or @ 80% of Fixed rate for Deviation Between 25%-35%	-	-
	Add: Deviation Charge @ Rs 1.50/unit or @ 70% of Fixed rate for Deviation Beyond 35%	-	-
	Total Receipt from/(payment to) Pool	(Nil)	50,000
	Net Revenue of Generator	550,000	550,000

Example 2: (For tolerance band > 35%)

		Scenario I: Intra-state wheeling	Scenario II: Inter-State wheeling
Schedule (MWh)	100		
PPA Tariff (Rs/Unit)	5		
Available Capacity (MWh)	100		
Scenario		Scenario I: Intra-state wheeling	Scenario II: Inter-State wheeling
Actual Generation		140	140
% Absolute Error		40%	40%
Buyer Pays		5*140*1000 = 700,000 (on actual basis)	5*100*1000 = 500,000 (on schedule basis)
Seller Receives		700,000	500,000
Add: Seller Receives from DSM Pool or pays into pool for Deviation upto 15%		(None)	5*(115-100)*1000 =75,000
Add: Deviation Charge @ Rs 0.50/unit or @ 90% of Fixed rate for Deviation Between 15%-25%		(0.5)*10*1000 = (5000)	(5*90%)*10*1000 = 45000
Add: Deviation Charge @ Rs 1.00/unit or @ 80% of Fixed rate for Deviation Between 25%-35%		(1.00)*10*1000 = (10000)	(5*80%)*10*1000 = 40000
Add: Deviation Charge @ Rs 1.50/unit or @ 70% of Fixed rate for Deviation Beyond 35%		(1.50)*5*1000 = (7500)	(5*70%)*5*1000 = 17500
Total Receipt from/(payment to) Pool		(22,500)	177,500
Net Revenue of Generator		677,500	677,500

Seller to DSM (row label alongside the deviation charge rows)

QCA to settle

Example 3:   (For tolerance band > - 35%)

		Scenario I: Intra-state wheeling	Scenario II: Inter-State wheeling
Schedule (MWh)	100		
PPA Tariff (Rs/Unit)	5		
Available Capacity (MWh)	100		
Scenario		Scenario I: Intra-state wheeling	Scenario II: Inter-State wheeling
Actual Generation		60	60
% Absolute Error		-40%	-40%
Buyer Pays		5*60*1000 = 300,000 (on actual basis)	5*100*1000 = 500,000 (on schedule basis)
Seller Receives		3,00,000	5,00,000
Add: Seller Receives from DSM Pool or pays into pool for Deviation upto 15%		(None)	5*(85-100)*1000 = (75,000)
Add: Deviation Charge @ Rs 0.50/unit or @ 110% of Fixed rate for Deviation Between 15%-25%		(0.5)*10*1000 = (5000)	(5*110%)*(-10)*1000 = (55000)
Add: Deviation Charge @ Rs 1.00/unit or @ 120% of Fixed rate for Deviation Between 25%-35%		(1.00)*10*1000 = (10000)	(5*120%)*(-10)*1000 = (60000)
Add: Deviation Charge @ Rs 1.50/unit or @ 130% of Fixed rate for Deviation Beyond 35%		(1.50)*5*1000 = (7500)	(5*130%)*(-5)*1000 = (32500)
Total Receipt from/(payment to) Pool		-22,500	-2,22,500
Net Revenue of Generator		2,77,500	2,77,500

Seller to DSM

QCA to settle

Model DPR for SAMAST Framework

Key Features and Important considerations

22-Aug-2016

Agenda

- Introduction

- Salient Features of SAMAST framework

- Approach for development of Budgetary Cost Estimate

- Sample DPR & budgetary cost estimate for TN

- Implementation Roadmap for SAMAST

Introduction

Context setting and fifth meeting of technical committee

Introduction

- During the Fifth meeting of Technical Committee, the Committee adopted the SAMAST Report and endorsed the framework to FOR for its acceptance.

- Upon review of DPR prepared by TamilNadu, the Consultant was asked to prepare Model DPR for category-B & C states for implementation of SAMAST framework at state level.

- Need for finalisation of F&S framework at State level based on deliberations during fifth meeting was well recognised, particularly, in respect of QCA, institutional structure, de-pooling arrangements, inter-state transactions of state entities.

Salient features of SAMAST framework

Implementation aspects and key considerations for Model DPR development

Overview of SAMAST framework

Stage-I

Identification of Intra State Entities

Demarcation of Interface boundary for each Intra State Entity

Assessment of Meters - Main, Check and Standby

Assessment of Automatic Meter Reading logistics requirement

Assessment of IT infrastructure (Hardware and Software) requirement

Preparation of Bill of Quantities (considering logistics already in place

Preparation of Detailed Project Report and completion of first stakeholder workshop

Stage-II

Approval of the State-specific SAMAST scheme by SERC

Commencement of Load Forecasting by SLDC

Commencement of Interchange Scheduling by SLDC for all the Intra State Entities

Formation of a State Power Committee for preparation of Account

Establishment of State Regulatory Pool Account

Application for funding from Central Government/PSDF

Inviting tenders and Placement of Award Adequacy of Human Resources in SLDC

Stage-III

Implementation of the recommended IT infrastructure-Hardware

Completion of boundary metering and AMR system (as per DPR)

Implementation of the recommended IT applications- Software

Computation of transmission losses for each 15-min by SLDC

Preparation of Energy Accounts by SPC/SLDC and Publication of the required documents on SPC/SLDC website

Clearing of Pool A/c Credit / Debit for at least four weeks and its reconciliation

Key Cost Components

Cost Drivers and premise for Budgetary Estimates

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

State Profiles for SAMAST (State Entities & Interface Points)

SAMAST : State-wise profile (State Entities & Interface points)
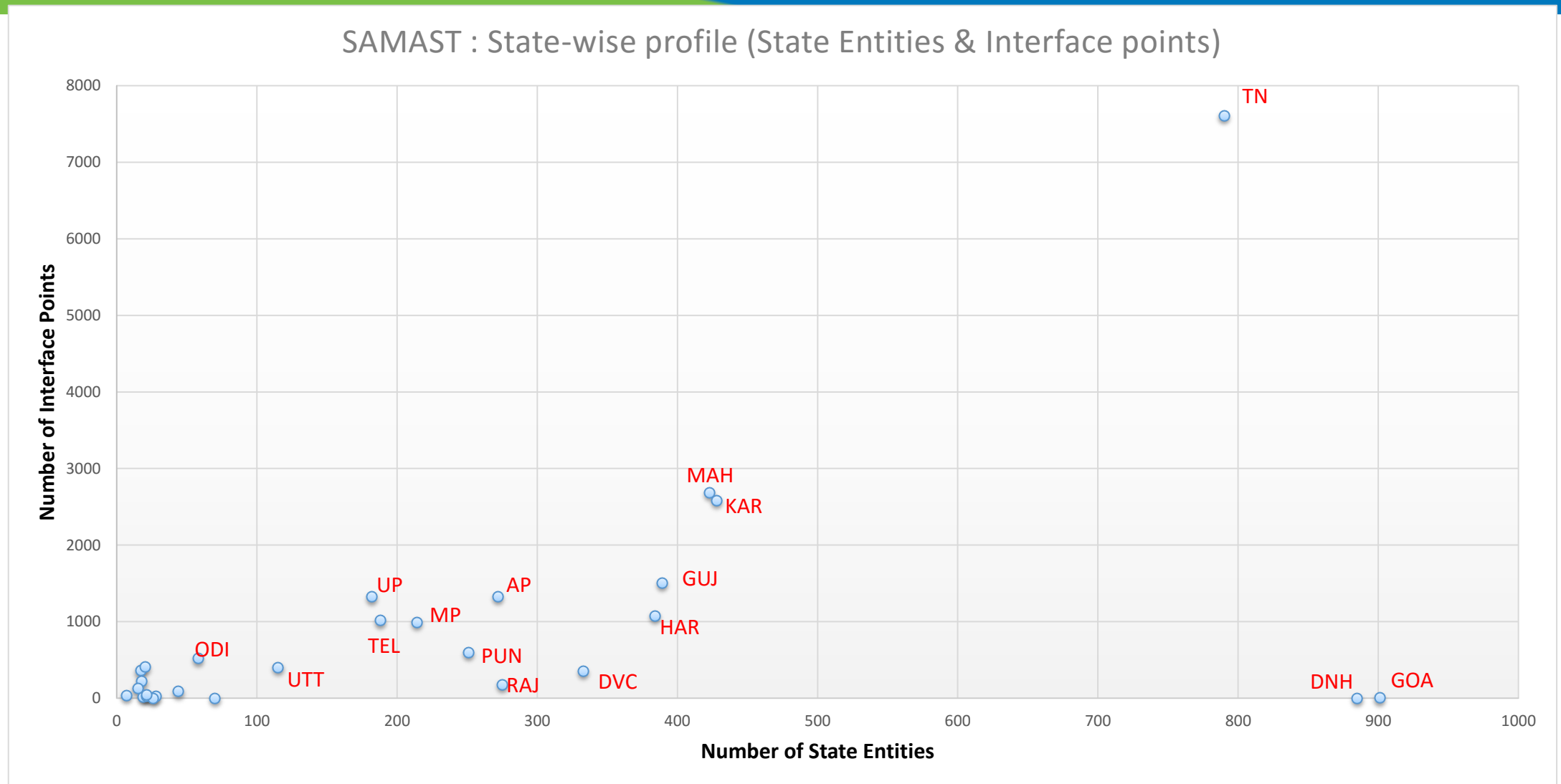
- Number of State Entities and Number of Interface Points within State are key influencing factors for Costs

