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

Venue	:	Upper Ground Floor CERC, New Delhi
Date	:	17-07-2018
List of Participants	:	At Annexure –1**(Enclosed)**

1. The Twentieth meeting of Technical Committee on Implementation of Framework for Renewables at the State level was held on 17th July 2018 under the Chairmanship of Shri. A.S Bakshi, Member, CERC. Shri P.K Pujari, Chairman, CERC & FOR and Dr. M.K Iyer, Member, CERC also attended the meeting.

2. Shri Bakshi welcomed all the participants and special invitees and highlighted that this will be his last meeting of Technical Committee as he will be retiring soon from office. Shri Bakshi expressed thanks and gratitude to all the Members of the Technical Committee for providing support to make the concept of forming Technical Committee for implementing renewables at the State level a success.

3. Dr M K Iyer recounted the immense contribution made by Shri Bakshi in taking the technical committee deliberations to a new height. He mentioned that the deep appreciation and gratitude for Shri Bakshi be put on record.

4. Dr. Sushanta. K.Chatterjee, Joint Chief (RA), CERC gave a brief background of how formation of Technical Committee was conceptualized and highlighted some achievements of the Committee under the Chairmanship of Shri Bakshi. Further, he welcomed all the participants and special invitees and highlighted the agenda items scheduled for the meeting.

Discussions on the Agenda

1. **Agenda Item No. 1: Status of implementation of SAMAST Report**

   - **Update by Consultant**

   - **Update in respect of other States by respective Members**

a. The Consultant (Idam Infra) made a presentation(Annexure-II) on the status of implementation of SAMAST in various States namely Haryana, Punjab, West Bengal, North Eastern States, Maharashtra, Andhra Pradesh, Telangana, Tamil Nadu, Karnataka, Himachal Pradesh and Bihar.

b. **Haryana:** The Consultant briefed the Committee that DPR for SAMAST implementation in Haryana has been submitted for PSDF Secretariat and some comments from the Techno Economic Sub-Group (TESG) have been received which they are addressing.

c. **Punjab:** DPR prepared and Management approval is under process.

d. **West Bengal:** Comments on DPR from TESG were submitted. PSDF called for a meeting on 24th July 20818 in which West Bengal has also been invited. It is expected that the DPR will be approved soon.

e. **Northern Eastern States:** DPR for SAMAST for all 7 States submitted to PSDF Secretariat. Assam and Meghalaya also requested for support on Forecasting & Scheduling Regulations.

f. **Maharashtra:** Implementation of SAMAST recommendation is under process by SLDC.

g. **Andhra Pradesh, Bihar, Karnataka and Telangana:** DPR is under scrutiny with TESG

h. **Tamil Nadu:** DPR is approved

i. **Himachal Pradesh:** DPR is under preparation

j. **Karnataka:** Shri Manival Raju, Member KERC informed the Committee that the DPR for Karnataka is under scrutiny by TESG

2. **Agenda Item No. 2: Status of implementation of Regulations on Forecasting, Scheduling and Deviation Settlement**

- **Update by Consultant**

- **Update in respect of other States by respective Members**

a. The Consultant (Idam Infra) made a presentation (Annexure-II) on the status of implementation of Regulations on Forecasting, Scheduling and Deviation Settlement for various States.

b. The Consultant highlighted that 17 States have come up with either Draft or Final Forecasting & Scheduling Regulations (7 Draft and 10 Final).

c. **Tamil Nadu**: Final Forecasting and Scheduling Regulations will be soon notified. It was underscored that DSM Regulations for Tamil Nadu are almost ready for publication and they are the first DSM regulations based on the lines of Model DSM regulations of FOR.

d. **Telangana:** Forecasting & Scheduling Regulations notified. The consultant is in process of developing DSM regulations for Telangana.

e. **Haryana & Punjab:** Final draft of Forecasting & Scheduling Regulations is ready. DSM regulations and Scheduling & Despatch Code for Haryana are under progress.

f. **Assam:** Forecasting and Scheduling Regulations have been notified and the DSM Regulations and Scheduling & Despatch Code for Assam are under progress.

g. **Meghalaya:** Forecasting and Scheduling Regulations and the DSM Regulations are under progress.

Update in respect of other States by respective Members

h. **Kerala:** Shri R. Preman Dinaraj, Chairperson KSERC, highlighted that Forecasting and Scheduling Regulations for Kerala are under progress and very soon the draft will be uploaded on website for public comments. He briefed about various parameters of the regulations like, Applicability, Scheduling, QCA – Qualification, Duties and functions, etc.

i. Dr. Chatterjee underscored that wherever the Regulations are under Draft stage, the provision for Hybrid projects (with or without storage) should also be included. Further, he informed that CERC is also evaluating various regulations which will require amendments to incorporate Hybrid projects.

j. The Consultant briefed about variations in certain parameters like applicability, error band, etc., of Forecasting & Scheduling Regulations of different States. The issue of addressing socialization cost of deviation charges was also discussed. Some States regulations are silent on it which could be cover in their DSM regulations. State like Telangana has notified that the shortfall would be calculated on annualized basis and then will be allocated back to the RE generators. Tamil Nadu regulations have mentioned it as a virtual pool but is silent on its treatment.

k. Shri S.K Soonee, Advisor POSOCO underscored the need of having harmonized regulations across all States. Shri Soonee also suggested that 'Hard Numbers' should not be included in the main Regulations and can be linked as annexure to the regulations. This will assist in a way that whenever there is any change in the value/number, the regulations need not be amended. Further, he highlighted the need for a due diligence of 'Hybrid projects' and the issues of QCA.

Action points/ Decisions

i. Agenda on Hybrid projects to be included in the next Technical Committee Meeting.

3. Agenda Item No. 3: Presentation by Special Invitee on issues pertaining to Biomass and MSW based Projects

a. The representative of Abellon Clean Energy, presented on the issues pertaining to Biomass and MSW based Projects (Annexure-III). He gave a brief background about his organization and highlighted various projects (commissioned and under development) based on Waste to Energy, RDF and Biomass.

b. Further, he highlighted the potential and benefits of Biomass and WTE projects underscoring the Environmental, Health and Social benefits of such projects. He also highlighted the challenges of processing Waste as a fuel as it is a heterogeneous mixture and is difficult to segregate

c. He highlighted that lot of biomass/WTE plants are under stress pertaining to various factors like unorganized fuel supply, low PLF, tariff and offtake uncertainty, lacking support from financial institutions.

d. To overcome these challenges, he made following request before the Committee:

- Allow existing biomass plants to use up to 30% RDF
- Allow existing/planned MSW/ RDF plants to be allowed use of up to 30% fuel as biomass
- All biomass/MSW/RDF plants to be classified as waste to energy
- DISCOMS to be obligated to buy 100% electricity from the Bio-MSW plants at tariff determined by SERC
- New hybrid tariff structure / policy
- Preferential treatment to bio-MSW Power Plants

Action points/ Decisions

i. The Committee decided to form a Sub-Group under Shri R.N Sen, Chairperson WBERC to study the challenges pertaining to Biomass and WTE projects. Other members would include Kerala Chairperson, representatives from Punjab/Haryana ERC and FOR Secretariat.

4. Agenda Item No. 4: Presentation by Special Invitees - Experience sharing of QCA

a. Presentations were made by APSLDC, REConnect, Del2infinity and Tata Power.

b. APSLDC gave an overview of Forecasting & Scheduling Regulations notified by the APERC (Annexure-IV). The procedure for implementation of DSM and Formation of QCA by generators was also shared. Further, it was highlighted that QCA needs to be registered at SLDC and has to pay the Registration fees and security deposit to SLDC. APSLDC underscored that the de-pooling of deviation charges among the generators is carried out by the QCA and SLDC has no role in that.

c. As on 30th June 2018, 6204MW of Wind and Solar projects have been installed n AP. The share of wind being 3995MW and Solar projects as 2209MW. It was further highlighted that till April 2018, the APSLD was receiving forecast of about 5500 MW of wind and solar projects (about 89% of installed capacity) and the forecast was about 95% time within + 15%.

d. REConnect made a presentation sharing its experience of QCA (Annexure-V). The impact of real time data in accuracy improvement was highlighted. It was demonstrated that aggregation has reduced errors over the period. It was underscored that more number of projects has started providing forecast with the notification of Forecasting and Scheduling Regulations by various States.

e. Del2infinity presented (Annexure-VI) on various issues concerning QCA model of Forecasting & Scheduling Regulations. It was highlighted that concept of Aggregation only reduces the penalty and does not assist in stabilizing the grid and some QCA are using 'Available Capacity' for gaming purpose. Further, it was argued that Forecasting & Scheduling Regulations are Open Ended and required further more clarity.

f. Dr. Chatterjee and Shri Ajit Pandit (Consultant – Idam Infra) clarified that Model regulations were developed after extensive study and the Error Formula was revised with 'Available Capacity' by careful consideration and has been explained in the Explanatory Memorandum and SOR of the regulations. The system as whole has to be perceived and the regulations can evolve as further clarity is attained.

g. Further, Tata Power presented on their experience as a QC (Annexure-VII).

h. Shri Soonee highlighted that there is a need for exhaustive study on QCA, its role, responsibility, accountability etc and also floated the idea of introducing DSO (Distribution System Operator) for stable operations of Grid.

Action points/ Decisions

i. A sub-group to be formed under the chairmanship of Kerala Chairperson to address issues pertaining to Aggregator/QCA. Other members would include Shri S K Sonnee, Advisor, POSOCO, and representatives from APERC, KERC and FOR Secretariat.

ii. It was decided that a model agreement should also be prepared by the sub-group clearly explaining the Roles and Responsibilities of an Aggregator/QCA.

The meeting ended with the thanks vote to Shri Bakshi for his ardors work as chairman of Technical Committee and Member of CERC. Shri Pujari facilitated Shri Bakshi with memento on behalf of Technical committee and appreciated the hard work put in by Shri Bakshi at CERC.

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Annexure-1

LIST OF PARTICIPANTS AT THE TWENTIETH MEETING OF TECHNICAL COMMITTEE FOR IMPLEMENTATION OF FRAMEWORK ON RENEWABLES AT THE STATE LEVEL HELD ON 17TH JULY 2018 AT CERC, NEW DELHI

1	Shri. P.K. Pujari, Chairperson	CERC, FOR
2	Shri. A. S. Bakshi, Member	CERC
3	Dr. M.K Iyer, Member	CERC
4	Shri R N Sen, Chairperson	WBERC
5	Preman Dinaraj, Chairperson	KSERC
6	Shri D.B. Manival Raju, Member	KERC
7	Shri Mukesh Khullar, Member	MERC
8	Shri. Sanoj Kumar Jha, Secretary	CERC
9	Shri.Abhijit Deshpande, Secretary	MERC
10	Shri. S.C. Srivastava, Chief (Engg.)	CERC
11	Shri. S.K. Chatterjee, JC(RA)	CERC
12	Smt. Shilpa Agarwal, Joint Chief (Engg.)	CERC
13	Shri. K.V.S. Baba, CMD	POSOCO
14	Shri S.K. Soonee, Advisor	POSOCO

15	Shri. Ravindra Kadam, Advisor(RE)	CERC
16	Shri.V.D.B. Srinivasa Rao	APSLDC
17	Shri. P.C. Kondalarao	APSLDC
18	Shri.R. C. Rao	APSLDC
19	Shri. Vibhav Nuwal	ReConnect Energy
20	Smt. Swagatika Rana	ReConnect Energy
21	Shri. Nitin Sawhney	Tata Power Trading Comp. Ltd.
22	Shri.Sunil Singh	Tata Power Trading Comp. Ltd.
23	Shri. Abhik Kr. Das	Del2 infinity
24	Shri. Tarun Rokadiya	Abellon Clean Energy
25	Shri. Ajit Pandit	Consultant
26	Shri Anant Sant	Consultant
27	Shri Abhishak Dixit	Consultant
28	Shri. Siddharth Arora, RO	CERC

Idam Infrastructure Advisory Pvt. Ltd.

Agenda Item-1 & 2

Status update on SAMAST implementation and draft F&S/draft DSM Regulations in Tamil Nadu, Haryana, Punjab, Telangana, West Bengal and North Eastern States

20th Meeting of FOR Technical Committee

July 17, 2018

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

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  - Telangana
  - Haryana
  - Punjab
  - West Bengal
  - North Eastern states (Assam, Arunachal Pradesh, Meghalaya, Mizoram, Manipur, Nagaland, Tripura)

Overview of Activities for TA support for State (as on Jul 2018)

States	DPR for SAMAST	F&S Regulations	DSM Regulations	Scheduling & Despatch Code
Tamil Nadu		√ (final draft)	√ (final draft)	
Telangana		√ (notified)	√ (in progress)	
Haryana	√	√ (final draft)	√ (in progress)	√ (draft)
Punjab	√	√ (final draft)		
West Bengal	√			
Assam	√	√	√ (in progress)	√ (draft)
Manipur	√			
Arunachal Pradesh	√			
Meghalaya	√	√ (in progress)	√ (in progress)	
Mizoram	√			
Nagaland	√			
Tripura	√			