Hardware cost components – I ... (1/3)

Hardware Components-I

- **ABT Meters**
- **Instrument Transformers (CT/PT)**
- **Calibration of Meters**
- **Automated Meter Reading Instruments (CMRI)**
- **Installation & testing**

S. No.	Item Description	Key Cost drivers
A	**Hardware component-I**	
1.1	**ABT meters**	
(a)	- State Generating Station (G<>T) interface points	No. of SGS Units and interface points
(b)	- Wind Generating Pooling Station (G<>T) interface points	No. of WEG Pooling S/S
(c)	- Solar Generating Pooling Station (G<>T) interface points	No. of Solar Pooling S/S
(d)	- DISCOM periphery interface (T<>D) interface points	No. of State Entities
(e)	- EHT/HT Open Access consumer Tx interface (T<>C)	No. of OA consumers
1.2	Instrument transformers (CT/PT) (0.5 class accuracy)	linked to 1.1 (b), (c) and (d)
1.3	Calibration of meters (only for OA Users)	linked to 1.1 (e)
1.4	**Automated Meter Reading Instruments & facility - T<>D periphery**	
(a)	AMR facility - T<>D periphery	
(b)	AMR Instruments & facility - SGS - G<>T periphery	linked to 1.1(a)
(c)	AMR Instruments & facility - WEG G<>T periphery	linked to 1.1(b)
(d)	AMR Instruments & facility - SolarGen - G<>T periphery	linked to 1.1(c)
1.5	Installation & Testing	

Hardware cost components – I ... (2/3)
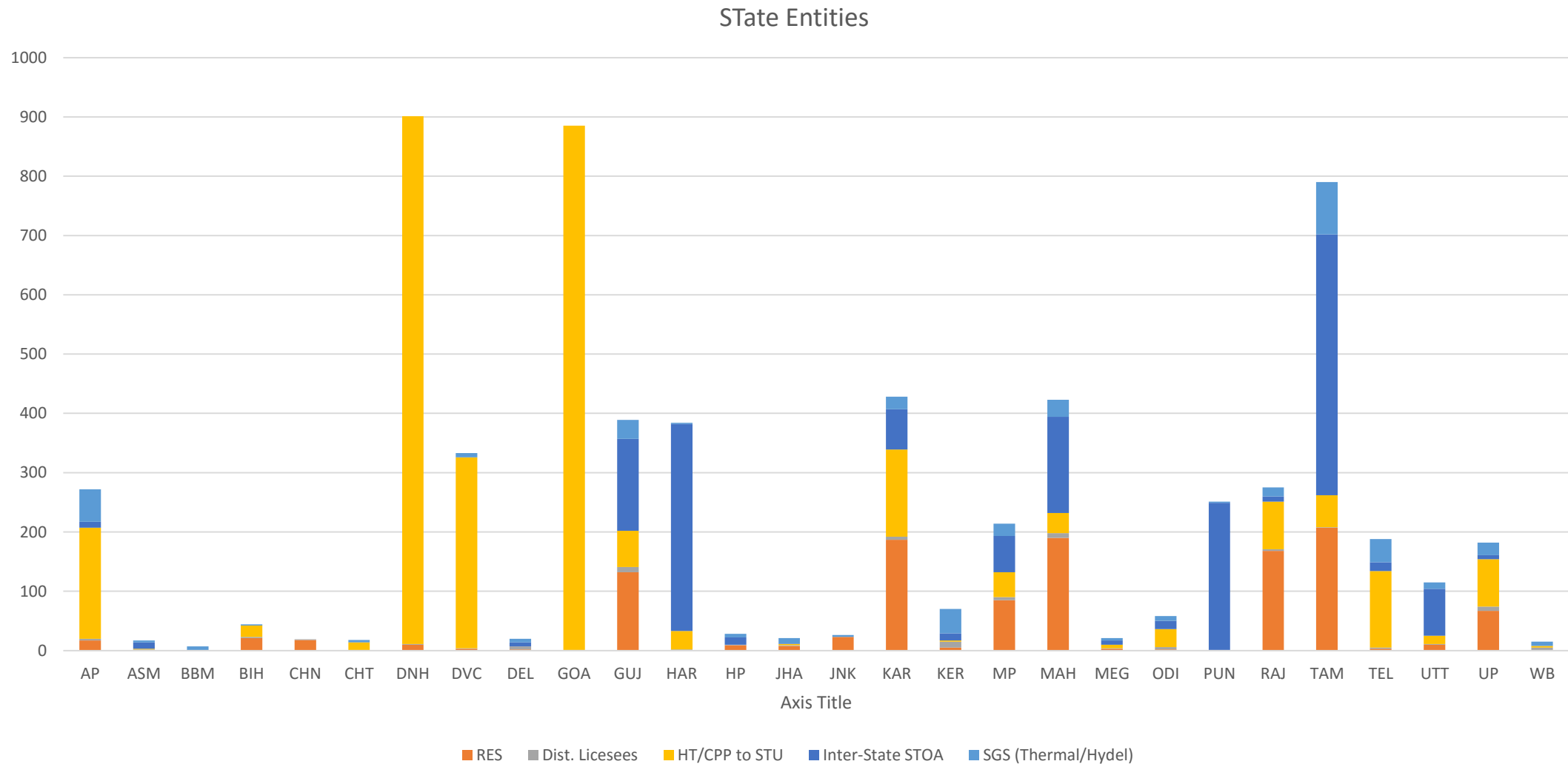
STate Entities

- States such as AP, GUJ, KAR, MAH, MP, RAJ, TAM, TEL, UP have large no. of State Entities with different types

Hardware cost components – I ... (3/3)

- Cost of SEM Meters for Main / Check / Standby meters for identified interface points except OA/HT consumers wherein only standby meter cost considered.

- Instrument X'mer (CT/PT) for SGS assumed to be available.

- AMR facility cost also to be covered incl. installation and commissioning

- Calibration cost only for OA/HT consumers considered.