Status of DPR for SAMAST implementation

Himachal Pradesh
- DPR is under preparation

Punjab
- DPR prepared (June, 18)
- Management approval is in process

Bihar
- Under scrutiny with TESG

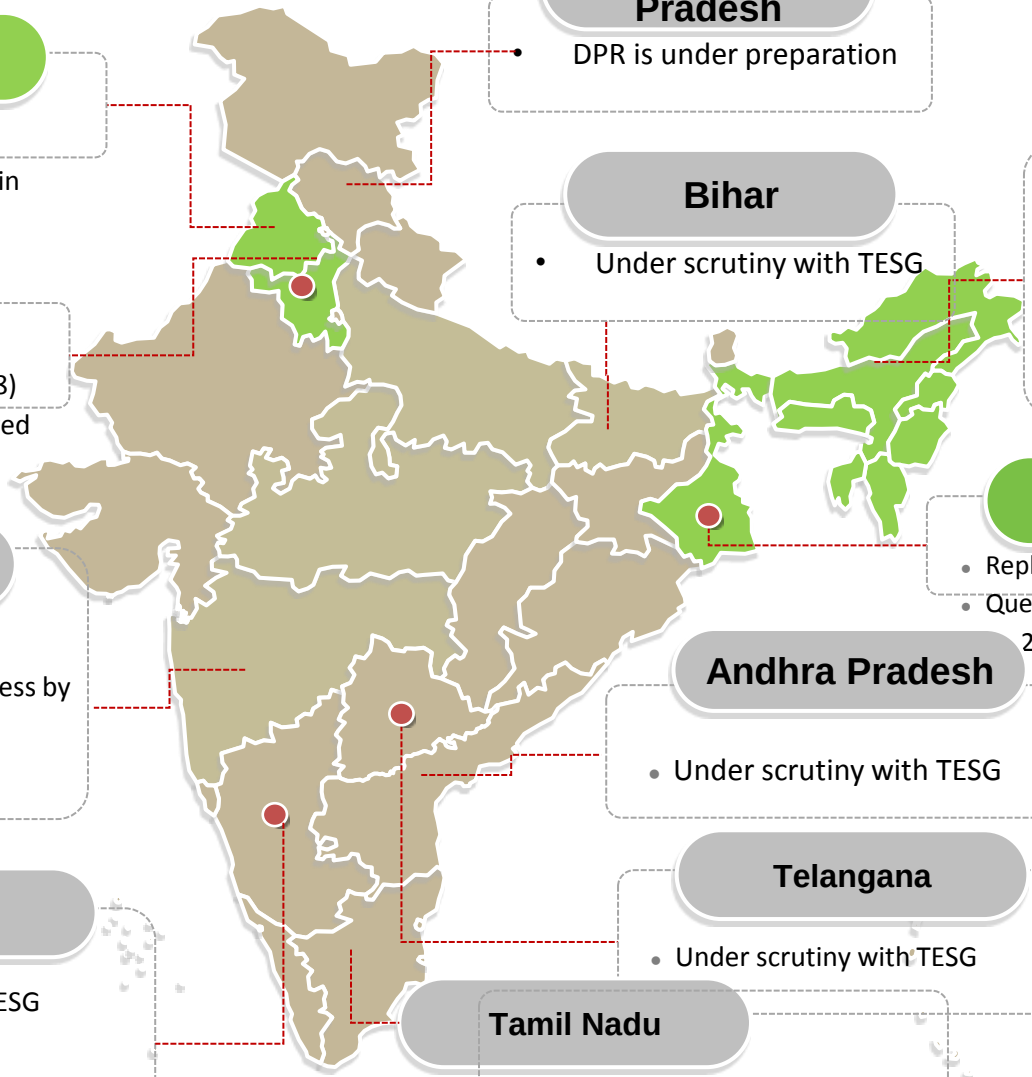
North Eastern States
- DPRs for SAMAST submitted to PSDF (31 May)

Haryana
- DPR submitted (March, 18)
- Comments of TESG received on DPR (9 July)

West Bengal
- Reply to TESG submitted (17 May)
- Queries replied and invited for meeting 24 Jul

Maharashtra
- Implementation of SAMAST recommendations is in process by SLDC

Andhra Pradesh
- Under scrutiny with TESG



Telangana
- Under scrutiny with TESG

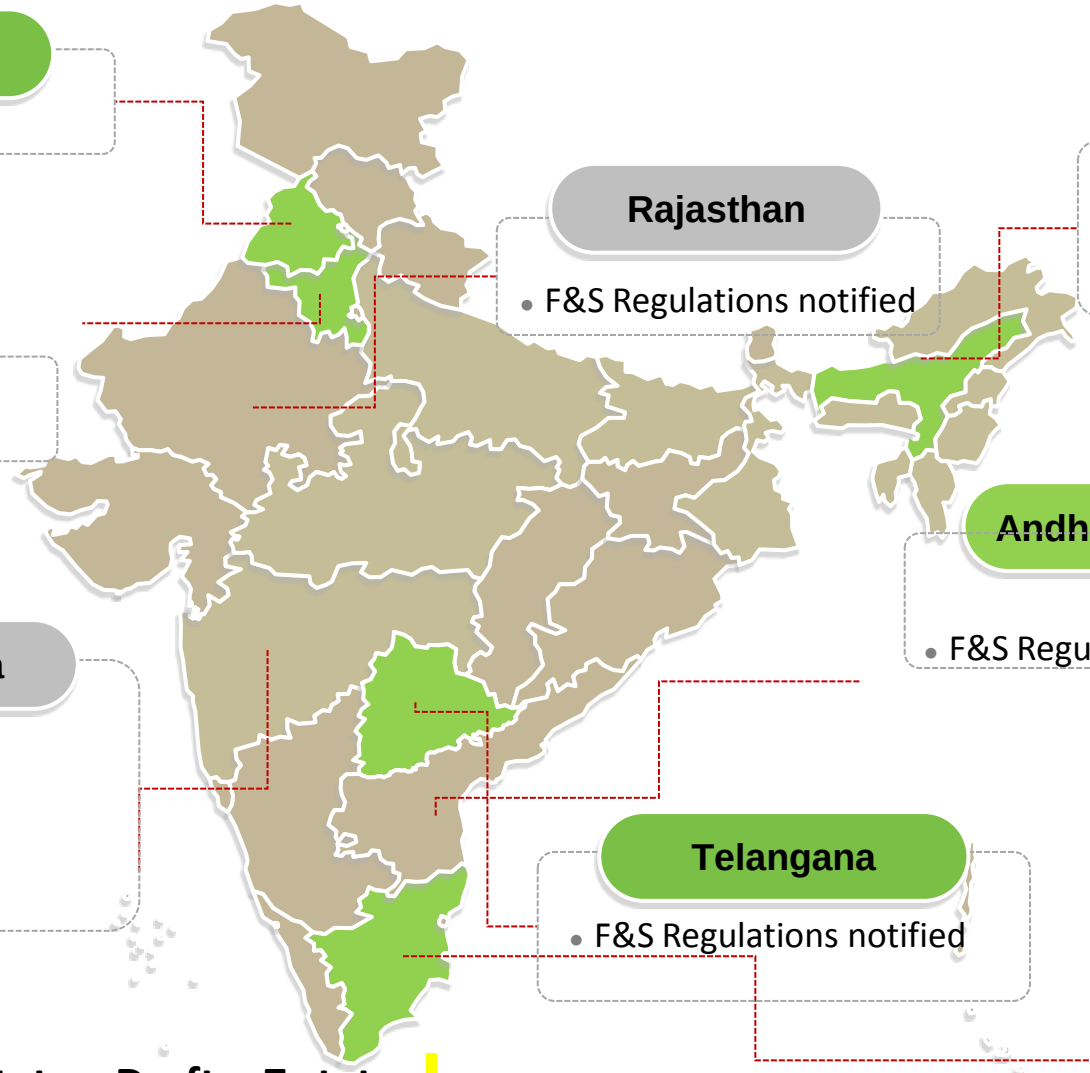
Karnataka
- Under Scrutiny with TESG

Tamil Nadu
- Approved

States assisted by the Consultant (10)

Status of DPR for SAMAST
17 (initiated) and 14 (under scrutiny)

Status of F&S Regulations at State Level



Punjab

- Draft F&S Regulations published
- Finalization in process

Haryana

- Draft F&S Regulations published
- Finalization in process

Maharashtra

- Draft F&S Regulations published
- Finalization in process

Rajasthan

- F&S Regulations notified

Assam

- Draft published for public comments (25 June)

Andhra Pradesh

- F&S Regulations notified

Telangana

- F&S Regulations notified

Tamil Nadu

- Draft F&S Regulations published
- Finalization in process

States assisted by the Consultant (5)

Notified: 10 states; Draft – 7 states

Status of F&S Regulations at State Level

SERCs	Status	Date of Notification
Andhra Pradesh ERC	**Final**	21 August, 2017
Chhattisgarh ERC	**Final (Under DSM)**	07 November 2016
Gujarat ERC	Draft	13 January 2017
Jharkhand ERC	**Final**	08 December 2016
Karnataka ERC	**Final**	31 May 2017
Madhya Pradesh ERC	**Final**	25 May 2017
Rajasthan ERC	**Final**	14 September, 2017
Tamil Nadu ERC	Draft	27 January 2018
Tripura ERC	**Final**	24 June 2017
Uttarakhand ERC	**Final (Under DSM)**	06 February 2017
Joint ERC (Manipur & Mizoram)	**Final**	09 August 2016
Haryana ERC	Draft	17 January, 2018
Punjab ERC	Draft	17 January, 2018
Telangana ERC	**Final**	30 May 2018
Maharashtra ERC	Draft	31 March,2018
Orissa ERC	Draft	23 September 2015
Assam ERC	Draft	25 June, 2018

Notified: 10 states; Draft – 7 states

Summary of comparison of F&S Regulations of various States – 1/2

Parameters	Applicability	Error formula	Tolerance Band	Deviation Charges Applicable	Treatment for Shortfall in DSM Pool
FOR Model	All Wind and Solar	AvC in Denominator	+/- 10% New +/- 15% Old	Fixed rate as % of PPA (band-10%, 20%, 30%, >30%)	PSDF and NCEF
Andhra Pradesh **(Final)**	All Wind and Solar	AvC in Denominator	+/- 15% and in steps • wind & solar • New and existing	Fixed rate of Rs./Unit (0.5, 1, 1.5) (band-15%, 25%, 35%, >35%)	Not specified
Karnataka **(Final)**	Wind combined Cap. >= 10 MW Solar Combined Cap. >= 5 MW	AvC in Denominator	+/- 15% and in steps • wind & solar • New and existing	Fixed rate of Rs./Unit (0.5, 1, 1.5) (band-15%, 25%, 35%, >35%)	Not specified
Rajasthan **(Final)**	Wind and Solar: >= 5 MW	AvC in Denominator	+/- 15% and in steps • wind & solar • New and existing	Fixed rate of Rs./Unit (0.5, 1, 1.5) (band-15%, 25%, 35%, >35%)	Not specified
Telangana **(Final)**	All Wind and Solar (Except Rooftop PV)	AvC in Denominator	+/- 15% and in steps • wind & solar • New and existing	Fixed rate of Rs./Unit (0.5, 1, 1.5) (band-15%, 25%, 35%, >35%)	(D-R) Allocated to RE Generators and Pooling S/S on proportionate
Tamil Nadu **(Draft)**	All Wind and Solar (Except Rooftop PV)	AvC in Denominator	+/- 10% and in steps • wind & solar • New and existing	Fixed rate of Rs./Unit (0.5, 1, 1.5) (band-10%, 20%, 30%, >30%)	Virtual Pool and treatment under state DSM Pool

Summary of comparison of F&S Regulations of various States – 2/2

Parameters	Applicability	Error formula	Tolerance Band	Deviation Charges Applicable	Treatment for Shortfall in DSM Pool
Haryana **(Draft)**	All Wind and Solar for capacity > 1 MW	AvC in Denominator	+/- 10% and in steps • wind & solar • New and existing	Fixed rate of Rs./Unit (0.5, 1, 1.5) (band-10%, 20%, 30%, >30%)	To be dealt separately
Madhya Pradesh **(Final)**	Wind combined Cap. – 10 MW Solar Combined Cap. – 5 MW	AvC in Denominator	+/- 15% and in steps • wind & solar • New and existing	Fixed rate of Rs./Unit (0.5, 1, 1.5) (band-15%, 25%, 35%, >35%)	Not specified
Gujarat **(Draft)**	All Wind and Solar	AvC in Denominator	Wind: +/-12% Old +/- 8% New Solar: +/- 7%	Fixed rate of Rs./Unit (Old Wind - 0.35, 0.7, 1.05 with band of 12%, 20%, 28%, >28%) (New Wind -0.35, 0.7, 1.05 with band of 8%, 16%, 24%, >24%) & (All Solar-0.6, 1.2, 1.8 with band of 7%, 15%, 23%, >23%)	(D-R) Allocated to RE Generators and Pooling S/S on proportionate basis
Maharashtra **(Draft)**	All Wind and Solar	1) AvC in Denominator OR 1) Schedule in Denominator	1. For AvC based error: +/-10% 2. For Scheduled Based error: +/- 30%	Fixed rate of Rs./Unit (0.5, 1, 1.5) 1. For AvC based Error: (band -10%, 20%, 30%, >30%) 2. For Schedule based Error: (band-30%, 40%, 50%, >50%)	(D-R) Allocated to RE Generators and Pooling S/S on proportionate basis

Status of DSM Regulations at State Level

Punjab

- Preliminary discussions done on need for DSM Regulations

Assam

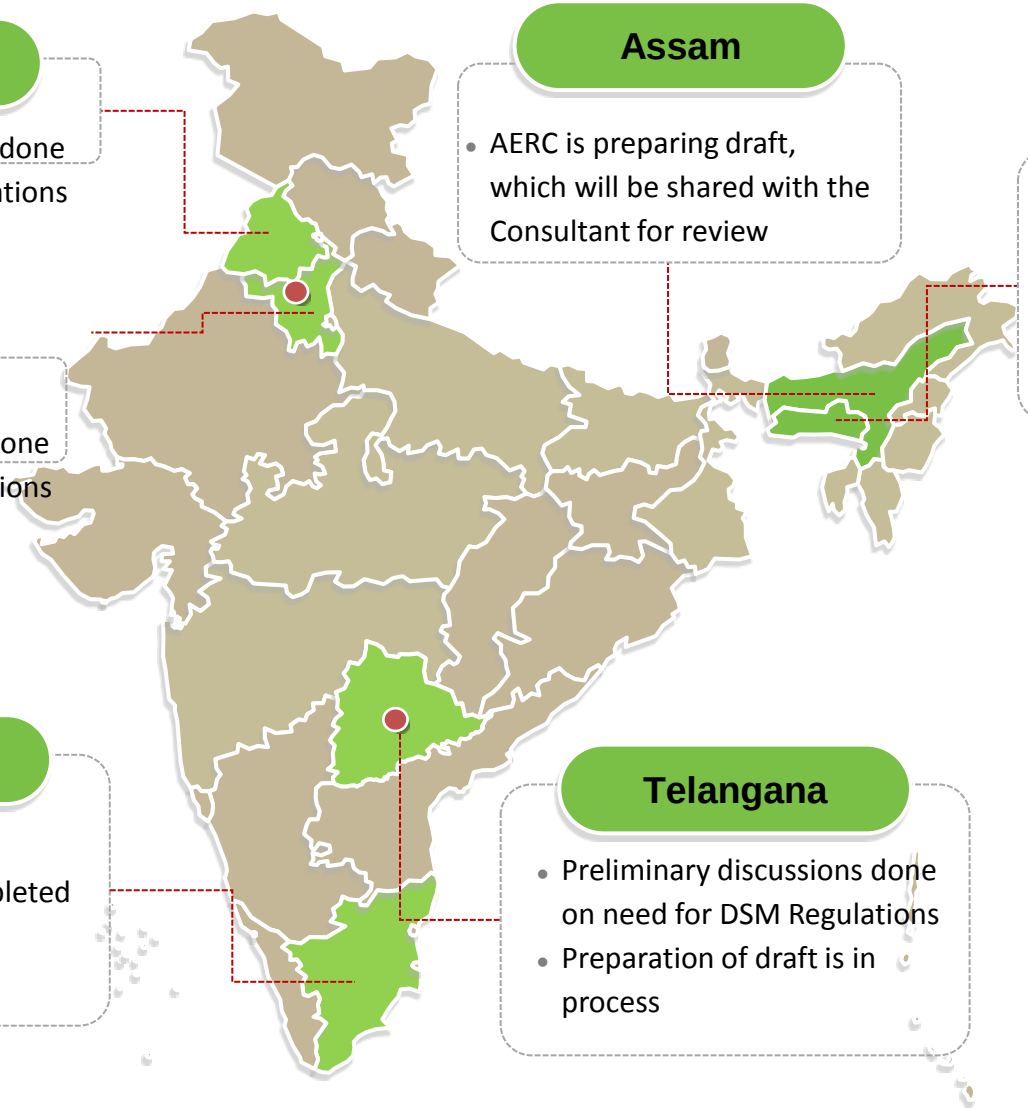
- AERC is preparing draft, which will be shared with the Consultant for review