Interface Points
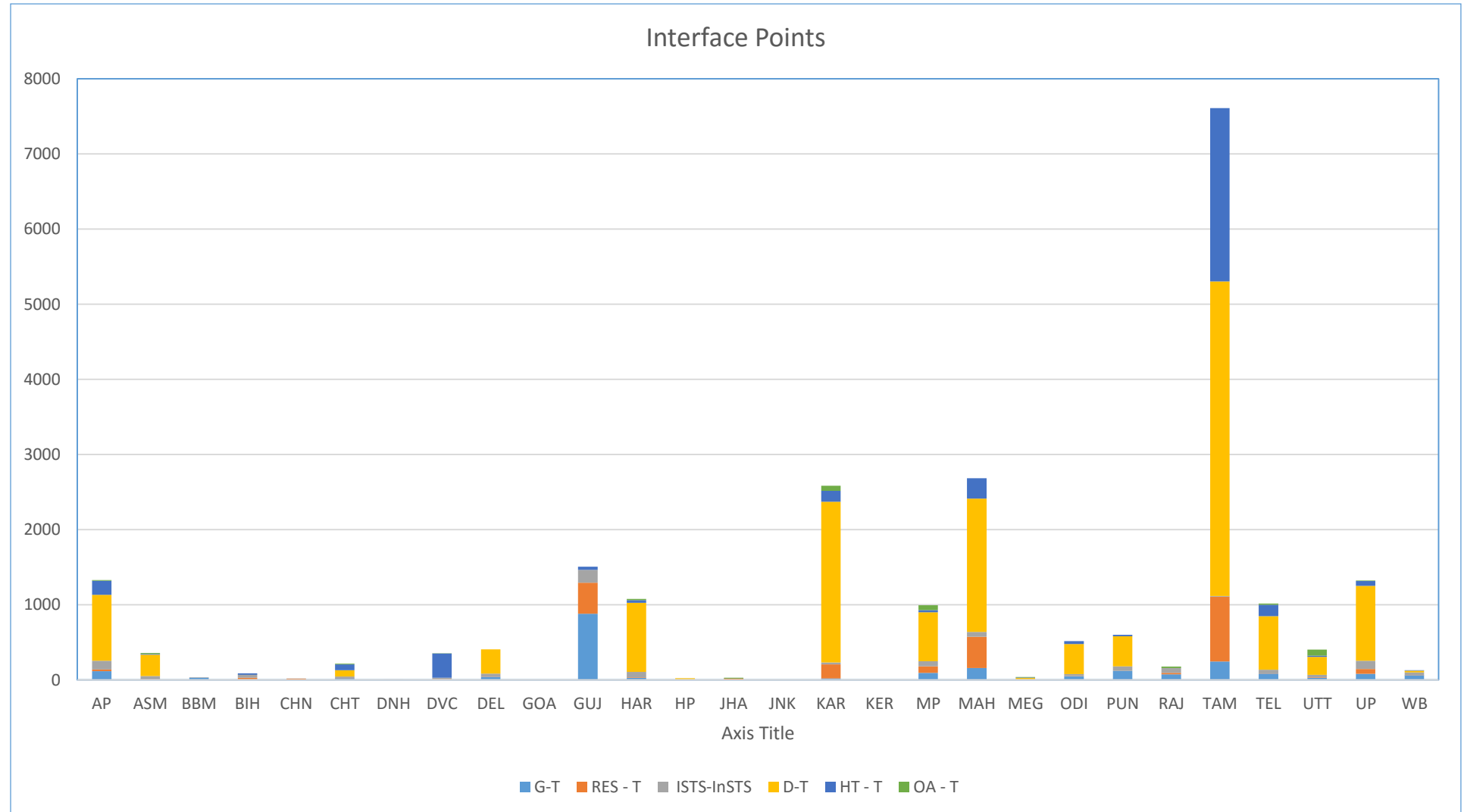
Hardware & Software : Critical components
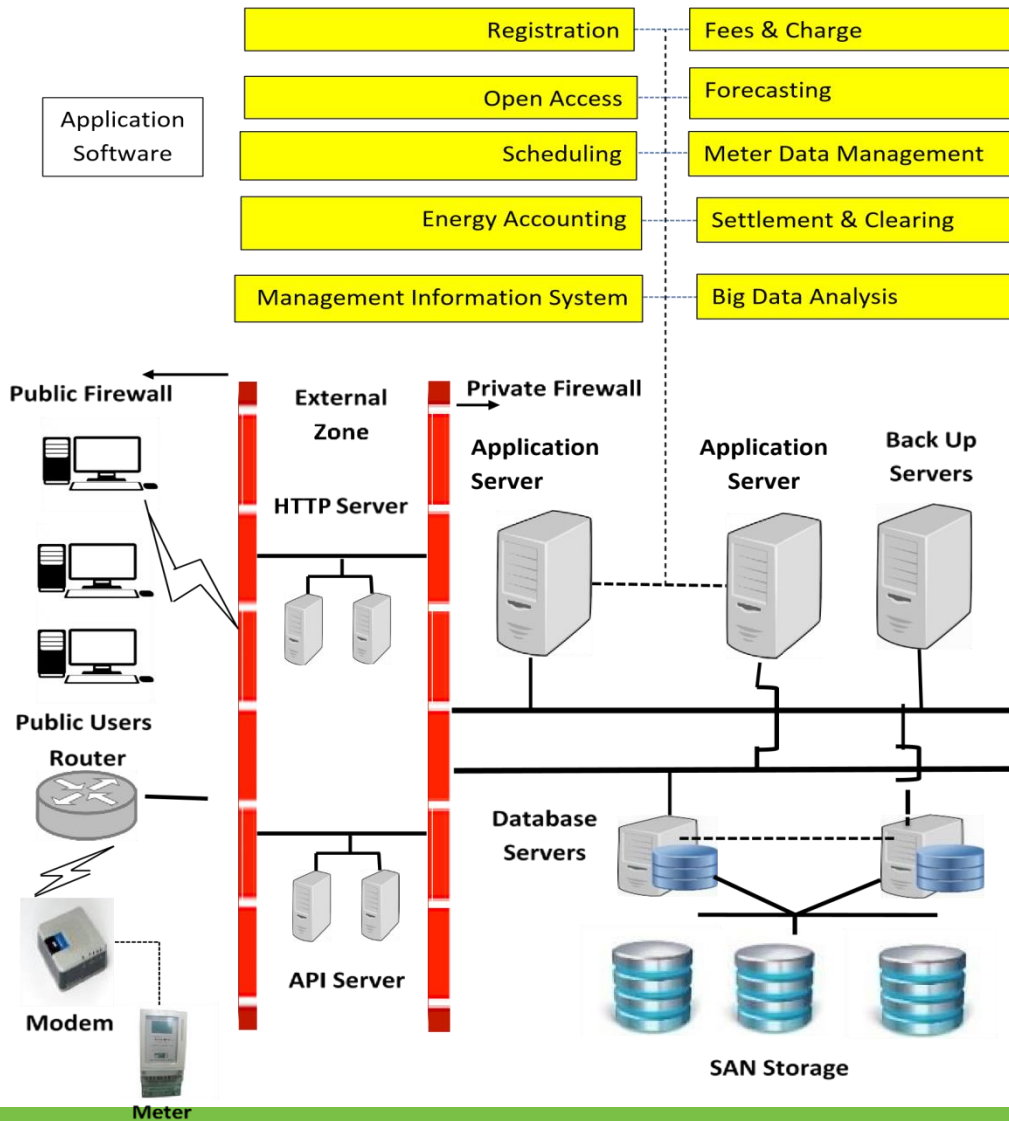
Figure 22: Typical IT Infrastructure in a Load Despatch Centre

Hardware Components-II

- Servers (database, application, domain, web, anti-virus)

- Storage SAN

- UPS/firewall/Rack for Server,

- Laptops/Desktops Printers, Monitoring Screens

- Installation & testing

Software Components

- Operating Systems and Software Licensing

- Scheduling s/f Module

- OA s/f Module

- Energy Accounting Module

- Billing & SLDC Report Module

- Testing/Trial runs

Hardware cost components – II … (1/3)

Hardware Components-II

- **Servers (database, application, domain, web, anti-virus)**

- **Storage SAN**

- **UPS/firewall/Rack for Server,**

- **Laptops/Desktops Printers, Monitoring Screens**

- **Installation & testing**

Sr. No.	Server	Clustering	Purpose
1	Main Database Server	DBMS Clustering (Active- Active)	For Installing Database Software which will store the application data required for MIS purposes
2	Application Server	Application Clustering (Active-Active)	For Installing Application Server Software. The Application Server will be such that as it can deploy the EMASS Software which can run on any Platform
3	API Servers	OS Clustering with Failover (Active-Passive)	For Installing Meter Data acquisition API Software which will parse binary meter data and pass it on to the Data Base
4	HTTP/Domain Servers	H A Mode (Active- Active)	For Installing HTTP Server Software which acts a Web server that is used for serving HTTP request
5	Load Balancer	H A Mode (Active- Active)	Used for balancing the load when the incoming HTTP requests are large
6	Storage and Backup Management Server		For Installing Backup Software. For taking the backup of Data base and files in to Tape Library

Hardware cost components – II … (2/3)

Hardware Components-II

- **Servers (database, application, domain, web, anti-virus)**
- **Storage SAN**
- **UPS/firewall/Rack for Server,**
- **Laptops/Desktops Printers, Monitoring Screens**
- **Installation & testing**

Item	Broad Specification
API Server	• **Server (Rack Mounted)/Blade:** 64 bit, Intel x86, compliant to Open System Standards, Latest generation, Multi-Core physical CPUs. Processor roadmap for at-least next 5 years should be provided • **Clock Speed of CPUs:** Minimum 2.0 GHz or above • **No. of Processors/Core:** 2* Quad /Hex Core • **Memory:** Minimum 32 GB, ECC using 16 GB modules, expandable to 256 GB, in max 16 slots • **Hard Drives:** Minimum 2 nos., 600 GB, in dual-Channel Hardware RAID-1 (mirror), SAS, 2.5", 10,000 RPM, Hot-Swap . • Network & Cluster connects for connectivity: Minimum 4 * Gigabit Ethernet ports on 2 separate cards /pass-thru modules in each Server, TCP Offload Engine,Teaming, Load Balancing and Failover, should be able to configure both Public and Private networks IP, with no single point of failure.
Database Server	• Size up to 10U to host the minimum of 14 Blade servers • Chassis should be configured with minimum Two numbers of 10 Gbps Ethernet Switch Modules with connectivity to all server bases and there is no single point of failure and at least 8 nos. of lGbps uplink ports for Data centre switch connectivity • Chassis should be configured with two numbers of FC Switch Modules with connectivity to all server base and there is no single point of failure and at least 8 nos. of 8 Gbps uplink ports for external SAN switch connectivity
SAN Storage	• Should have minimum of 8 nos. of 8 Gbps Fiber-Channel Host ports, across minimum Dual independent Controllers, for an aggregate host bandwidth of minimum 64 Gbps. Provision of full Patch-Cords for all supplied physical ports. • Offered SAN Array shall be configured with 5 TB Usable Space in RAID 1+0 using 600 GB 10KRPM SAS Disks

Hardware cost components – II … (3/3)

Hardware Components-II

- **Servers (database, application, domain, web, anti-virus)**

- **Storage SAN**

- **UPS/firewall/Rack for Server,**

- **Laptops/Desktops Printers, Monitoring Screens**

- **Installation & testing**

S. No.	Item Description	Key Cost drivers	Brief Specifications
B	Hardware component-II		
2.1	Database Server	No. of State Entities and Meter data volume	3 configurations - 4 L / 5 L / 6.5 L
2.2	Application Server	Complexities of OA & Forecasting Applications	2 configurations - 5 L / 6.5 L
2.3	Domain Server	Standard	
2.4	Web Server	Standard	
2.5	Storage Devices / SAN	Capacity linked to No. of Entities / RE Generators / OA applications	3 configurations - 8 L / 12 L / 15 L
2.6	UPS / Firewall /Rack for server / Anti-Virus	Standard	
2.7	Laptops / Desktops	Manpower / Organisation structure	3 configurations - Qty - 8/ 14 / 20
2.8	Printers	Combination of High end and low end	2 configurations - 1.2 L / 1.95 L
2.9	LED Monitoring Screens	Manpower / Organisation structure	3 configurations - Qty - 2 / 4 / 6
2.10	Project Mgmt and IT Hardware Consulting support	duration linked to complexity of implementation	2 configurations - Qty - 4 / 6 mth
2.11	Installation & testing		

Software cost components … (1/4)

Software Components

- **Operating Systems and Software Licensing**
- **Scheduling s/f Module**
- **OA s/f Module**
- **Energy Accounting Module**
- **Billing & SLDC Report Module**
- **Financial Accounting & Statutory compliance**
- **Testing/Trial runs**

In the House Development
- Requires availability of software engineers with knowledge of electrical and LDC operations
- Retention of IT proficient human resources at LDC is a challenge

Off the self procurement
- Offshelf Products requires exhaustive customisation before productive deployment
- Requires prolonged modifications to allign the system iwth evolving regulations

Development by third party
- Finalisation of Technical Specifications,scope of work,contracting procedure,closing of contracts, availability of post delivery support etc. pose challenges

Outsourcing
- Business continuity and process ownership is rarely expected from outsourcing agencies

- Implementation of the Intra-state DSM at the state level requires scalable, agile, resilient and redundant software requirements.