Meghalaya

- Preliminary discussions done on design of DSM Regulations
- Preparation of draft is in process

Haryana

- Preliminary discussions done on need for DSM Regulations
- Preparation of draft is in process



Tamil Nadu

- Draft published
- Public consultation completed
- Finalization is in process

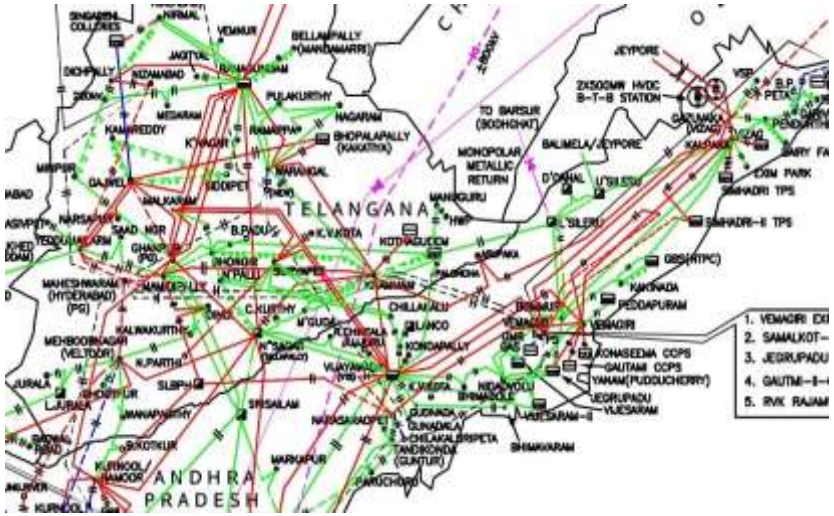
Telangana

- Preliminary discussions done on need for DSM Regulations
- Preparation of draft is in process

States assisted by the Consultant

- 7 states are already implementing DSM

Status of Telangana



- **TSERC has notified F&S Regulations on 31st May, 2018**
- The Consultant is also assisting TSERC for preparation of DSM Regulations.
- Design issues of DSM Regulations are discussed with Commission on 22nd June, 2018
- Preparation of draft DSM Regulations is in process

Gen. sources	State	Central
Nuclear		149
Coal	5082	1956
Gas		
Hydro	2450	
RE	40	10
Total in MW	**7573**	**2115**

Total Gen Cap. : 15087 MW
IPPs: 5400 MW
RE Total: 3660 MW

(Ref.: CEA Executive Summary May 2018)

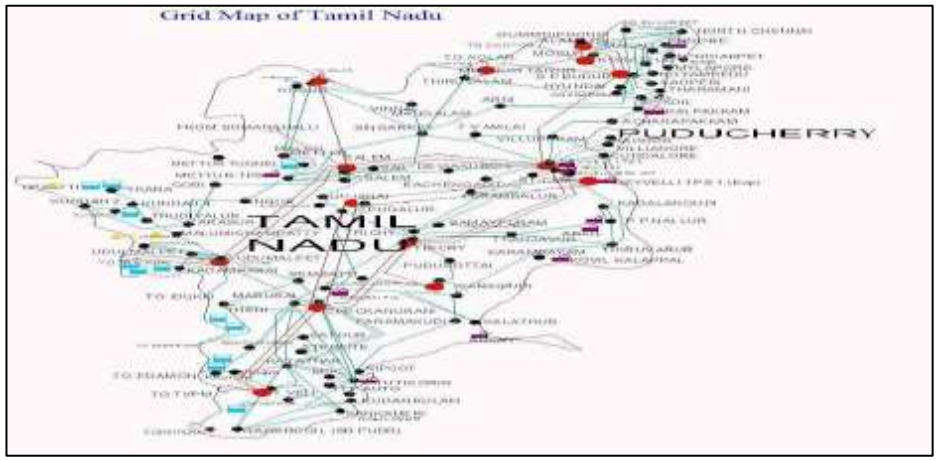
No. of Distribution Licensees /SEZ: 3 nos. (TSSPDCL, TSNPDCL & Rural Electric Co-operative Society, Sircilla (Sircilla, RESCO))
No. of Transmission Licensees: 1 no. (TSTRANSCO)

Peak Demand: 10124 MW (2017-18)
Supply: 10109 MW
No. of Transmission S/s: 214 no. of Substations
(Ref.: CEA Summary April 2018 & 15th TC Meeting PPT by TSTRANSCO)

Regulatory Developments:

- Telangana falls under **Category 'B'** of SAMAST report
- Generators payment on actual basis
- Intra state DSM is yet to be notified and 15 minute time block has to be fully implemented in Intra state.
- TSERC Grid code is in draft stage

Status of Tamil Nadu



Gen. sources	State	Central
Nuclear		1448
Coal	4320	4490
Gas	524	
Hydro	2203	
RE	123	182
Total in MW	**7170**	**6119**

Total Gen Cap. : 29903 MW
IPPs: 16613 MW
RE Total: 11165 MW

(Ref.: CEA Executive Summary May 2018)

Peak Demand: 15001 MW (2017-18)
Supply: 14975 MW
No. of Transmission S/s: 842 no. of Substations
(Ref.: CEA Summary April 2018 & TANTRANSCO Website)

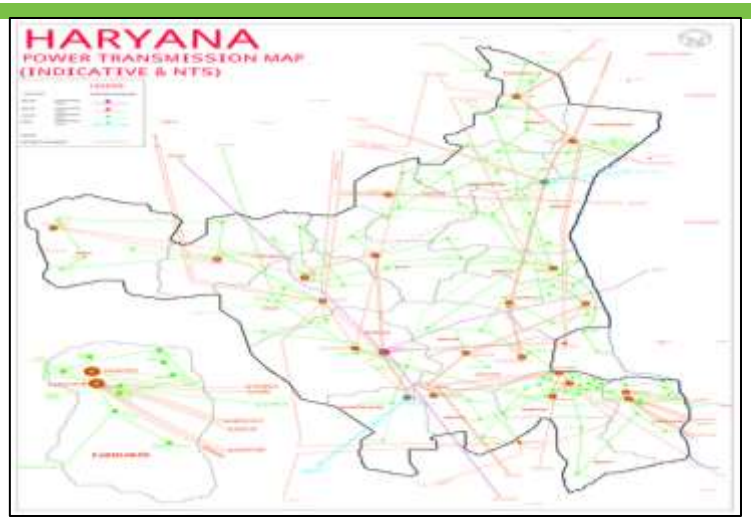
- Draft F&S Regulations and draft DSM Regulations published for public comments in Dec, 2017
- The Consultant prepared the summary of the comments, draft SOR and revise the draft of F&S Regulations and DSM Regulations and discussed with the Commission
- TNERC is in process to finalize F&S Regulations and DSM Regulations

No. of Distribution Licensees /SEZ: 1 no. (TANGEDCO)
No. of Transmission Licensees: 1 no. (TANTRANSCO)
No. of OA Consumers : 440 no. (LTOA/MTOA/STOA)
(Ref.: FOR - SAMAST Report, 2016)

Regulatory Developments:

- Tamil Nadu falls under **Category 'C'** of SAMAST report
- MYT Tariff Regulations, 2005 and its amendments, TNERC MYT Regulation specifies provision determination of Capacity Charge and Energy Charge of generators
- State Electricity Grid Code, 2005 and its amendments
- Grid Connectivity and Intra-State OA Regulations, 2014, specifies treatment to the Deviation of OA generators/ consumers

Status of Haryana



Cost Component	Cost (in Rs lac)
Cost Estimate - Hardware-Metering infrastructure	1539.17
Cost Estimate - Communication Component	498.75
Cost Estimate - Software, Hardware-II, Infrastructure, Training & Capacity Building – SAMAST	1068.90
Project Management and consultancy	186.41
Grand Total	**3293.24**

- Comments of TESG has been received on SAMAST DPR. Compliance of comments is in process
- No of Interface Meters proposed are 2470
- The Consultant prepared summary of public comments on F&S Regulations and discussed with the Commission and submitted SOR and revised draft to the Commission on 14th June, 2018 for final notification of F&S Regulations

Gen sources	Installed Cap (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)

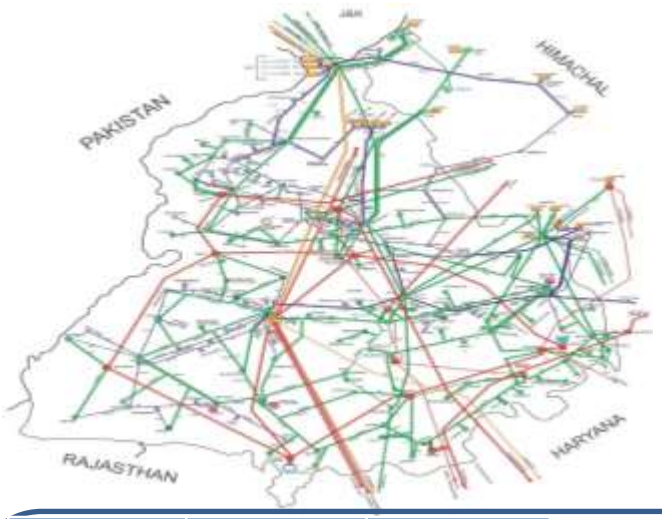
Peak Demand: 9262 MW
Supply: 9262 MW
No. of Transmission S/s: 422 no. of Substations
(Ref.: LGBR 2017-18 Report & HVPNL website)

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

Status of Punjab



Gen. sources	Installed Cap (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)

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

Cost Component	Cost (in Rs lac)
Cost Estimate - Hardware-Metering infrastructure	953.66
Cost Estimate - Communication Component	298.00
Cost Estimate - Software, Hardware-II, Infrastructure, Training & Capacity Building – SAMAST	1522.22
Cost estimates without taxes	2773.88
Grand Total (with taxes)	**3273.18**

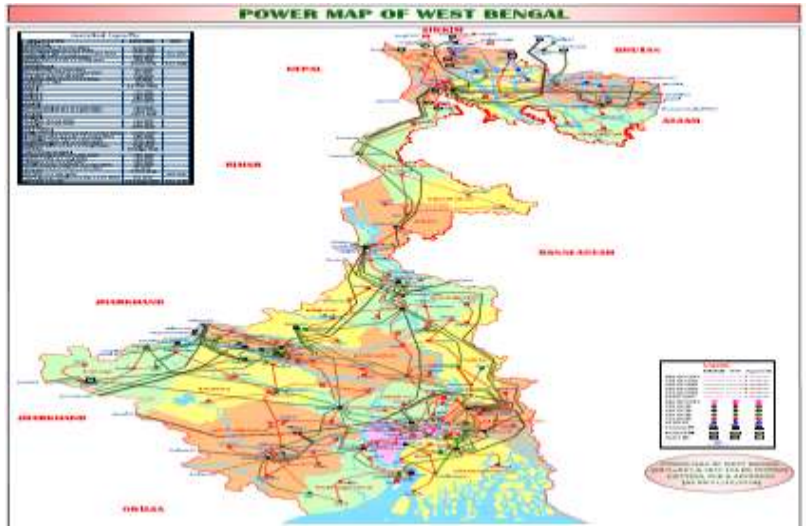
- No of Interface Meters are 1318
- The Consultant prepared summary of public comments on F&S Regulations and submitted SOR and revised draft to the Commission on 2nd May, 2018 for final notification of F&S Regulations
- Punjab SLDC has prepared DPR for SAMAST implementation in consultation with the Consultant and submitted for Management Approval

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

Status of West Bengal



Cost Component	Cost (INR in lac)
Cost-Estimate - Hardware-Metering infrastructure	1,290
Cost-Estimate - Communication Component	213
Cost-Estimate - Software, Hardware-II, Infrastructure, Training & Capacity Building – SAMAST	1,093
COST ESTIMATE GRAND TOTAL	**2,596**

- No of Meters considered in DPR is 1035;
- DPR has been submitted in December, 2017 to PSDF Secretariat
- The Consultant assisted SLDC for complying comments on DPR.
- SLDC has submitted the comments to PSDF on 17th May, 2018.
- Meeting has been called by TESG on 24th July, 2018 to discuss SAMAST DPR with WB SLDC

Gen. sources	State	Central
Coal	5400	761
Gas	100	
Hydro	986	410
RE	92	
Total in MW	**6578**	**1171**

Total Gen Cap. : 10518 MW
IPPs: 2769 MW
RE Total: 436 MW

(Ref.: CEA Executive Summary May 2018)