- The software requirement ranges from scheduling, forecasting, energy accounting, open access, billing & report, financial accounting and statutory compliance.

- Further, regulatory and user requirements bring in with itself the need for regular updates/changes to the software in order to adapt to the changes.

Software cost components … (2/4)

Software Components

- **Operating Systems and Software Licensing**
- **Scheduling s/f Module**
- **OA s/f Module**
- **Energy Accounting Module**
- **Billing & SLDC Report Module**
- **Financial Accounting & Statutory compliance**
- **Testing/Trial runs**
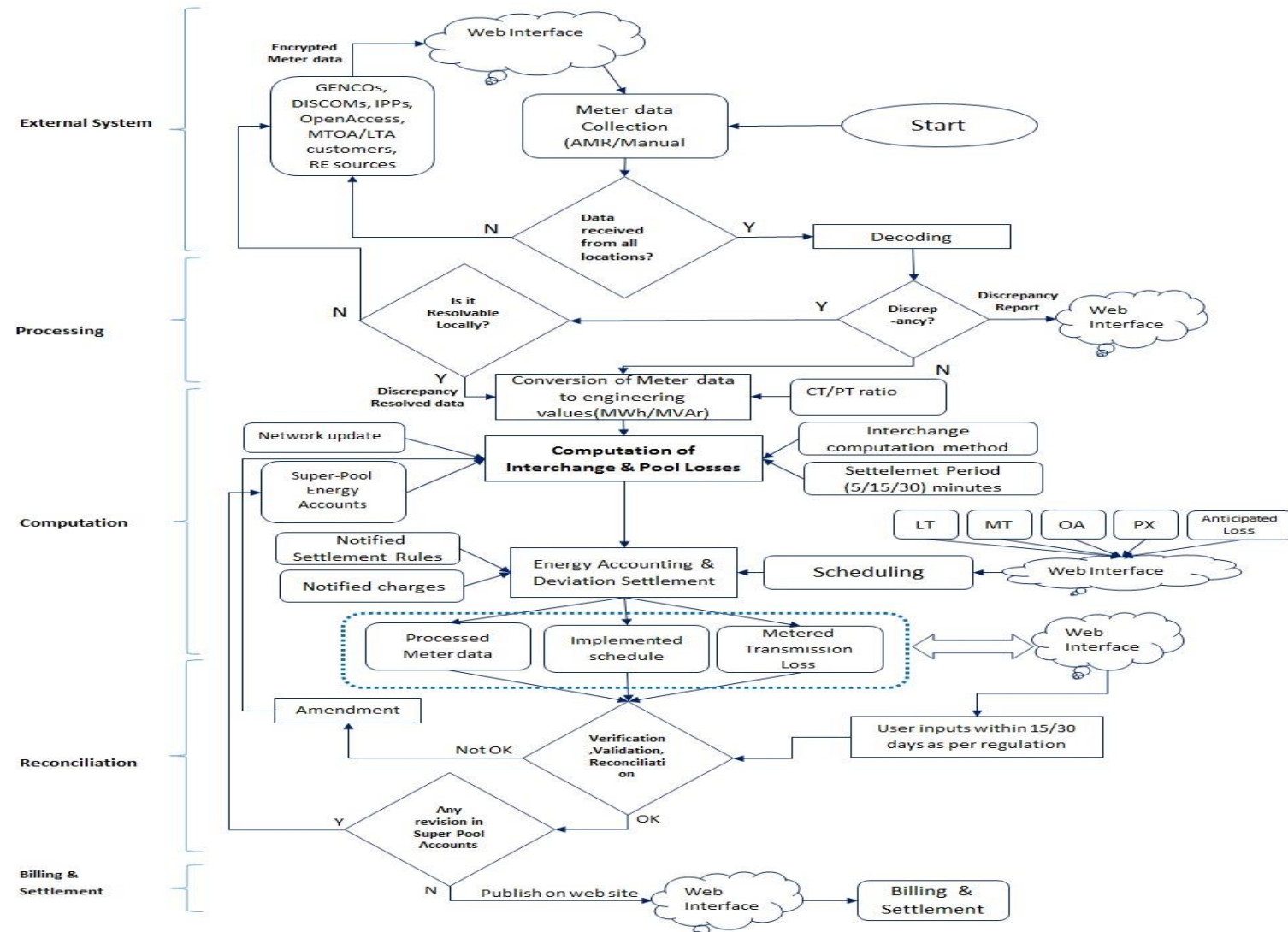
State Profiles for SAMAST (Distribution Entities & SGS incl. RE)

SAMAST : (Distribution Entities & Generating Stns)

- Number of Distribution Licensees and Generating Stations would influence the complexities of EA/Billing Software

Software cost components ... (3/4)

Software Modules	Brief description of the functional requirement
Scheduling software Module	• Generation Availability declarations and Schedules • Load / Demand forecasts/schedules from DISCOMs and TOUs • Integration of RE generator forecasts/schedules thru QCAs • Schedules of Inter-state / Bilateral transactions • Load Generation Balancing through constraints (technical minimum, hydro optimization etc.) • Target Despatch and Target Drawal Schedule • Schedule Revision management • User Interface with Web applications and back-end data
Open Access software Module	• Open Access Application registration and processing • Coordination with STU and DISCOMs and other Nodal Agencies • Open Access Schedules and Congestion Management • Open Access Contract Management • Open Access Charge computation and Billing • OA transaction inventory and reports
Energy Accounting Module	• Interface with Meter Data processing for all interface points • Transmission loss computation • Entity wise Injection, Drawal, Schedule and Deviation • Pool Deviation Settlement account – volume and value • Reconciliation of State Energy Accounts – with regional, state pool members • Reactive Energy Pool Account • EA Report Generation – weekly, monthly • RE Generator registrations and accounting for RECs • REC account processing

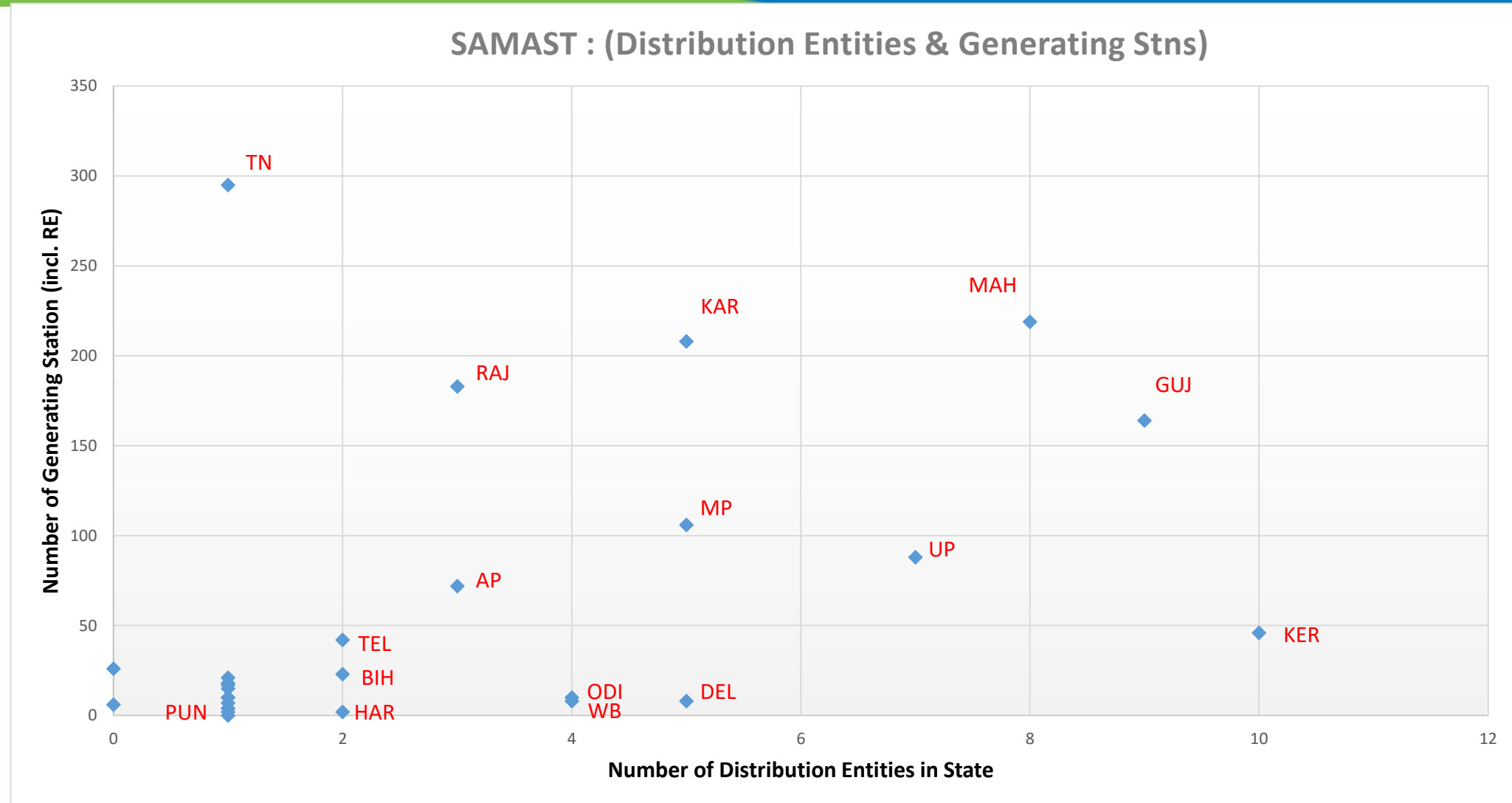| Software Modules	Brief description of the functional requirement
Billing and SLDC Report Module	• Generator Energy Account, Deviation (volume & value) • RE Generator/QCA Energy Account, Deviation (volume & value) • DISCOM Energy Account, Deviation (volume & value) • OA User Energy Account, Deviation (volume & value) • Reactive Energy Charges Accounting • Integration with Regional Energy Account • Weekly Report / Monthly Reports / Annual Reports • Reconciliation, Revisions Management, Discrepancy Report
Financial Accounting and Statutory compliance Module	• Billing & Payment registry management of Deviation Charges, penal charges • Financial Statements and reporting - Weekly, Monthly and Annual Reconciliation • Contract-wise Accounting and Reconciliation • Entity-wise Reconciliation of TDS, Service Tax • Statutory compliance reporting