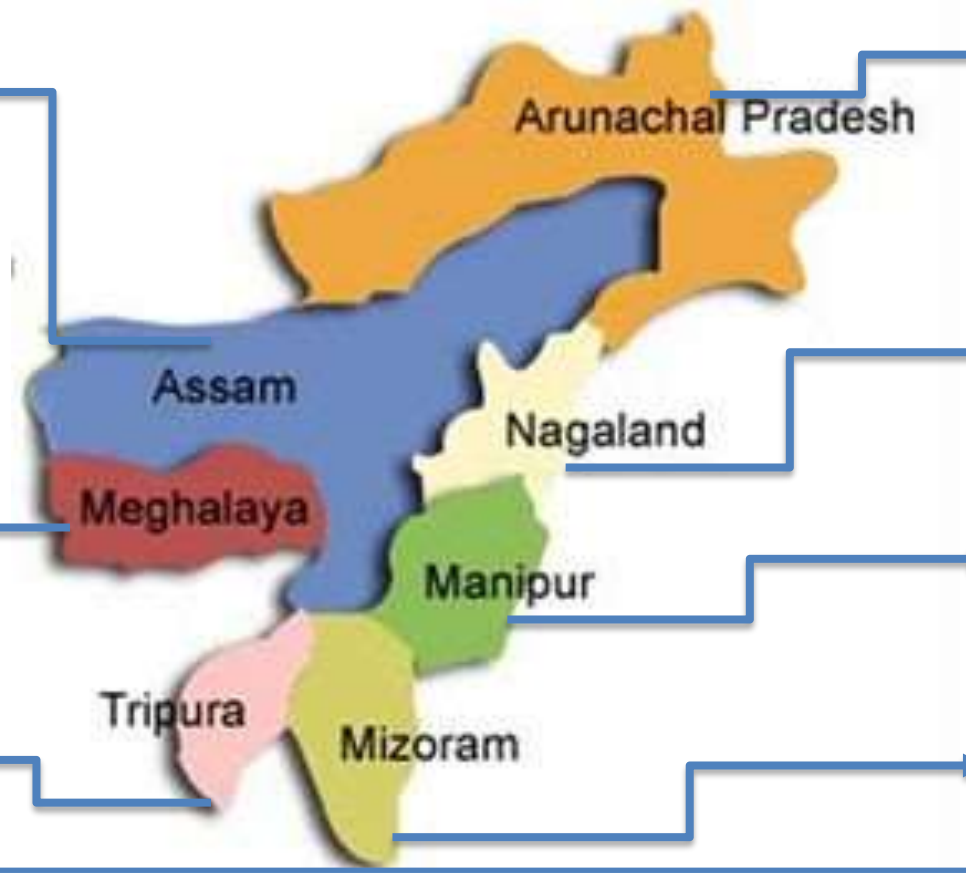
No. of Distribution Licensee: 1 no. (WBSEDCL)
No. of Transmission Licensee: 1 no. (WBSETCL)

Peak Demand: 8137 MW (2017-18)
Supply: 8114 MW
No. of Transmission S/s: no. of Substations
(Ref.: CEA Summary April 2018)

Regulatory Developments:

- West Bengal falls under **Category 'A'** of SAMAST report
- Generators payment on actual basis
- WBERC Tariff Regulations, 2011 and its amendments, WBERC tariff Regulation specifies provision determination of Capacity Charge and Energy Charge of generators
- State Electricity Grid Code, 2007 and its amendments
- WBERC Open Access Regulations, 2007, specifies treatment to the Deviation of OA generators/consumers

North Eastern Region: Overview



1505 MW (APGCL, NTPC, NEEPCO; SLDC, Kahelipara, Guwahati)

278 MW (NEEPCO; SLDC, Itanagar)

558 MW (NEEPCO, MECL; SLDC, Shillong

155 MW (NEEPCO; SLDC, Dimapur)

235 MW (NHPC, MPDC; SLDC, Imphal)

727 MW (NEEPCO, OTPC, TSECL; SLDC, Agartala)

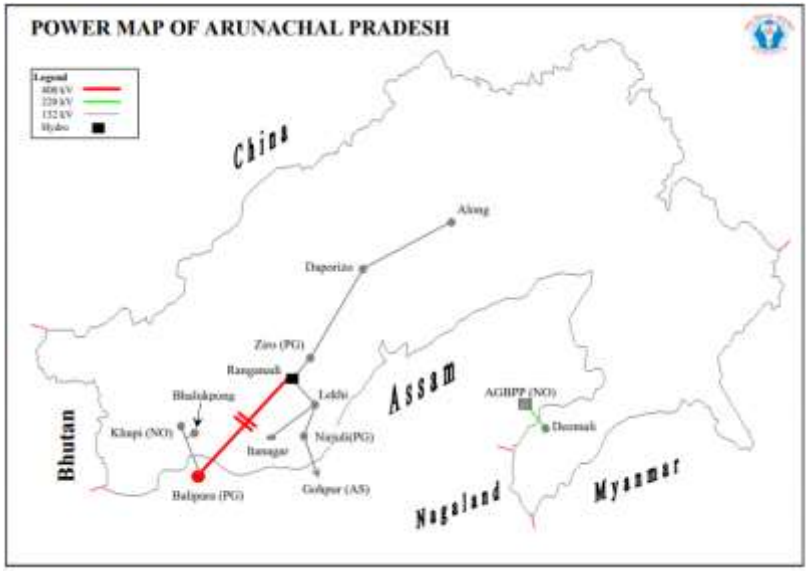
192 MW (NEEPCO; SLDC, Aizawl)

- Total installed capacity of North Eastern Region is 3916 MW, which includes 265 MW of Central – Unallocated share.
- Regional Peak Demand: 2487 MW; Peak met: 2475 MW

Consultation Support in North Eastern Region

- Idam Infra made presentation before officials of NERPC, and SLDC-Meghalaya on 14 May, 2018 at NERLDC, Shilong on SAMAST implementation in Meghalaya.
- Idam Infra made presentation before officials of NERPC, AERC and SLDC- Assam on 16 May, 2018 at AERC, Guwahati on SAMAST implementation in Assam.

Status of Arunachal Pradesh



Particulars	Cost (in Rs lac)
Cost of Meter	55.7
Cost of Hardware and Software	1287.6
Project Cost of SAMAST	1343.3
CT/PT replacement Cost	0
Grand Total	1343.3

- NERLDC is coordinating agency for preparation of DPR for SAMAST implementation
- DPR for SAMAST implementation has been submitted on 31st May, 2018 to PSDF

Gen. sources	State	Central
Coal		25
Gas		47
Hydro		118
RE	105	
Total in MW	**105**	**190**

Total Gen Cap. : 300 MW
IPPs: 5 MW

(Ref.: CEA Executive Summary May 2018)

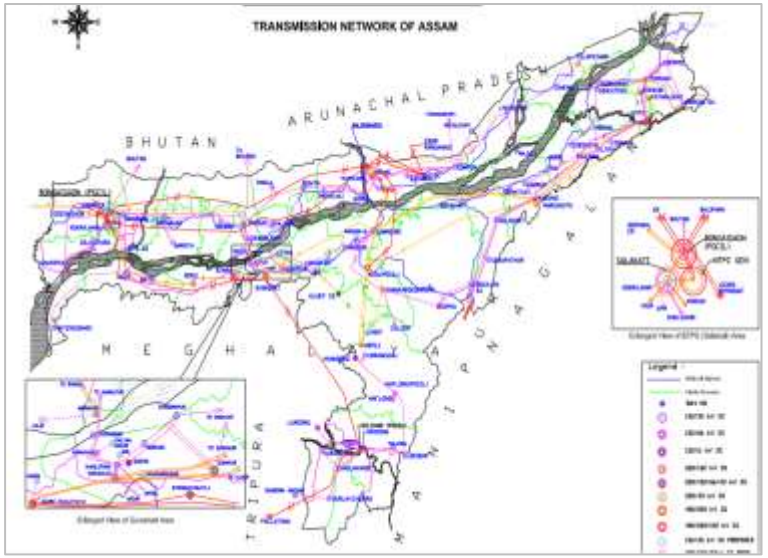
No. of Distribution Licensees: 1 no. (Dept. of Power Arunachal Pradesh)
No. of Transmission Licensees: 1 no. (Dept. of Power Arunachal Pradesh)
No. of Generation Company: 2 nos. Department of Hydro Power Development (DHPD) & Ar. Pradesh Energy Development Agency (APEDA)

Peak Demand: 145 MW (2017-18)
Supply: 145 MW
No. of Transmission S/s: no. of Substations
(Ref.: CEA Summary April 2018)

Regulatory Developments:

- Arunachal Pradesh falls under **Category 'D'** of SAMAST report
- Hydro generator payment on **scheduled** basis
- MYT Tariff Regulations, 2013, APSERC MYT Regulation specifies provision of determination of Capacity Charge and Energy Charge of Hydro generators
- State Electricity Grid Code, 2012
- APSERC (Terms and Conditions for Open Access) Regulations 2012, specifies treatment to the Deviation of OA generators/consumers

Status of Assam



Particulars	Cost (in Rs lac)
Cost of Meter	322.5
Cost of Hardware and Software	1530.8
Project Cost of SAMAST	1853.3
CT/PT replacement Cost	157.6
Grand Total	**2010.9**

- DPR for SAMAST has been submitted on 31st May, 2018
- Meeting was held on 16th May, 2018 with AERC for discussion on need of F&S Regulations and DSM Regulations for the state
- The draft F&S Regulations prepared by AERC was reviewed and revised by the Consultant and submitted to the Commission
- AERC published draft F&S Regulations for public comments on 25th June, 2018
- AERC is preparing draft DSM Regulations which will be shared with the Consultant for review

Gen. sources	State	Central
Coal		279
Gas	288	436
Hydro	100	369
RE	30	
Total in MW	**418**	**1083**

Total Gen Cap. : 1543 MW
IPPs: 41 MW

(Ref.: CEA Executive Summary May 2018)

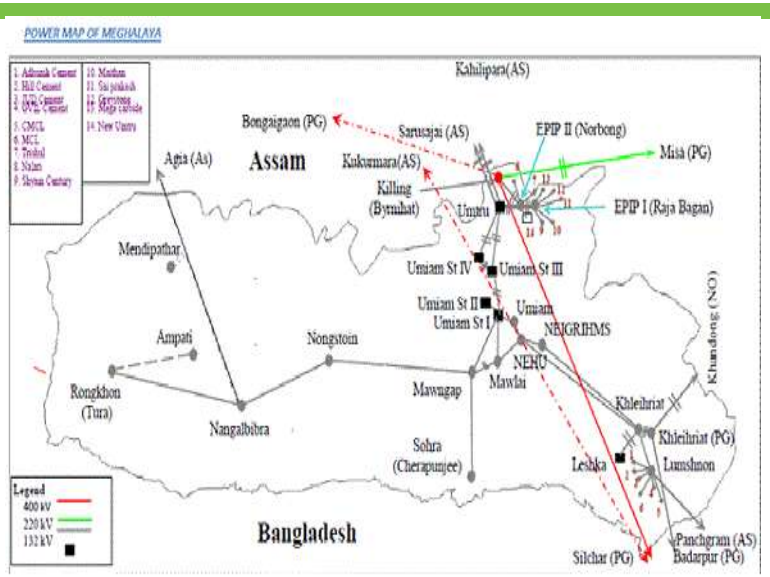
No. of Distribution Licensee: 1 no. (APDCL - Assam Power Dist. Co. Ltd)
No. of Transmission Licensee: 1 no. (AEGCL - Assam Electricity Grid Co. Ltd.)
No. of OA Consumers : 14 no. (LTOA/MTOA/STOA) *(Ref.: FOR - SAMAST Report, 2016)*

Peak Demand: 1822 MW (2017-18)
Supply: 1745 MW
No. of Transmission S/s: 63 no. of Substations (as on July, 2017)
(Ref.: CEA Summary April 2018 & AEGCL website)

Regulatory Developments:

- Assam falls under **Category 'D'** of SAMAST report
- Thermal Gen. payment on **actual** basis and Hydro gen. on **scheduled** basis
- AERC MYT Tariff Regulations, 2015 and its amendments, specifies provision of determination of Capacity Charge and Energy Charge of Hydro generators and thermal generators
- State Electricity Grid Code, 2004
- AERC (Open Access) Regulations 2005, specifies treatment to the Deviation of OA generators/consumers
- Draft AERC (Terms and Conditions for Open Access) Regulations, 2018 published for public comments on 7th Feb,2018

Status of Meghalaya



Particulars	Cost
Cost of Meter	180.9
Cost of Hardware and Software	1467.0
Project Cost of SAMAST	1647.9
CT/PT replacement Cost	229.3
Grand Total	**1877.2**

- DPR for SAMAST has been submitted on 31st May, 2018
- Meeting was held on 14th May, 2018 with MSERC for discussion on need of F&S Regulations and DSM Regulations for the state
- Design issues of DSM Regulations were discussed with the Commission on 10th July, 2018
- Preparation of draft DSM Regulations is in process

Gen. sources	State	Central
Coal		30
Gas		110
Hydro	322	75
RE	31	
Total in MW	**353**	**215**

Total Gen Cap. : 568 MW
IPPs: 0.02 MW

(Ref.: CEA Executive Summary May 2018)

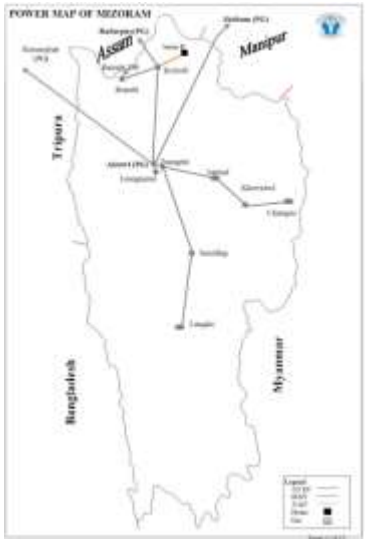
No. of Distribution Licensee: 1 no. (MePDCL)
No. of Transmission Licensee: 1 no. (MePTCL)
No. of OA Consumers : 7 no. (LTOA/MTOA/STOA)
(Ref.: FOR - SAMAST Report, 2016)

Peak Demand: 369 MW (2017-18)
Supply: 368 MW
No. of Transmission S/s: no. of Substations
(Ref.: CEA Summary April 2018)

Regulatory Developments:

- Meghalaya falls under **Category 'B'** of SAMAST report
- Generators payment on scheduled basis
- MYT Tariff Regulations, 2014 and its amendments, MSERC MYT Regulation specifies provision determination of Capacity Charge and Energy Charge of generators
- State Electricity Grid Code, 2012 and its amendments
- MSERC Terms & condition of Open Access Regulations, 2012, specifies treatment to the Deviation of OA generators/consumers

Status of Mizoram



Particulars	Cost
Cost of Meter	190.3
Cost of Hardware and Software	1435.7
Project Cost of SAMAST	1626.0
CT/PT replacement Cost	200.0
Grand Total	**1825.9**

- NERLDC is coordinating agency for preparation of DPR for SAMAST implementation
- DPR for SAMAST implementation has been submitted on 31st May, 2018 to PSDF

Gen. sources	State	Central
Coal		21
Gas		40
Hydro		99
RE	36	
Total in MW	**36**	**160**

Total Gen Cap. : 197 MW
IPPs: 0.2 MW

(Ref.: CEA Executive Summary May 2018)

No. of Distribution Licensee: 1 no. (Power & Electricity Dept. of Mizoram)
No. of Transmission Licensee: 1 no. (Power & Electricity Dept. of Mizoram)

Peak Demand: 105 MW (2017-18)
Supply: 96 MW
No. of Transmission S/s: 52 no. of Substations
(Ref.: CEA Summary April 2018 & Power & Electricity Dept. of Mizoram)

Regulatory Developments:

- Mizoram falls under **Category 'D'** of SAMAST report
- Thermal Gen. payment on **Scheduled** basis and Hydro gen. on **Actual** basis
- **JERC (Forecasting, Scheduling, Deviation Settlement and Related Matters of Solar and Wind Generation Sources) Regulations, 2016**
- MYT Tariff Regulations, 2014, JERC MYT Regulation specifies provision determination of Capacity Charge and Energy Charge of generators
- State Electricity Grid Code, 2010 and its amendments
- Terms and Conditions of Open Access Regulations, 2010, specifies treatment to the Deviation of OA generators/consumers

Status of Manipur

Particulars	Cost
Cost of Meter	284.9
Cost of Hardware and Software	1561.6
Project Cost of SAMAST	1846.5
CT/PT replacement Cost	1685.5
Grand Total	**3532.0**

- NERLDC is coordinating agency for preparation of DPR for SAMAST implementation
- DPR for SAMAST implementation has been submitted on 31st May, 2018 to PSDF

Gen. sources	State	Central
Diesel	36	
Coal		31
Gas		72
Hydro		97
RE	5	
Total in MW	**41**	**200**

Total Gen Cap. : 241 MW
IPPs: 0.06 MW

(Ref.: CEA Executive Summary May 2018)

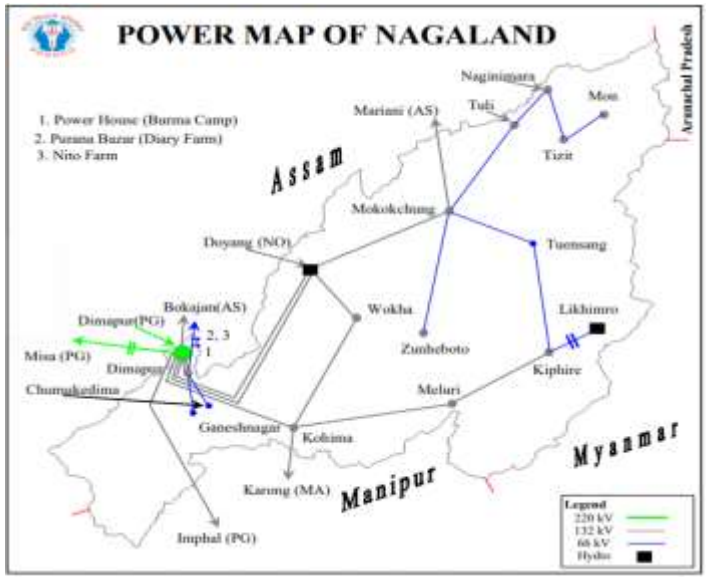
No. of Distribution Licensees: 1 no. (MSPDCL - Manipur State Power Co. Ltd.)
No. of Transmission Licensees: 1 no. (MSPCL)

Peak Demand: 202 MW (2017-18)
Supply: 195 MW
No. of Sub-stations: 95 no. of Substations
(Ref.: CEA Summary April 2018 & MSPCL petition)

Regulatory Developments:

- Manipur falls under **Category 'D'** of SAMAST report
- Thermal Gen. payment on **Scheduled** basis and Hydro gen. on **Actual** basis
- **JERC (Forecasting, Scheduling, Deviation Settlement and Related Matters of Solar and Wind Generation Sources) Regulations, 2016**
- MYT Tariff Regulations, 2014, JERC MYT Regulation specifies provision determination of Capacity Charge and Energy Charge of generators
- State Electricity Grid Code, 2010 and its amendments
- Terms and Conditions of Open Access Regulations, 2010, specifies treatment to the Deviation of OA generators/consumers

Status of Nagaland



Gen. sources	State	Central
Coal		21
Gas		49
Hydro		59
RE	31	
Total in MW	**31**	**129**

Total Gen Cap. : 161 MW
IPPs: 1 MW

(Ref.: CEA Executive Summary May 2018)

Peak Demand: 155 MW (2017-18)
Supply: 146 MW
No. of Sub-stations: no. of Substations
(Ref.: CEA Summary April 2018)

Particulars	Cost
Cost of Meter	91.2
Cost of Hardware and Software	1335.9
Project Cost of SAMAST	1427.1
CT/PT replacement Cost	445.0
Grand Total	**1872.2**

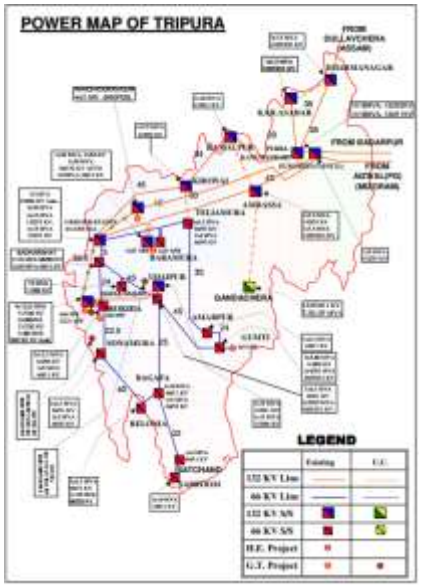
- NERLDC is coordinating agency for preparation of DPR for SAMAST implementation
- DPR for SAMAST implementation has been submitted on 31st May, 2018 to PSDF

No. of Distribution Licensees: 1 no. (Department of Power, Nagaland)
No. of Transmission Licensees: 1 no. (Department of Power, Nagaland)

Regulatory Developments:

- Nagaland falls under **Category 'D'** of SAMAST report
- Thermal Gen. payment on **Scheduled** basis and Hydro gen. on **Actual** basis
- MYT Tariff Regulations 2016, NERC MYT Regulation specifies provision determination of Capacity Charge and Energy Charge of Thermal & Hydro generators
- State Electricity Grid Code, 2012
- NERC (Terms and Condition for Intra-State Open Access Reg.), 2012

Status of Tripura



Particulars	Cost
Cost of Meter	168.6
Cost of Hardware and Software	1343.1
Project Cost of SAMAST	1511.7
CT/PT replacement Cost	1339.3
Grand Total	**2851.0**

- NERLDC is coordinating agency for preparation of DPR for SAMAST implementation
- DPR for SAMAST implementation has been submitted on 31st May, 2018 to PSDF

Gen. sources	State	Central
Coal		37
Gas	170	437
Hydro		71
RE	16	5
Total in MW	**186**	**550**

Total Gen Cap. : 736 MW
IPPs: 0.09 MW

(Ref.: CEA Executive Summary May 2018)

No. of Distribution Licensee: 1 no. (TSECL)
No. of Transmission Licensee: 1 no. (TSECL)

Peak Demand: 342 MW (2017-18)
Supply: 342 MW
No. of Sub-stations: 16 no. of Substations
(Ref.: CEA Summary April 2018 & TSECL Website)

Regulatory Developments:

- Tripura falls under **Category 'D'** of SAMAST report
- Generators payment on **scheduled basis**
- **TERC (Forecasting, Scheduling, Deviation Settlement and Related Matters of Solar and Wind Generation Sources) Reg., 2016**
- MYT Tariff Regulations 2015, TERC MYT Regulation specifies provision determination of Capacity Charge and Energy Charge of generators
- State Electricity Grid Code, 2010
- TERC Terms and condition of Intra-State Open Access Regulations, 2010, specifies treatment to the Deviation of OA generators/consumers

Summary of DPR for SAMAST implementation (NE States)

Sl. No.	States	No of Meters (No.)	Cost of Meter (INR L)	Cost of HW/SW (INR L)	Project Cost of SAMAST (INR L)	CT/PT replacement Cost (INR L)	GRAND Total (INR L)
1	Arunachal Pradesh	121	55.7	1287.6	1343.3	0.0	**1343.3**
2	Assam	700	322.5	1530.8	1853.3	157.6	**2010.9**
3	Manipur	589	284.9	1561.6	1846.5	1685.5	**3532.0**
4	Meghalaya	374	180.9	1467.0	1647.9	229.3	**1877.2**
5	Mizoram	413	190.3	1435.7	1626.0	200.0	**1825.9**
6	Nagaland	198	91.2	1335.9	1427.1	445.0	**1872.2**
7	Tripura	366	168.6	1343.1	1511.7	1339.3	**2851.0**
	Total	**2761**	**1294.0**	**9961.8**	**11255.8**	**4056.6**	**15312.5**

*-including 18% GST #- inclusive PMC cost

Idam Infrastructure Advisory Pvt. Ltd.

Thank You

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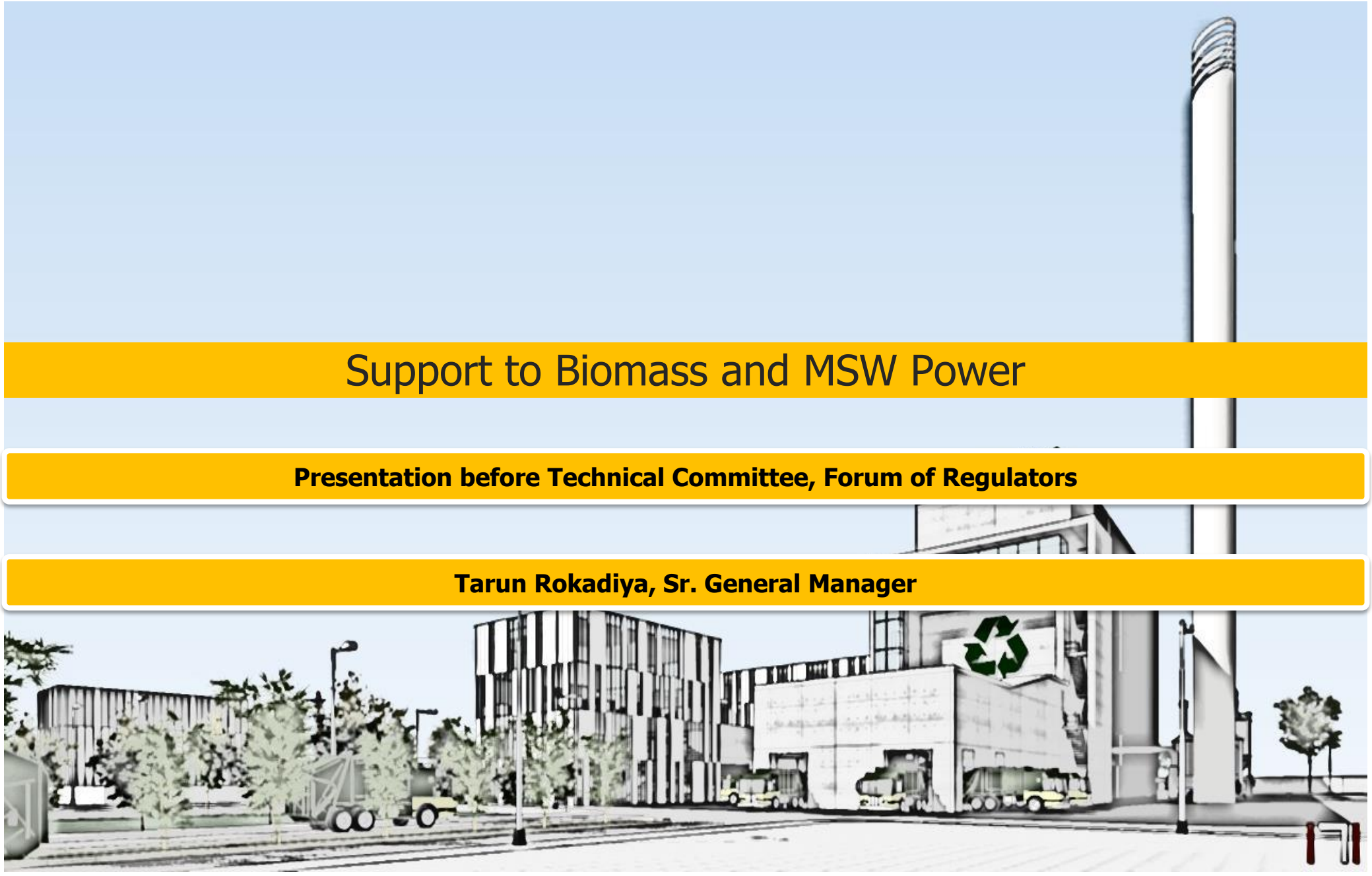
Abellon

Support to Biomass and MSW Power

Presentation before Technical Committee, Forum of Regulators

Tarun Rokadiya, Sr. General Manager



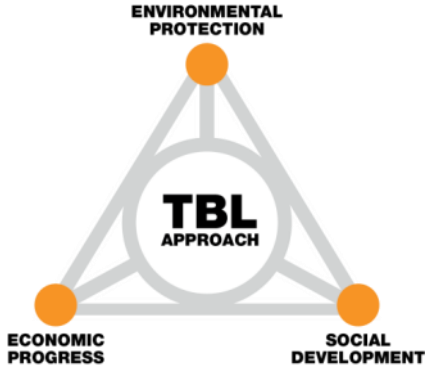
Abellon Group

- ✓ **Pioneer in W2E in India**
- ✓ **Proven track record of 9+ years**
- ✓ **Unique R&D/Technology Development Skill**
- ✓ **Highly capable, experienced and stable team**