Software cost components … (4/4)

Software Components

- **Operating Systems and Software Licensing**
- **Scheduling s/f Module**
- **OA s/f Module**
- **Energy Accounting Module**
- **Billing & SLDC Report Module**
- **Financial Accounting & Statutory compliance**
- **Testing/Trial runs**

S. No.	Item Description	Key Cost drivers	Brief Specifications
C	**Software component**		
3.1	Operating System (Windows) - Desktops/Laptops	Manpower / Organisation structure	3 configurations - Qty - 8/ 14 / 20
3.2	Operating Systems & Licence for Database Servers	Database service licence combinations	2 configurations - 1.1 L / 2.1 L
3.3	Licence for Application Servers	Complexity of Application Servers	2 configurations - 1.5 L / 2.5 L
3.4	Scheduling Software module development	No. of State Entities & OA Entities	S/F develop. Time/LoE - 2/ 3/ 4 mths
3.5	Open Access Software Module development	No. of OA Entities	S/F develop. Time/LoE - 3/ 4/ 6 mths
3.6	Energy Accounting (incl. REC accounting) Software module developme	No. of State Entities & OA Entities & RE Gen	S/F develop. Time/LoE - 3/ 4/ 6 mth
3.7	Billing and SLDC report module development	No. of State Entities & OA Entities	S/F develop. Time/LoE - 4/ 6/ 8 mth
3.8	RE forecasting & Scheduling module development	No. of RE Generators (WEG & Solar)	S/F develop. Time/LoE - 3/ 4/ 6 mth
3.9	Financial Accounting & Statutory Compliance Module development	No. of State Entities & OA Entities	S/F develop. Time/LoE - 3/ 4/ 6 mth
3.10	Testing and Trial runs		
3.11	Project Mgmt and IT Consulting support	duration linked to complexity of implementation	PMC duration - Time/LoE - 4/ 6/ 9 m
3.12	Training and handholding support		

Communication cost components … (1/3)

Communication Components

- Modems
- DCUs at field
- GPRS/GSM connectivity for sites
- MPLS communication lines
- Internet & telephone connectivity
- Installation & testing

Meter with RS 485 Port

Converter

RS 485 Connection

Meter without RS 485 Port

Data Concentrator Unit

RS 232 read only port Connection

Local Computer Connection

GSM/GPRS Connection

GSM/GPRS Modem Connection

Remote Computer Connection
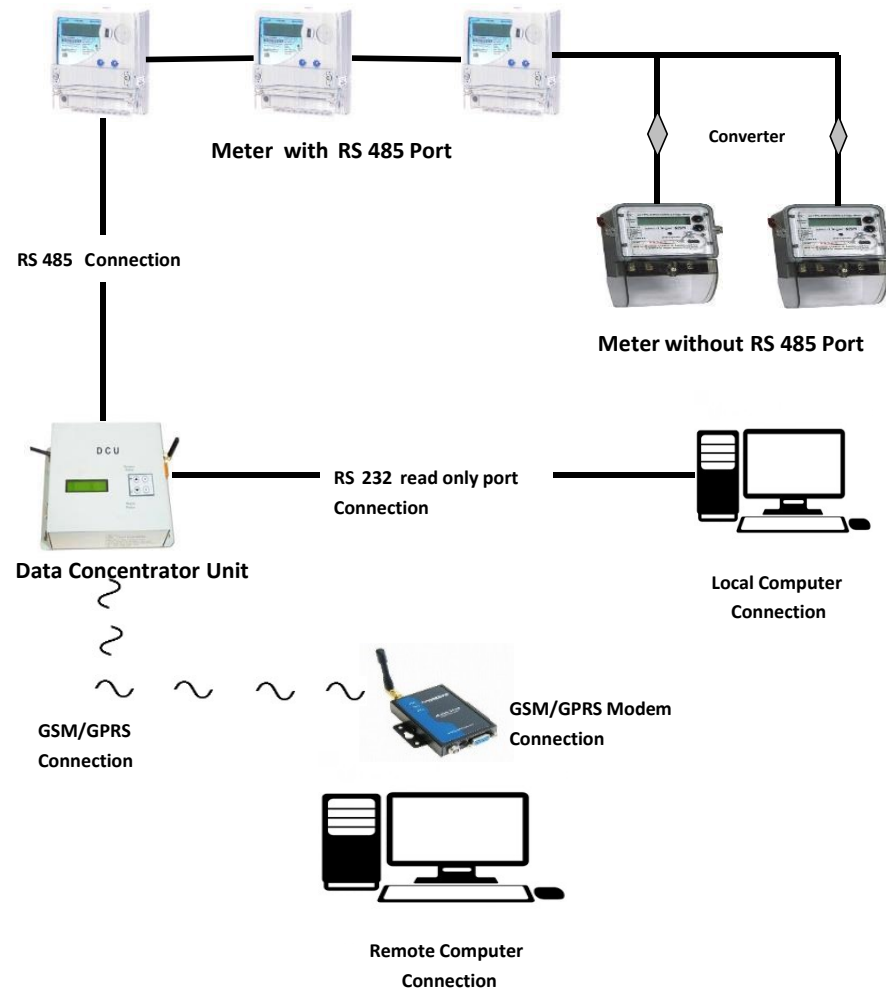
Report of Task Force on Communication System in power sector (Feb 2016)

Specifying necessary communication system required for transfer/exchange of data, voice and control signals between Generating Stations including Renewable energy sources, Substations, control centres at national, regional, state, area, utility and Discom level :

- Mode of communication between various nodes be decided by the Standing Committee on Communication System keeping in view the data volume and the response time requirement.
- As a General Guideline, it is suggested that all regional substations at or above 132 kV/110 kV level shall be on the fibre optic backbone. Also all new 132 kV and above inter -state lines shall have OPGW.

Communication cost components … (2/3)

Communication Components

- **Modems**
- **DCUs at field**
- **GPRS/GSM connectivity for sites**
- **MPLS communication lines**
- **Internet & telephone connectivity**
- **Installation & testing**

Backup RF 2 mb

SLDC – Back-up site

Servers

Router

IDU

ABT
ERP
SCADA

LAN Switch

Primary RF

MPLS CLOUD

Backup RF 2 mb

2 Mbps LL

Servers

SLDC – Main Site

ABT
ERP
SCADA

LAN Switch

Router

IDU

Primary 10 Mbps LL

IDU

Router

8 port SNMP LAN Switch

Substation (1-n)

ABT LAN Switch

VOIP GateIDUway

METERS (ABT/MFM)