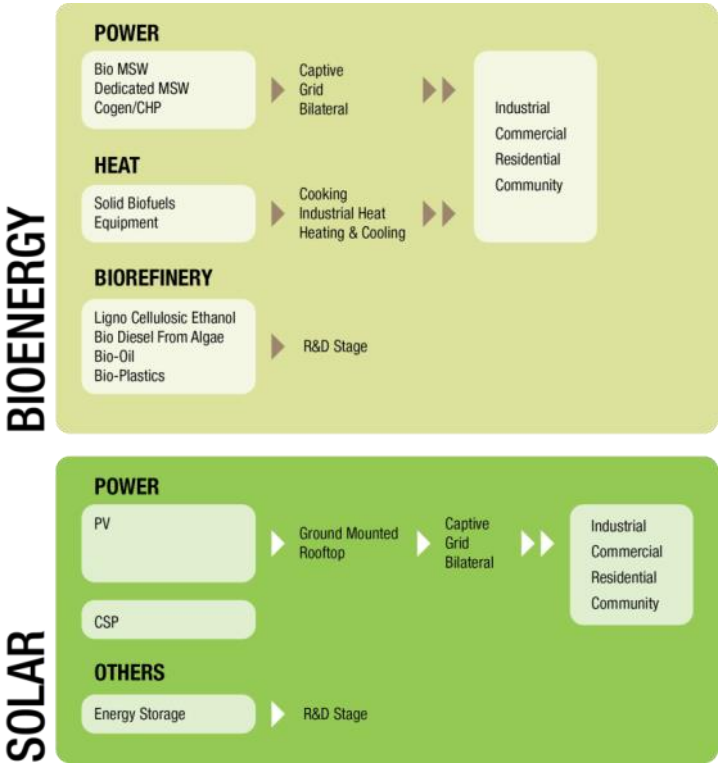
Renewable Power:
Bio-MSW, Dedicated MSW & Solar power generation and CHP models

Renewable Heat:
Solid biofuels & equipment use for cooking, industrial heating, community heating & cooling

Agrisciences:
Sustainable solutions for agriculture / agroforestry based on Genomics and other research



Triple Bottom Line Approach: integrating sustainable development models, income and employment generation, no food-fodder-fuel conflict, and energy self reliance for the nation

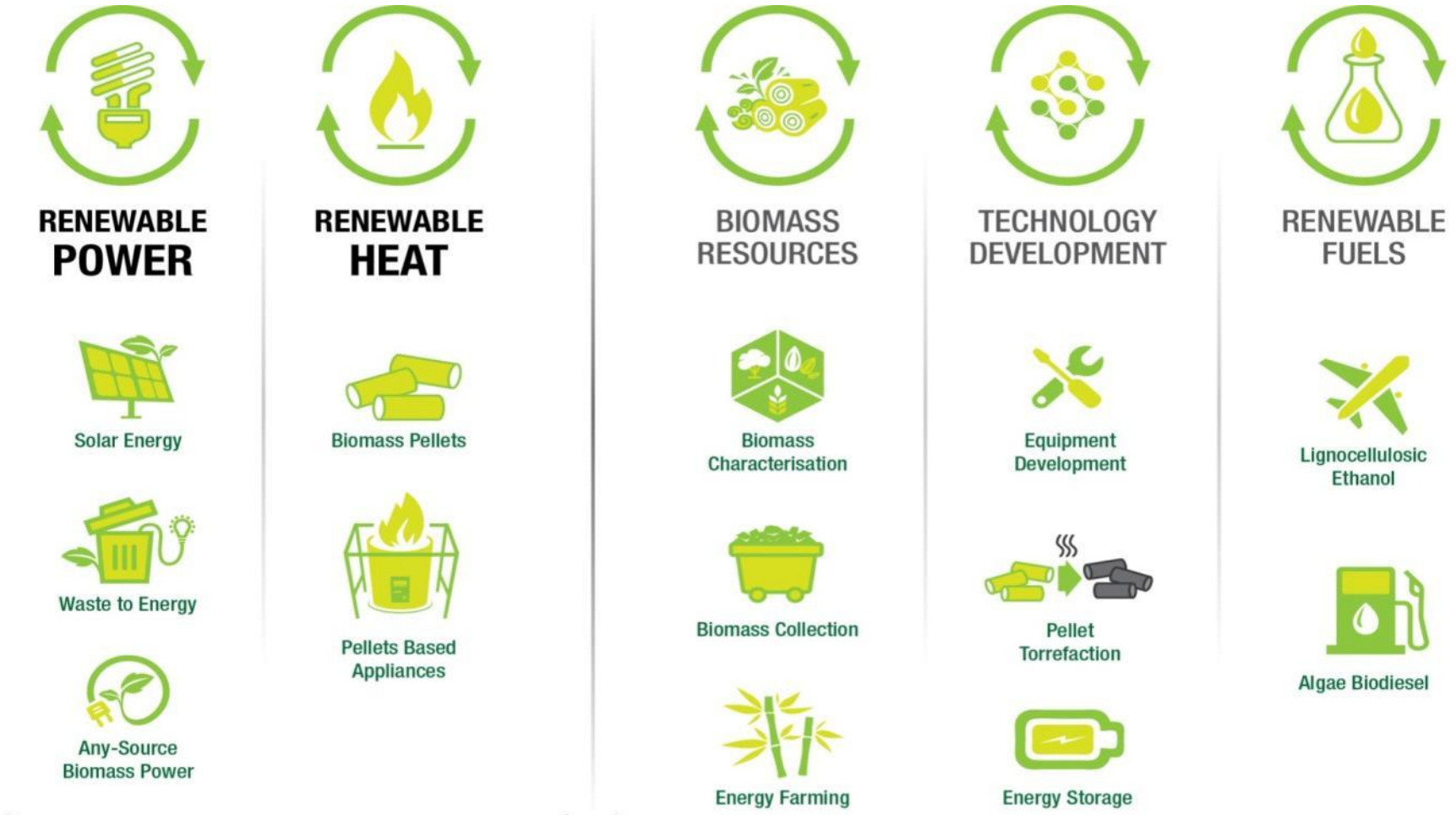


Promoter Background - Aditya Handa

- Entrepreneur with over a decade of diversified experience of building businesses
- MBA in Entrepreneurship from Babson College, USA, with passion for application of new technologies for sustainable development
- Founding family member - Claris Lifesciences: One of India's leading sterile injectables companies, with global presence across 90+ countries. Strong portfolio of products across critical care, nutrition, renal and oncology. Publicly listed since 2010.

Abellon

Self Sustaining, Evolving Business Model



Abellon-Portfolio

Proven capabilities in successful set up and management of Bio-MSW Power and Solar Power generation projects

Co-gen Project Claris Lifesciences: 1st biomass co-gen project to receive UNFCCC CDM approval in India (2006)

9.9 MW Bio-MSW Project in Gujarat: Operating successfully since 2014. UNFCCC CDM approved project

5MW solar project at Modasa, Gujarat: Operating successfully since 2012. UNFCCC CDM approved project. Innovative, award winning solar-agro electric model

Waste to Energy Project Portfolio		
City	**Waste Allotted**	**WTE Capacity**
	TPD	**MW**
Ahmedabad	1000	15.00
Surat	1000	15.00
Baroda	1000	15.00
Jamnagar	250	7.50
Rajkot	500	12.50
Total	**3750**	**65.00**

Abellon is developing projects to process and dispose over 33% of MSW in Gujarat

Abellon

9.9 MW Plant @ Khas, Gujarat – Power Sale in Open Access

Project location	Khas, Near Ranpur, Dist: Ahmedabad, Gujarat
Technology	Travelling Grate Combustion/Incineration
No. Of Boilers installed	1 No.
Capacity of the Boiler (TPH)	45 TPH
Boiler Outlet Steam Parameters	67 Kg/Cm^2 at 465 °C ± 5°C
No. of Turbo generators	1
Capacity of Turbo generator	9.9 MW

Utilized 20 + different types of wastes
GPCB Permission to use RDF

Turbine Building and Cooling Tower – Khas, Gujarat

9.9MW Bio-power Plant – Khas, Gujarat

WTE Business

65 MW City based WTE Project *(under development)*

+

45 MW Regional/Biomass Projects *(commissioned)*

+

600 TPD Waste to RDF *(under development)*

Abellon

WASTE CHARACTERIZATION

OVER 5,000 TYPES OF WASTE CHARACTERIZED

ENERGY CROPS

FOREST RESIDUES

AGRICULTURAL RESIDUES

INDUSTRY WASTE / RDF

MUNICIPAL SOLID WASTE

WASTE ANALYSIS & SELECTION CRITERIA

CHEMICAL
- Energy & chemical content
- Waste Blending

PHYSICAL
- Preprocessing method
- Storage method/policy
- Feeding/conveyance system

BIOLOGICAL
- Study of Growth & cultivation cycles to understand seasonality and availability

KEY OUTCOMES
- Uninterupted Waste Supply: 12 different blends of waste ensuring flexibility and round the year availability
- Capability of Co-firing superior and inferior calorific value waste in Bio-MSW operations
- Incineration of 100% MSW for waste to energy generation

Emission Control → **Combustion Efficiency** → **Logistics / Storage** → **Economics**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy Crops	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	No Biodegradation • Low Material loss • Easy to process • No intermittant storage • Logistically efficient • High heat value
Forest Residue	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✓	✓	Linked to wood imports • Semi organized supply source • Moderate price • No intermittant storage • Logistically efficient • High heat value
Agri Residue	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✓	✓	Diversified source • Most economical • Easy to process & burn • TBL benefits • Biodegradation risk • Poor logistics • Unorganized availability • Large people involvement
Industry Waste / RDF	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Highly organized supply chain • Round the year availability • Logistically efficient • Custom pre-process requirement • Lower Heat value • High emission hazard
MSW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Round the year availability • Moderate price • Segregation challenge • Logistically inefficient • Lower heat value • High emission hazard

Abellon

WASTE PROCESSING

MATERIAL


Wood Bark


Briquettes


Pellets


Castor DOC

PROCESS


MILLING


Wood Strips


Branches


Cotton Stalk

PROCESS


CHIPPING


Pulp & Plastic Waste

PROCESS


DEWATERING


SHREDDING


Food Waste


Other Wet Biomass

PROCESS


BIOGAS DIGESTION

KEY OUTCOMES

- Ease of material handling & logistics, lower costs
- Combustion efficiency
- Improved flowability, fuel feeding & blending


STORAGE (BALING)


COMBUSTION

Abellon

WTE Due Diligence

1. City's Socio-Economic Profile and Urbanization
2. City's Waste Collection & Transportation System
3. City's Waste Composition
4. Technology Maturity and Relevance to Local Waste
5. Global Precedence / References
6. Technology Partner Experience & Capabilities
7. Operation & Maintenance Requirement
8. Scalability of Operations
9. Environmental Controls / Compliance
10. Social Aspects and Acceptance
11. Land Use

Abellon

Due Diligence – Waste Characterization

Mixing waste

Representative Waste Sample

Weighing of Representative sample

Waste Segregation Process

Site Preparation for the survey

Coconut

Fabric

Glass

Food

Green

Paper

Plastic

Wood

Rubber

Metal

Sample Preparation for R & D analysis

Parameters Analyzed:
As received Moisture
Moisture (dry basis)
Volatile Matter
Fixed Carbon
Ash
GCV
Sulphur
Nitrogen
Chloride

Note: Quantity of sample waste is determined by Quadrate Method

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R&D: An Integral Driver for Business

Genesis of Abellon's R&D DNA

DSIR, Government of India approved R&D Facility

- Patents Filed: **20**

Publications

- Technical Publications: **19**
- Non-Technical Publications : **05**
- Manuscripts under Progress: **06**

Funding Agencies

Global Collaborations

U.S. - India Consortium for Development of Sustainable Advanced Lignocellulosic Biofuel Systems

Indo-German Project for Intercropping of Banana & Sweet Sorghum in marginal lands of Gujarat

Collaborative Research Centre 1026 (CRC) Project, Germany

Indo-Canada Project for Catalytic Upgrading of Biomass into Value-added Chemicals & Liquid Fuels

Indo-UK Project for Design and development of Carbon Neutral Dual Fuel (Solid & Liquid fuel) burner device

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Biomass and Municipal Solid Waste to Power

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Why support biomass and MSW to power?