DATA CONCENTRATOR

Local Monitoring

ERP

SCADA

LOCAL SOFTWARE

VOIP Phone
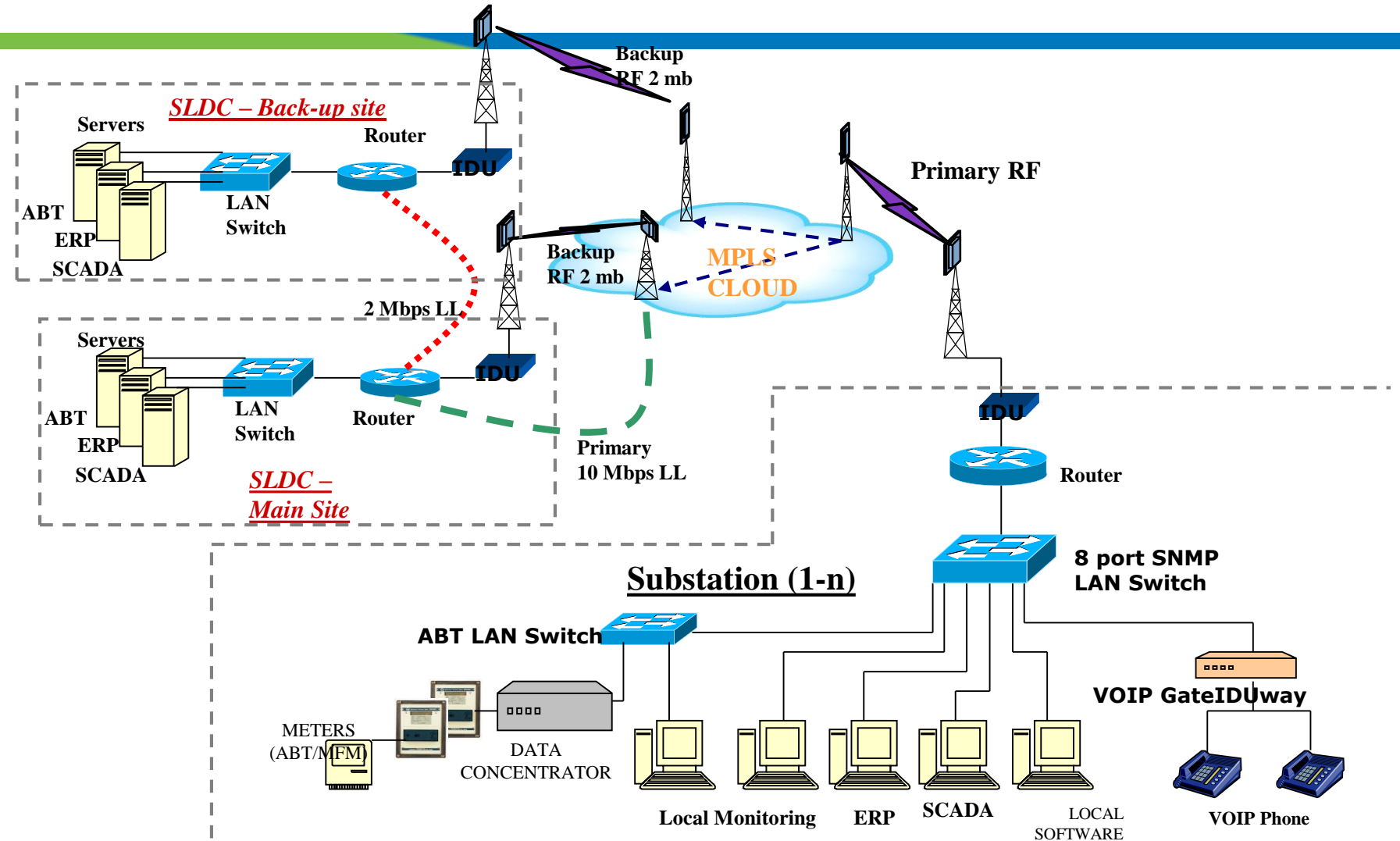
Note : Premise for Estimates will undergo change as per Communication backbone. Draft Regulations for Communication as per Task Force recommendations are underway. Nodal agency for planning/development of Communication backbone at state level is STU.

Communication cost components … (3/3)

Communication Components

- **Modems**
- **DCUs at field**
- **GPRS/GSM connectivity for sites**
- **MPLS communication lines**
- **Internet & telephone connectivity**
- **Installation & testing**

S. No.	Item Description	Key Cost drivers	Brief Specifications
D	**Communication component**		
4.1	Modems - (Distribution T<>D interfaces)	No. of State Entities and interface points (T<>D)	
4.2	Modems - (SGS - G<>T interfaces)	No. of SGS Units and interface points (G<>T)	
4.3	Modems - (WEG Pooling S/S - G<>T interfaces)	No. of WEG Pooling S/S	
4.4	Modems - (SolarGen - G<>T interfaces)	No. of Solar Pooling S/S	
4.5	Data Concentrator Units (DCUs)		
4.6	GPRS/GSM connectivity - (Distribution T<>D inter	No. of State Entities and interface points (T<>D)	
4.7	GPRS/GSM connectivity - (SGS - G<>T interfaces)	No. of SGS Units and interface points (G<>T)	
4.8	GPRS/GSM connectivity - (WEG Pooling S/S - G<>	No. of WEG Pooling S/S	
4.9	GPRS/GSM connectivity - (SolarGen - G<>T interf	No. of Solar Pooling S/S	
4.10	MPLS communication system	Volume of meter data communication	3 configurations - 2 L / 3 L / 4.5 L
4.11	Internet connectivity & Telephone lines	Bandwidth requirement	2 configurations - 1.25 L / 1.75 L
4.12	Project Management for Communication Mgmt		3 configurations - Qty 6/ 9/ 12 mths
4.13	Installation & testing		

Training & Capacity Building component

Training & Capacity Building and Infra Dev.

- **Training & Capacity Building**
- **AMC for hardware & software**
- **space within Building/ Premises**
- **Furniture & Fixtures**
- **Air-conditioning system**
- **Project Mgmt/IT consultant**

S. No.	Item Description	Key Cost drivers	Brief Specifications
F	**Training / Capacity Building and Annual Operating Cost**		
6.1	Training on Implementation aspects of SAMAST framework	2 weeks Training program (covering regulatory, IT, communication, market opns, RE, forecasting, legal, accounting, taxation) for manpower	3 options - 20 / 30 / 40 PP cost
6.2	Capacity Building activities	Participation in Semi-Annual Knowledge Exchange workshops/Training Visits/ Skill Enhancement Workshops (1 week x 2 no. KEW)	3 options - 20 / 30 / 40 PP cost
6.3	AMC Cost for Hardware-II	3 year comprehensive AMC support	linked to 1.5% p.a. for 3 yrs (4.5%)
6.4	AMC Cost for Software	3 year comprehensive AMC support	linked to 1.5% p.a. for 3 yrs (4.5%)
6.5	Overheads		

Infrastructure cost components

Training & Capacity Building and Infra Dev.

- **Training & Capacity Building**
- **AMC for hardware & software**
- **Office space within Building/ Premises**
- **Furniture & Fixtures**
- **Air-conditioning system**
- **Project Mgmt/IT consultant**

S. No.	Item Description	Key Cost drivers	Brief Specifications
E	**Infrastructure and Operating component**		
5.1	Office space (Building premises)	Volume of transactions / State Entities / Manpower	3 configuration - 2000/5000/10000 sq ft
5.2	Furniture and Fixtures	Manpower and Organisation structure	3 configurations - Qty - 20/ 30 / 40
5.3	Air-conditioning system	Office premises	3 configurations - Qty - 2/ 4 / 6
5.4	Project Management for Infra development		3 configurations - Qty 6/ 9/ 12 mths
5.5	Overheads		

Sample DPR for TN

Budgetary Cost Estimate for implementation of SAMAST framework at TN

Hardware Components-I

- **ABT Meters**
- **Instrument Transformers (CT/PT)**
- **Calibration of Meters**
- **Automated Meter Reading Instruments (CMRI)**
- **Installation & testing**

S. No.	Item Description	Unit Rate (INR/unit)	Quantity (Qty)	Cost Estimate (INR Lakh)	Column refere	TAM
A	**Hardware component-I**					
1.1	**ABT meters**					
(a)	- State Generating Station (G<>T) interface points	27,000	735	198	12	245
(b)	- Wind Generating Pooling Station (G<>T) interface points	27,000	2,586	698	13	862
(c)	- Solar Generating Pooling Station (G<>T) interface points	27,000	-	-		-
(d)	- DISCOM periphery interface (T<>D) interface points	27,000	12,555	3,390	15	4,185
(e)	- EHT/HT Open Access consumer Tx interface (T<>C)	27,000	2,307	623	16	2,307
1.2	Instrument transformers (CT/PT) (0.5 class accuracy)	1,65,000	5047	8,328		5,047
1.3	Calibration of meters (only for OA Users)	30,000	2307	692	16	2,307
1.4	**Automated Meter Reading Instruments & facility - T<>D periphery**					
(a)	AMR facility - T<>D periphery	27,286	4,185	1,142		
(b)	AMR Instruments & facility - SGS - G<>T periphery	27,286	245	67		
(c)	AMR Instruments & facility - WEG G<>T periphery	27,286	862	235		
(d)	AMR Instruments & facility - SolarGen - G<>T periphery	27,286	0	-		
1.5	Installation & Testing		0%	-		
	Sub-total (Hardware Component-I)			**15,373**		

- *Note : Unit Rates considered for estimation are based on TANTRANSCO DPR and Quantum as per SAMAST Report. Need to be validated further.*

Sample DPR (budgetary Cost estimate) for TN – 2/5

Hardware Components-II

- **Servers (database, application, domain, web, anti-virus)**
- **Storage SAN**
- **UPS/firewall/Rack for Server,**
- **Laptops/Desktops Printers, Monitoring Screens**
- **Installation & testing**

S. No.	Item Description	Unit Rate (INR/unit)	Quantity (Qty)	Cost Estimate (INR Lakh)	Column refere	TAM
B	**Hardware component-II**					
2.1	Database Server	6,50,000	2	13	3 config	₹ 6,50,000
2.2	Application Server	6,50,000	2	13	2 config	₹ 6,50,000
2.3	Domain Server	5,00,000	2	10		
2.4	Web Server	5,00,000	2	10		
2.5	Storage Devices / SAN	15,00,000	1	15	3 config	₹ 15,00,000
2.6	UPS / Firewall /Rack for server / Anti-Virus	19,45,550	1	19		
2.7	Laptops / Desktops	52,000	20	10	3 options	20
2.8	Printers	1,95,000	6	12	2 options	₹ 1,95,000
2.9	LED Monitoring Screens	3,00,000	6	18	3 options	6
2.10	Project Mgmt and IT Hardware Consulting support	5,00,000	6	30	2 options	6
2.11	Installation & testing		5%	6		
	Sub-total (Hardware Component-II)			**157**		

- *Note : Unit Rates considered for estimation are based on TANTRANSCO DPR and Quantum as per SAMAST Report. Need to be validated further.*

29

Sample DPR (budgetary Cost estimate) for TN – 3/5

Software Components

- **Operating Systems and Software Licensing**
- **Scheduling s/f Module**
- **OA s/f Module**
- **Energy Accounting Module**
- **Billing & SLDC Report Module**
- **Financial Accounting & Statutory Compliance**
- **Testing/Trial runs**