Waste

Biomass		MSW
• Open burning • Green house gas • Black carbon	**Environment & Health**	• Open burning • Green house gas • Soil & water pollution
• Employment generation • Income enhancement • Skill development	**Social**	• Landfill reduction • Employment generation • Skill development
• India's NDC – 10 GW • National Policy on Crop Residue • NGT Orders	**Policy/Regulatory**	• Clean India Mission • SWM Rules 2016 • NGT Orders

Common: Prevent negative effects of *waste* while recovering value

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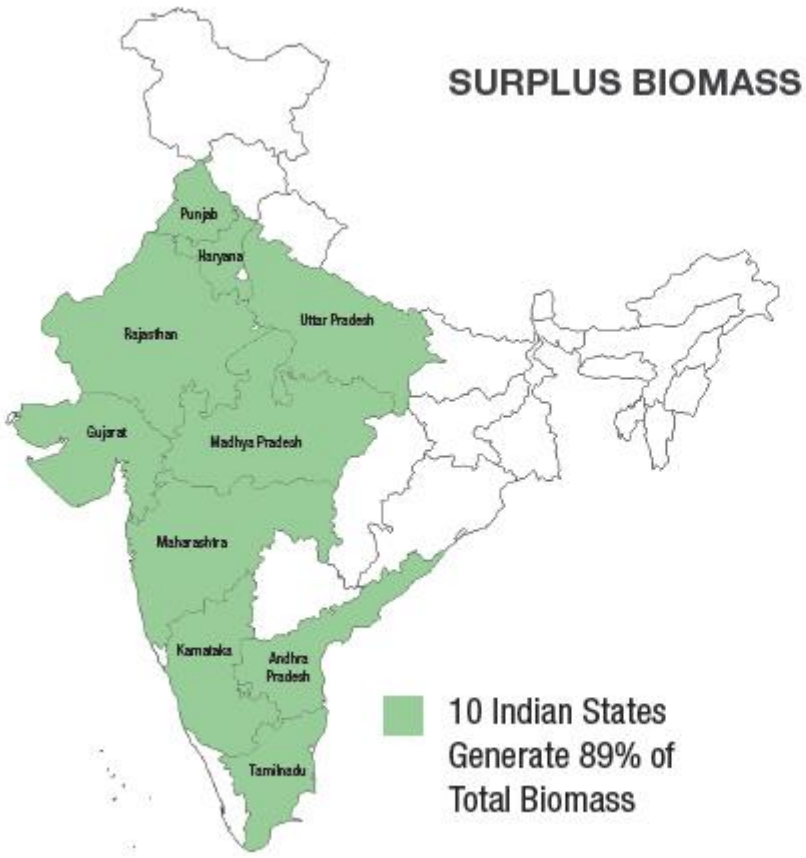
Biomass Sector



SURPLUS BIOMASS IN INDIA ~ 240 Million tonnes/annum

KEY SOURCES OF BIOMASS

Source: https://www.researchgate.net

- Unorganized fuel supply
- Seasonal availability
- Low PLF
- Tariff uncertainty
- Off-take uncertainty
- Difficult to finance

- **Sector in stress!!**

18,000 MW Potential – 5000 MW installed - ??? Operational

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MSW to Power

62 Mn tonnes/year

- Consistent availability but heterogeneous mix
- Low calorific value - operational issues
- Highly unpredictable
- Very high moisture (>35%)

S No	Description	Number	Waste generation, TPD	Potential
1	Cities above 5 million population	8	41,000 (23%)	2-4 plants per city
2	Cities between 1 million to 5 million population	45	42,000 (24%)	~ 1 plant per city
3	Cities between 5 Lacs to 1 million population	43	15,000 (9%)	Clustering ULBs within 50-80 km distance*
4	Cities between 1 Lacs to 5 Lacs population	372	38,000 (21%)	
5	Cities between 20 thousand to 1 Lacs population	1543	40,000 (23%)	

More than 60% of waste is spread across small towns 25 – 300 TPD waste generation

Focus is primarily on urban areas ~ 12 Mn tonnes – solution needed for ALL cities

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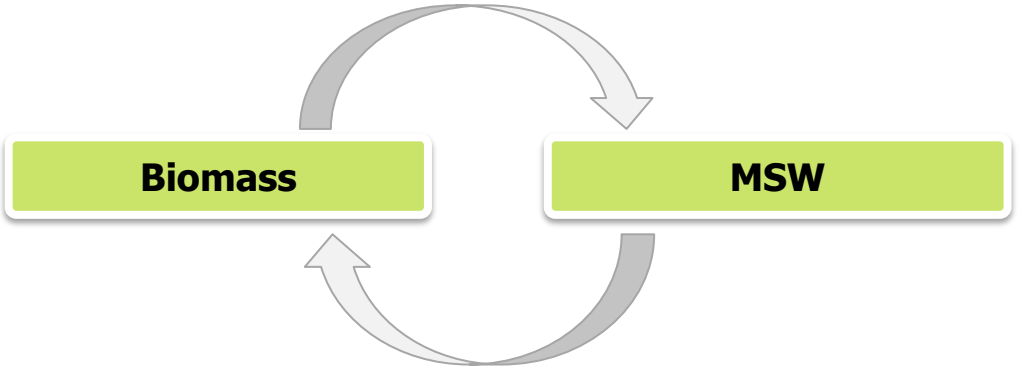
Synergize Waste: Biomass + MSW

- **Biomass plants are under stress – NPA, low PLF, seasonality of fuel, financial institution unwilling**
- **Abundant waste > 60% in smaller cities/ towns – within 100 – 150 kms of biomass assets**
- **Opportunity to synergise?**



Can biomass power benefit from MSW and vice-versa?

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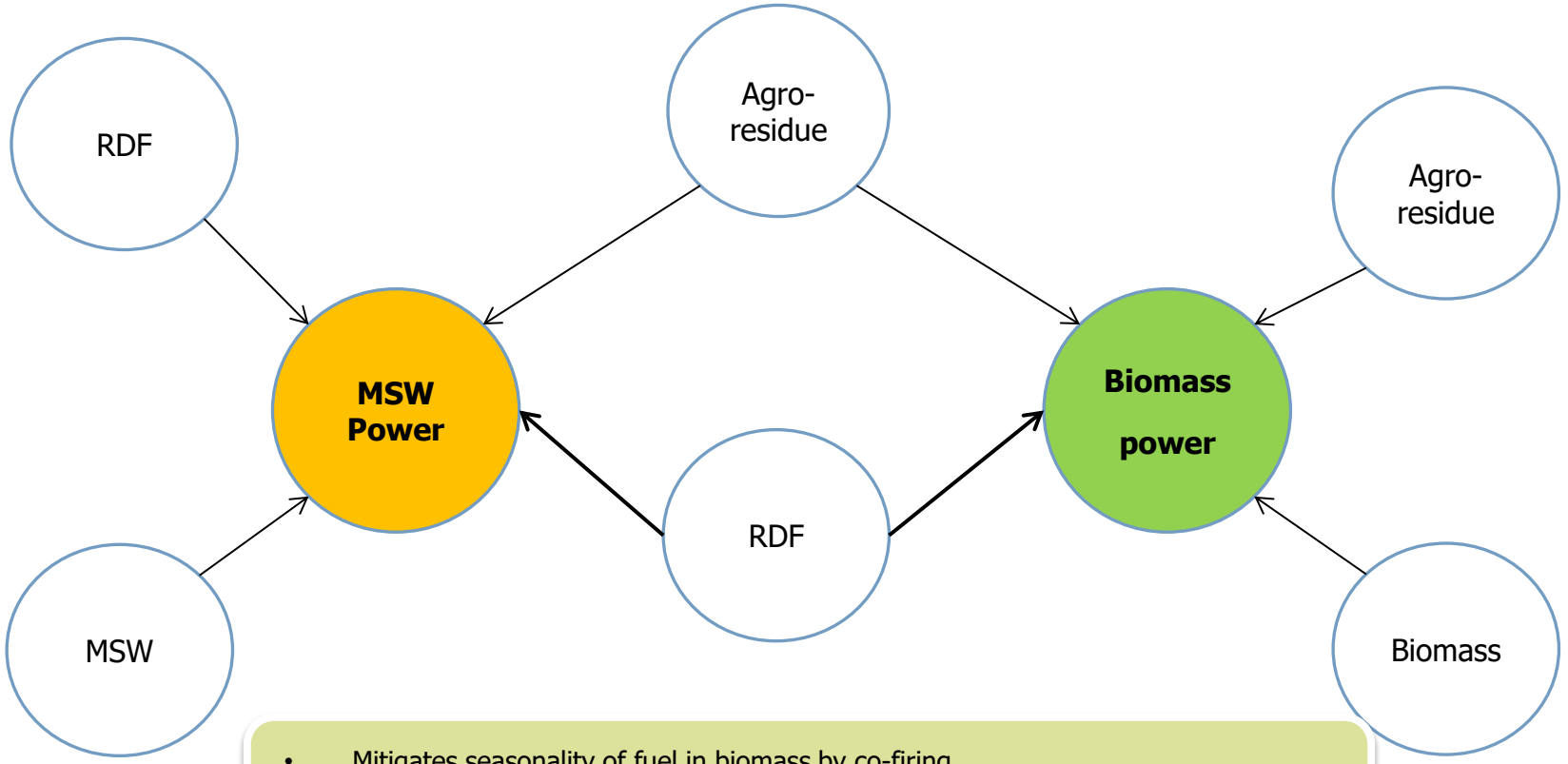
Synergize Waste: Biomass + MSW

Approach: Blending of *RDF* in biomass power plants and *biomass* in MSW power plants



- Mitigates seasonality of fuel in biomass by co-firing
- Mitigates operational issues in MSW power plants
- Ability to achieve higher PLF
- Economy of scale – better economics & resource utilization
- Contextually relevant model for smaller cities/towns/rural areas

SWM Rules 2016

18. **Duties of the industrial units located within one hundred km from the refused derived fuel and waste to energy plants based on solid waste-** All industrial units using fuel and located within one hundred km from a solid waste based refused derived fuel plant shall make arrangements within six months from the date of notification of these rules to replace at least five percent of their fuel requirement by refused derived fuel so produced.

SWM Rules mandate blending of RDF

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Synergize Biomass + MSW Power = Bio-MSW Power

Implications:

- **Revival of stranded assets – creating a compelling case**
- **Development of new hybrid waste to energy plant**
- **Make in India model**
- **Boost to *Swacch Bharat Mission* – will enable waste processing & disposal in smaller towns and cities**
- **Addresses environmental and social issues for processing and disposal of waste – urban + rural areas**

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Synergize Biomass + MSW Power = Bio-MSW Power

Request:

- Allow existing biomass plants to use **up to 30% RDF**
- Allow existing/planned MSW/ RDF plants to be allowed use of up to **30% fuel as biomass**
- **ALL biomass/MSW/RDF plants to be classified as waste to energy**
- DISCOMS to be obligated to buy 100% electricity from the Bio-MSW plants at tariff determined by SERC
- New hybrid tariff structure / policy
- Preferential treatment to bio-MSW Power Plants

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Synergize Biomass + MSW Power = Bio-MSW Power

		Biomass	RDF	Biomass Plant Upgrade to Bio-MSW	
Reference		CERC	CERC		**Remarks**
CAPEX	Cr/MW	5.59	9	Additional capex of 1.5 Cr/MW over Biomass	*Emission control, Pre-processing, fuel feeding, MoC change,*
GCV	Kcal/kg	3100	2500	2900	*Blended GCV*
SHR	Kcal/KWh	4200	4200	4800	*Due to de-rating*
Fuel Cost	Rs/Ton	3226	1800	2800	*Blended cost*
Sp. Fuel Consumption	Kg/KWh	1.35	1.68	1.66	
Variable Cost	Rs/KWh	4.91	3.56	4.63	
Fixed Cost	Rs/KWh	2.74	4.34		
Total Tariff	Rs/KWh	7.65	7.90		
Fuel Cost	Rs/Kcal	0.96	1.39	1.04	

Existing biomass plants would need to incur additional CAPEX for RDF compatibility

Concept being seen positively:

- NTPC – 100 WTE plants target
- Municipal Corporations/Nagarpalika's/Urban Development Department
- Financial Institutions – domestic as well as international

Need regulators support

Other Issues

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High Variation in Tariff Considerations

Parameters	Reference	CERC	MERC	PERC	MPERC	RJERC	GERC
		RE Regulation 2017	CASE No.45 of 2016.	Petition No. 43 of 2015	APTEL Order 211 of 2015	Revision in Fuel Price 9th Sept. 2015	Order no.1 of 2018
		17th April 2017	29th April 2016	24th July, 2015	4th May 2016		15th March 2018
Year		2018-19	2016-17	2015-16	2016-17	2016-17	2018-19
GCV	Kcal/Kg	3100	3600	3174	3100	3400	4423
Station Heat Rate	Kcal/KWh	4200 for travelling grate boilers 4125 for AFBC boilers	4200	4126	4200	4200	3800 – WCC 3950- ACC
Specific Fuel Consumption	Kg/KWh	1.35 for travelling grate boilers 1.33 for AFBC boilers	1.17	1.29	1.35	1.24	0.86 for WCC 0.89 for ACC
Fuel Cost	Rs/Ton	3226 for other states	4186	3500	2925	2875	3764
Variable Cost	Rs/KWh	4.91 for other states	5.41	5.06	4.86	3.82	3.82 WCC 3.97 ACC

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Gross Calorific value-Biomass and MSW

Issue:

- Biomass/MSW is not homogeneous compared to other fossil fuels
- High amount of moisture is present that lowers the GCV
- Generally, inert material like dirt/stones etc. come mixed with Biomass/MSW
- Biomass/MSW have high ash content compared to other fossil fuels
- Presence of moisture in Biomass/MSW results in natural decomposition of the fuel, a problem which is unique to this fuel. This degrades the GCV of the fuel
- No standardization of GCV of Biomass in India. It varies from state to state

Request:

- **Gross calorific value may determined in range of 3100kCal/kg - 3300kCal/kg by all state regulators**

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Fossil Fuel Usage – MSW Power

- Minimum temperature of 950ºC to be maintained in incineration chamber in compliance with MSW Rules, 2016. For compliance, it is required to have auxiliary burners/startup burners using fossil fuel to maintain 950ºC. For achieving the same, fossil fuel usage must be allowed

- Upto 15% of coal bending in Biomass based power plant is allowed by MNRE. Same can be extended to MSW based power plants due to above mentioned temperature requirement

Temperature requirement

Complete combustion requirement

(b) Waste to be incinerated shall not be chemically treated with any chlorinated disinfectants.

f chlorinated plastics shall be phased out within two yea

(d) if the concentation of toxic metals in incineration ash exceeds the limits sp (Management, Handling and Trans boundary Movement) Rules, 2008, as amended from time to time, the ash shall be sent to the hazardous waste treatment, storage and disposal fcaility.

(e) Only low sulphur fuel like LDO, LSHS, Diesel, bio-mass, coal, LNG, CNG, RDF and bio-gas shall be used as fuel in the incinerator.

(f) The CO2 concentration in tail gas shall not be more than 7%.

(g) All the facilities in twin chamber incinerators shall be designed to achieve a minimum temperature of 950^{0}C in secondary combustion chamber and with a gas residence time in secondary combustion chamber not less than 2 (two) seconds.

(h) Incineration plants shall be operated (combustion chambers) with such temperature, retention time and turbulence, as to achieve total Organic Carbon (TOC) content in the slag and bottom ash less than 3%, or the loss on ignition is less than 5% of the dry weight.