S. No.	Item Description	Unit Rate (INR/unit)	Quantity (Qty)	Cost Estimate (INR Lakh)	Column refere	TAM
C	Software component					6
3.1	Operating System (Windows) - Desktops/Laptops	40,000	20	8	3 options	20
3.2	Operating Systems & Licence for Database Servers	2,10,000	2	4	2 options	₹ 2,10,000
3.3	Licence for Application Servers	2,50,000	2	5	2 options	₹ 2,50,000
3.4	Scheduling Software module development	15,000	320	48	3 options	4
3.5	Open Access Software Module development	15,000	480	72	3 options	6
3.6	Energy Accounting (incl. REC accounting) Software module developme	15,000	480	72	3 options	6
3.7	Billing and SLDC report module development	15,000	640	96	3 options	8
3.8	RE forecasting & Scheduling module development	15,000	480	72	3 options	6
3.9	Financial Accounting & Statutory Compliance Module development	15,000	480	72	3 options	6
3.10	Testing and Trial runs	15,000	80	12		
3.11	Project Mgmt and IT Consulting support	5,00,000	9	45	3 options	9
3.12	Training and handholding support		5%	25.31		
	Sub-total (Software Component)			**532**		

• *Note : Unit Rates considered for estimation are based on TANTRANSCO DPR and Quantum as per SAMAST Report. Need to be validated further.*

Sample DPR (budgetary Cost estimate) for TN – 4/5

Communication Components

- **Modems**
- **DCUs at field**
- **GPRS/GSM connectivity for sites**
- **MPLS communication lines**
- **Internet & telephone connectivity**
- **Installation & testing**

S. No.	Item Description	Unit Rate (INR/unit)	Quantity (Qty)	Cost Estimate (INR Lakh)
D	**Communication component**			
4.1	Modems - (Distribution T<>D interfaces)	4,880	12555	613
4.2	Modems - (SGS - G<>T interfaces)	4,880	735	36
4.3	Modems - (WEG Pooling S/S - G<>T interfaces)	4,880	2586	126
4.4	Modems - (SolarGen - G<>T interfaces)	4,880	0	-
4.5	Data Concentrator Units (DCUs)	29,820	397	118
4.6	GPRS/GSM connectivity - (Distribution T<>D interfaces)	750	12555	94
4.7	GPRS/GSM connectivity - (SGS - G<>T interfaces)	750	735	6
4.8	GPRS/GSM connectivity - (WEG Pooling S/S - G<>T interfaces)	750	2586	19
4.9	GPRS/GSM connectivity - (SolarGen - G<>T interfaces)	750	0	-
4.10	MPLS communication system	4,50,000	2	9
4.11	Internet connectivity & Telephone lines	1,75,000	2	4
4.12	Project Management for Communication Mgmt	4,00,000	12	48
4.13	Installation & testing		3%	32.18
	Sub-total (Communication Component)			**1,105**

- *Note : Unit Rates considered for estimation are based on TANTRANSCO DPR and Quantum as per SAMAST Report. Need to be validated further.*

Sample DPR (budgetary Cost estimate) for TN – 5/5

Training, Capacity Building & Infra Dev.

- **Training & Capacity Building**
- **AMC for hardware & software**
- **Office space within Building/ Premises**
- **Furniture & Fixtures**
- **Air-conditioning system**
- **Project Mgmt/IT consultant**

S. No.	Item Description	Unit Rate (INR/unit)	Quantity (Qty)	Cost Estimate (INR Lakh)
E	**Infrastructure component**			
5.1	Office space (Building premises)	2,000	10000	200
5.2	Furniture and Fixtures	25,000	40	10
5.3	Air-conditioning system	50,000	6	3
5.4	Project Management for Infra development	1,00,000	12	12
5.5	Overheads		5%	11
	Sub-total (Infrastructure Dev. Component)			**236**
F	**Training / Capacity Building and Annual Operating Cost**			
6.1	Training on Implementation aspects of SAMAST framework	1,00,000	40	40
6.2	Capacity Building activities	50,000	80	40
6.3	AMC Cost for Hardware-II		4.5%	7
6.4	AMC Cost for Software		4.5%	24
6.5	Overheads		5%	6
	Sub-total (Training/Capacity Building and Annual Opn Component)			**117**

- *Note : Unit Rates considered for estimation are based on TANTRANSCO DPR and Quantum as per SAMAST Report. Need to be validated further.*

Sample DPR (budgetary Cost estimate) for TN

S. No.	Item Description	Cost Estimate (INR Lakh)	Cost Estimate (INR Lakh)
6	**Summary of Key Cost Components**		
6.1	Hardware component-I	15,373	3,728
6.2	Hardware component-II	157	138
6.3	Software component	532	438
6.4	Communication component	1,105	249
6.5	Infrastructure component	236	124
6.6	Training, Capacity Building & Annual Operating Cost	117	90
6.7	Contingency (est @ 3% on Metering and @5% on other cost)	568	164
6.8	**GRAND TOTAL**	**18,087**	**4,931**
	Hardware-Metering infrastructure	15,834	3,840
	Communication Component	1,160	261
	Software - SAMAST	1,093	829
	GRAND TOTAL	**18,087**	**4,931**

Different Interface Metering requirement

- Metering Infrastructure related costs are estimated to be higher in TN, as it has proposed to cover Feeder (T<>D) level metering.
- However, upon careful examination, the interface points can be optimised.
- Cost of Metering Infrastructure (Hardware Component-I) could be covered by STU/concerned Entity through ARR.
- All other Cost for SAMAST framework (excl. cost of Metering Infrastructure) may be covered under this framework.

Implementation Roadmap

Description of the steps towards implementation of SAMAST at State level

SAMAST : State-wise Cost Estimate …(1/2)

- Metering Infrastructure and Communication component is the backbone of the SAMAST framework.

- Network topology, system configuration, nature/type/number of state entities varies across state.

- It is important to clearly identify state entities, outline periphery interface points and ascertain metering infrastructure requirement as first step.

- This would influence the complexities of scheduling, energy accounting, metering, billing and deviation settlement
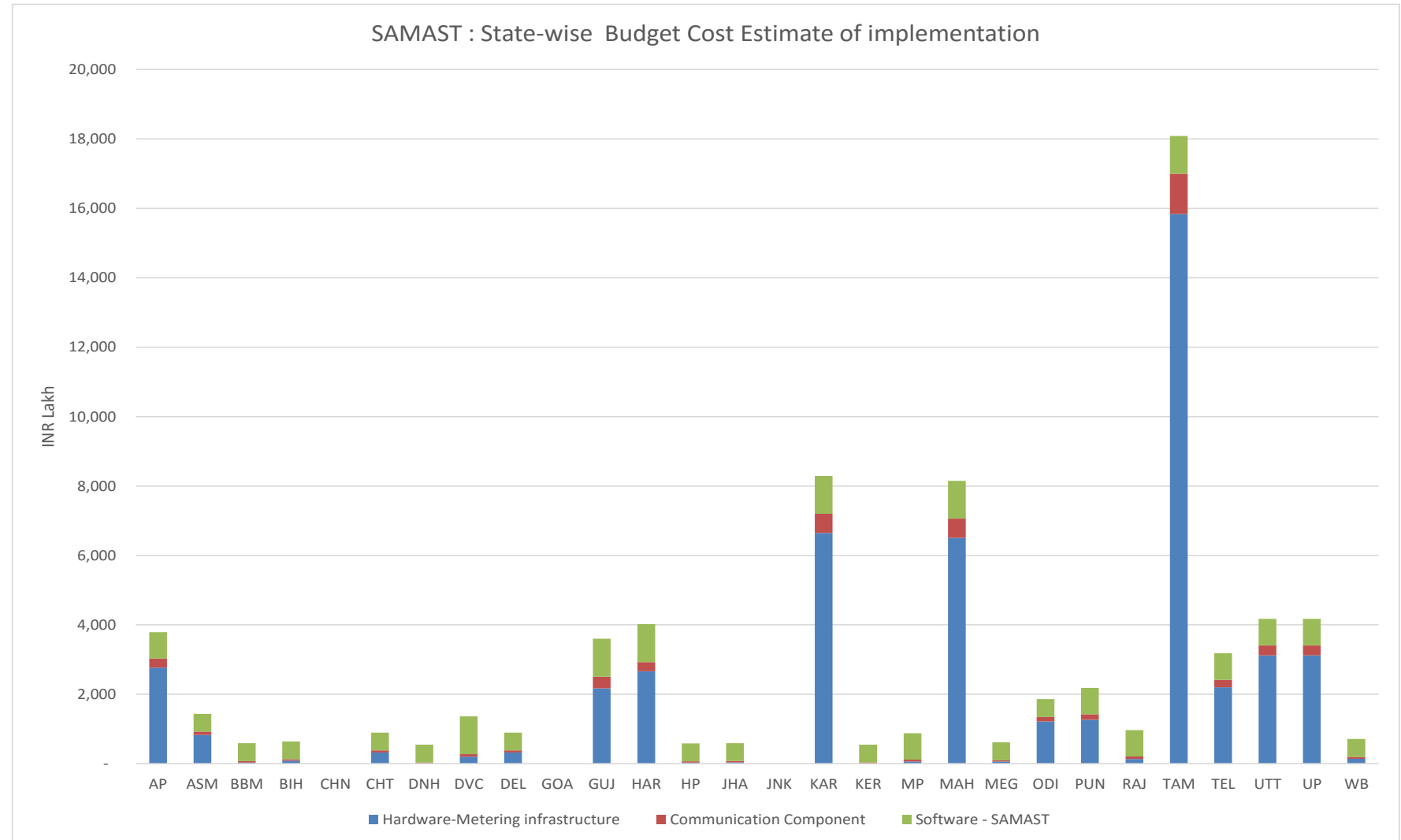
SAMAST : State-wise Budget Cost Estimate of implementation

Legend: Hardware-Metering infrastructure, Communication Component, Software - SAMAST

Note : Estimates based on partial information as per SAMAST Report and assumptions. Need to be validated further.

SAMAST : State-wise Cost Estimate... (2/2)

- Key Cost Components – Hardware-II, Software, Infra Dev. And Training/Capacity Building and AMC

- Metering Infrastructure and Communication component to be implemented by STUs and covered through ARR.

- Typical Cost Estimate for SAMAST at state level in **three groups, Gr-I (5.15 Cr), Gr-II (7.63 Cr) and Gr-III (10.93 Cr)**

- **All India Estimate of total Cost Rs 196.32 Cr**
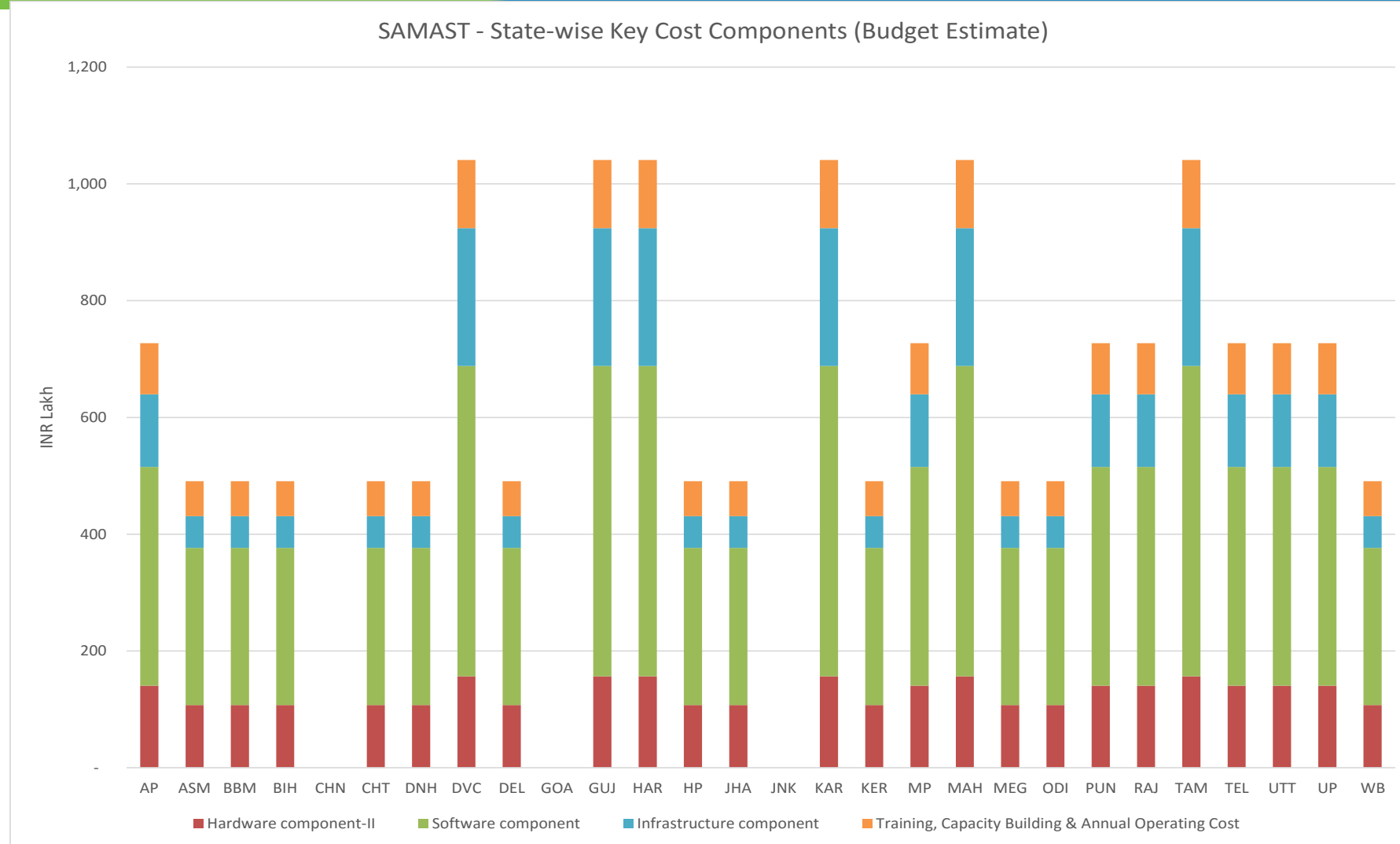
SAMAST - State-wise Key Cost Components (Budget Estimate)

Note : Estimates based on partial information as per SAMAST Report and assumptions. Need to be validated further.

Steps towards implementations of SAMAST…(1/3)

Conceptualisation Stage

- State preparedness assessment study (Gap analysis)
- Preparation of DPR for state specific SAMAST
- Tie-up for Funding Arrangement

Pre-Development Stage

- Preparation of System Specifications (hardware & software)
- Preparation of Tender document and Bid process management
- Ensuring data gathering and Information sharing protocol and roles
- Evaluation of proposals and award of contract

Development Stage

- Development of detailed System, implementation of network, establishing communications framework
- User Acceptance tests, Pilot testing and trial runs
- Training, Capacity building, Human resource deployment and contingency planning
- Deployment of final system

Post-Development Stage

- Documentation and User Manual
- Addressing operational challenges – scalability, flexibility aspects

Task	Activities	Mth-1	Mth-2	Mth-3	Mth-4	Mth-5	Mth-6	Mth-7	Mth-8	Mth-9	Mth-10	Mth-11	Mth-12	Mth-13	Mth-14	Mth-15	Mth-16	Mth-17
Conceptualisation Stage																		
State preparedness assessment study (Gap analysis)	Identification of Intra State Entities	▓																
	Demarcation of Interface boundary for each Intra State Entity	▓	▓															
	Assessment of Meters - Main, Check and Standby		▓															
	Assessment of Automatic Meter Reading logistics requirement		▓															
	Assessment of IT infrastructure (Hardware and Software) requirement		▓	▓														
Preparation of DPR for state specific SAMAST	Preparation of Bill of Quantities			▓	▓													
	Stakeholder consultation - Vendor Engagement			▓														
	Preparation of DPR			▓														
Tie-up for Funding Arrangement	Management / Board Approval				▓													
	Application for to PSDF				▓													
	Filing of Petition/ Regulatory Approval of DPR				▓													
Pre-Development Stage																		
Preparation of System Specifications (hardware & software)	Approval of the State-specific SAMAST scheme by SERC					▓												
	Development of URS / SRS for IT system					▓												
	Development of URS / SRS for Software program modules					▓	▓											
Preparation of Tender document and Bid process management	vendor / IT partner selection and management policy									▓								
	Finalisation of draft tender document and initiating tender process									▓								
Ensuring data gathering and Information sharing protocol and roles	Manpower / Human resource planning				▓							▓						▓
	Roles and resonsibility matrix									▓								
	defining data / information management policy																	
	Stakeholder engagement workshop																	
Evaluation of proposals and award of contract	Prequalification and technical assessment									▓								
	Financial evaluation and IT partner/vendor selection									▓								
	Award of mandate and Contract Execution									▓								

Task	Activities	Mth-1	Mth-2	Mth-3	Mth-4	Mth-5	Mth-6	Mth-7	Mth-8	Mth-9	Mth-10	Mth-11	Mth-12	Mth-13	Mth-14	Mth-15	Mth-16	Mth-17
Development stage																		
Development of detailed System, implementation of network, establishing communications framework	Establishment of Communication and information sharing protocol with state entities					▓												
	Commencement of Load Forecasting by SLDC						▓	▓	▓									
	Commencement of Interchange Scheduling by SLDC for all the Intra State Entities						▓	▓	▓									
	Implementation of IT infrastructure - Hardware										▓	▓						
	Implentation of boundary metering/testing									▓	▓	▓						
	Stakeholder engagement workshop																	
	Formation of a State Power Committee for preparation of Account									▓								
	Establishment of State Regulatory Pool Account																	
User Acceptance tests, Pilot testing and trial runs	Pilot tests for different software modules												▓					
	Data testing and mock trial runs													▓				
	Preparation of Trial Energy Accounts													▓				
	Web publication of Energy Accounts and Pool Account statements													▓				
	Engagement with State Power Committee and pilot demonstration													▓				
	User Acceptance Tests and sample bills													▓				
Training, Capacity building, Human resource deployment and contingency planning	Training modules for resource teams										▓			▓				
	Identification of Key champions and process owners																	
	Training Manuals																	
Deployment of final system	Documentation for Final system																	
	Contingency planning documentation																	
Post Development stage																		
Documentation and User Manual	User Manual																	
	Review of Specs / Shortfall/Gap Analysis																	
	State Power Committee Meetings																	
Addressing operational challenges – scalability, flexibility aspects	Ongoing training																▓	

Way forward

- STU, through the state level committees (say, Grid Coordination Committee) should evolve **Action Plan** with clear identification of milestones under each stage of Implementation alongwith timelines for implementation of SAMAST at state level.

- Such Action Plan could be approved by state power committee or state advisory committee under aegis of concerned SERC.

- These Committee could provide support for Monitoring, Guiding and Governance mechanism for implementation of SAMAST at state level.

Thank You