(i) Odour from sites shall be managed as per guidelines of CPCB issued from time to time

Maintaining combustion temperature is a critical regulatory requirement

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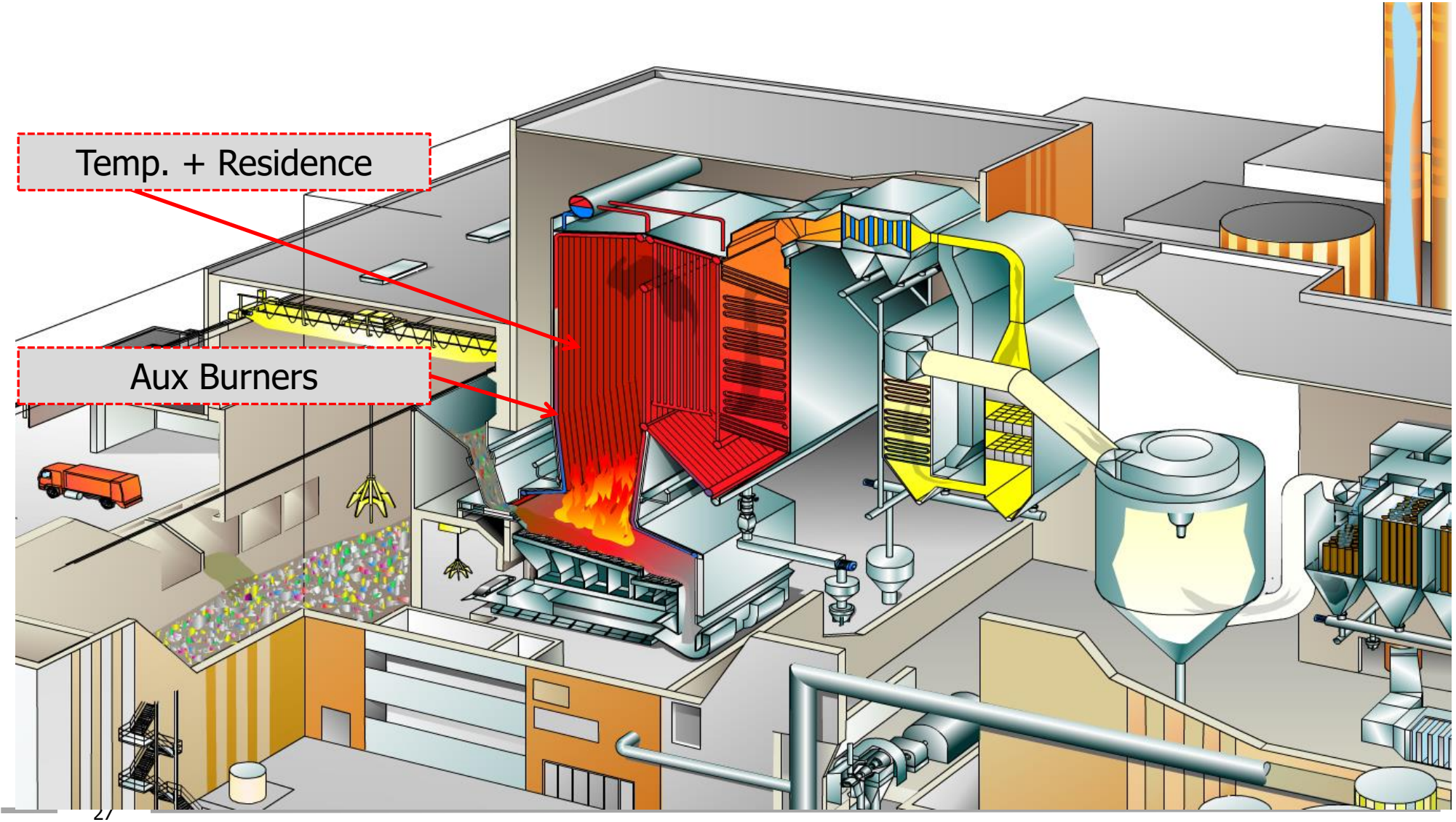
Environmental Compliance



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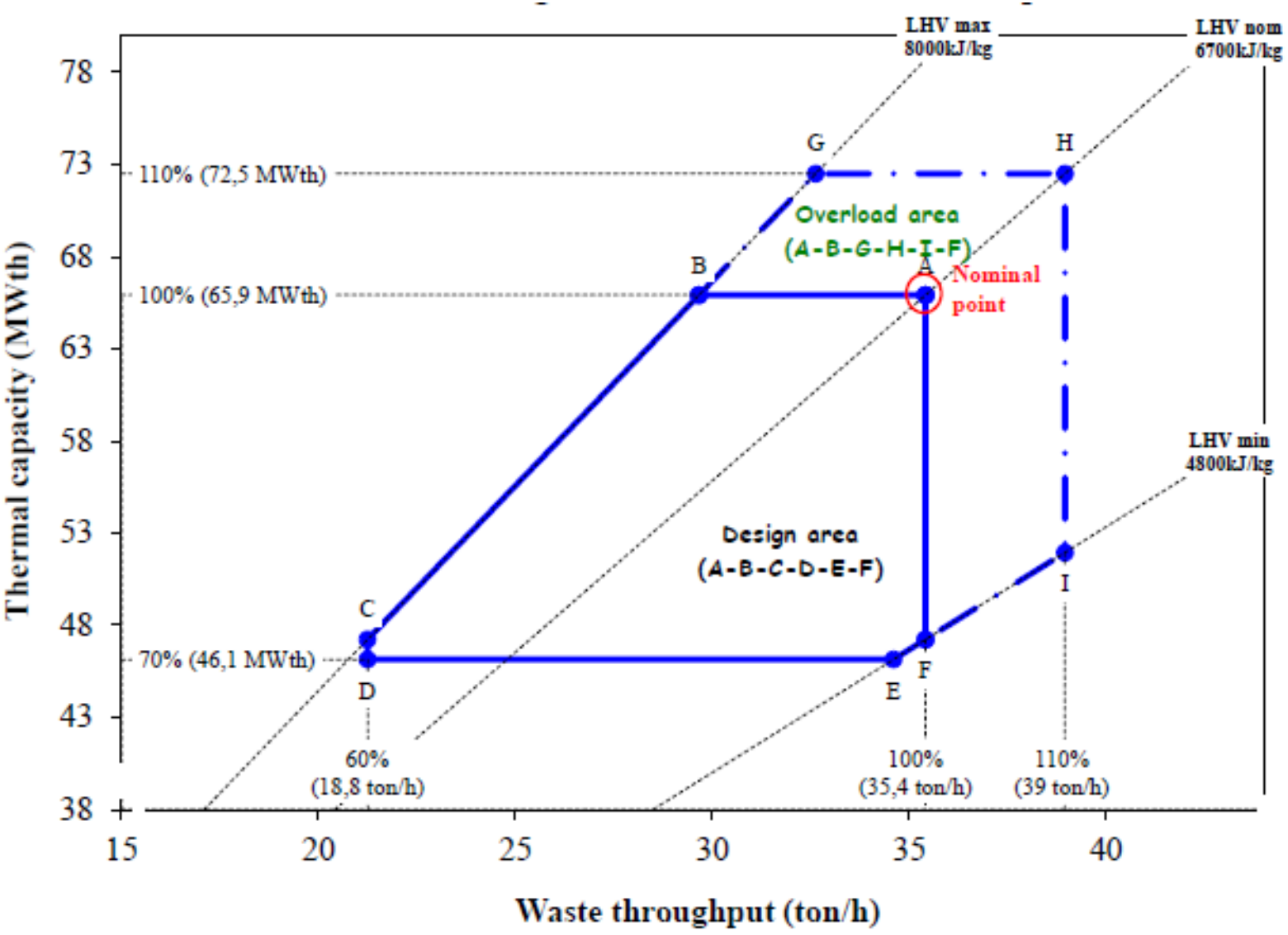
Combustion Diagram of WTE



Nominal LHV:
1600
kcal/kg

Design Range LHV:
1100 – 1900
kcal/kg

WTE plant needs to be designed to handle wide variations

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WTE Emission Norms

Sr. No.	Parameters	INDIA	
		MSW Rules 2000	SWM Rules 2016
		(mg/m3)	(mg/m3)
1	Total Dust/ PM	150	50
2	HCL	50	50
3	SO_2	ND	200
4	CO	ND	100
5	TOC	ND	20
6	HF	ND	4
7	NO_x	450	400
8	Cd + Th+ their compounds	ND	0.05
9	Hg and its compounds	ND	0.05
10	Sb+As+Pb+Co+Cr+Cu+Mn+Ni+V+ their compounds	ND	0.5
11	Total Dioxins & Furans ($ngTEQ/Nm^3$)	ND	**0.1**

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Station Heat Rate-Biomass and MSW

- Station Heat Rate varies with the capacity of the plant and the variation in the steam parameters (pressure and temperature) which leads to poor performance of the boiler
- For Biomass/MSW based plants the variation is high due to unpredictability of fuel quality, source, moisture, ash content, etc. and hence plant does not run at full load condition at design parameters
- If the plant is running at part load, then the Station Heat Rate is higher. Due to the variability of fuel & usage of different fuels there is variation in the operational parameters impact the Station Heat Rate in Biomass/MSW power plants
- Further, aging of plant leads to deration in capacity with time. The lower efficiency also negatively impacts the SHR
- It is to be noted that for Solar power plants, a deration factor of 1% is used. Similarly, deration in MSW/Biomass power plants also needs to be factored
- Hon'ble CERC has considered a Station Heat Rate of 4200 kCal/kWh for project using travelling grate boilers and 4125 kCal/kWh for project using AFBC boilers

Request:

- **Station Heat Rate may be standardized to 4400kCal/kWh for Biomass power plants and 4800 kcal/kg for MSW power plants**

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Plant Load Factor-Biomass and MSW

- Plant Load Factor is measure of the output of a power plant compared to the maximum output it could produce
- The actual output in turn depends upon the heat input
- In case of Biomass/MSW power plants, the heat input is variable due to substantial variation in the quality of fuel input
- Hon'ble CERC has considered a PLF of 80% from second year onwards for Biomass Power Plants

Request:

- **The PLF may be revised to 75% from second year onwards**

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Commercial Issues

- **Reduced transmission and wheeling charges:**
  - Biomass/MSW based power plants should be given waiver/concession in transmission and wheeling charges as a promotional measure in similar lines of solar and wind power plants
  - Inter-state charges to be waived

- **Open Access for <1 MW consumers:**
  - In many states, open access is limited to consumers with demand >1MW. This is contradictory to underlying philosophy of open access i.e. non- discriminatory
  - It shall open potential untapped market for Biomass/MSW power plants

- **Contract demand waiver:**
  - Biomass/MSW power plants have to declare contract demand for electricity while the testing and commissioning of the project and electricity been used is charged are industrial tariff
  - As a promotional measure, same may be waived off and the electricity used may be charged as per provision of Deviation Settlement Mechanism

- **UI**
  - **Waste to energy/biomass plants should be kept outside of UI mechanism -**

- **Cross Subsidy Surcharge & Additional Surcharge Waiver:**
  - Cross Subsidy Surcharge & Additional Surcharge should be waived off for the consumers buying electricity from Biomass/MSW power plants throughout India

- **Delinking of REC and Cross Subsidy Surcharge & Additional Surcharge:**
  - Hon'ble CERC has clearly stated that Cross Subsidy Surcharge and REC's cannot be linked together
  - However, in many states , Cross Subsidy Surcharge and REC's are linked, i.e. while availing REC waiver of Cross Subsidy Surcharge can't be sought and vice-versa
  - **REC's and Cross Subsidy Surcharge should be delinked**

Thank You

Independence begins at the bottom...

A society must be built in which every village has to be self sustained and capable of managing its own affairs. It will be a free and voluntary play of mutual forces. In this structure composed of innumerable villages, there will be ever widening, never acsending circles.

Life will not be a pyramid with the apex sustained by the bottom. But it will be an oceanic circle whose center will be the individual. Therefore, the outermost circumference will not wield power to crush the inner circle but will give strength to al within and derive its own strength from it.

”

Thank you

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Biomass Power Potential in India – State Wise

State	Agro-residues			Forest and wasteland residues		
	Biomass Generation (kT/Yr)	Biomass Surplus (kT/Yr)	Power Potential (MWe)	Biomass Generation (kT/Yr)	Biomass Surplus (kT/Yr)	Power Potential (MWe)
Andhra Pradesh	24871.7	4259.4	520.8	3601.0	2435.5	341.1
Arunachal Pradesh	400.4	74.5	9.2	8313.1	6045.4	846.3
Assam	11443.6	2436.7	283.7	3674.0	2424.4	339.4
Bihar	25756.9	5147.2	640.9	1248.3	831.9	116.3
Chhattisgarh	11272.8	2127.9	248.3	13592.3	9066.0	1269.2
Goa	668.5	161.4	20.9	180.7	119.2	16.7
Gujarat	29001.0	9058.3	1224.8	12196.3	8251.9	1150.0
Haryana	29034.7	11343.0	1456.9	393.3	259.5	36.3
Himachal Pradesh	2896.9	1034.7	132.6	3054.6	2016.1	282.2
Jharkhand	3644.9	890.0	106.7	4876.6	3249.8	455.0
Karnataka	34167.3	9027.3	1195.9	10001.3	6601.0	924.3
Kerala	11644.3	6351.9	864.4	2122.1	1429.2	200.0
Madhya Pradesh	33344.8	10329.2	1373.3	18398.2	12271.2	1718.0
Maharashtra	47624.8	14789.9	1983.7	18407.1	12440.1	1741.6
Manipur	909.4	114.4	14.3	1264.0	834.3	116.7
Meghalaya	61.1	91.6	11.3	1705.9	1125.7	157.5
Mizoram	511.1	8.5	1.1	1590.9	1050.1	147.0
Nagaland	492.2	85.2	10.0	843.8	556.9	77.9
Odisha	20069.5	3676.7	429.1	9370.2	6084.6	851.8
Punjab	50847.6	24843.0	3172.1	398.5	263.0	36.9
Rajasthan	29851.3	8645.6	1126.7	9541.6	6297.4	881.6
Sikkim	149.5	17.8	2.3	531.5	350.7	49.1
Tamil Nadu	22507.6	8899.9	1159.8	4652.4	3070.6	429.9
Telangana	19021.5	2697.2	342.5	1550.7	1048.9	147.0
Tripura	40.9	21.3	3.0	1035.5	683.4	95.7
Uttar Pradesh	60322.2	13753.7	1748.3	5478.4	3672.1	514.1
Uttarakhand	2903.2	638.4	81.0	4559.2	3055.5	427.8
West Bengal	35989.9	4301.5	529.2	1430.7	949.1	133.0
Total	**511040.9**	**145105.7**	**18729.9**	**155473.9**	**104048.1**	**14561.5**

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Enabling policies/regulations and orders (1/3)

Ministry/Court/Tribunal	Name and date of policy/order	Main Directives/features
Ministry of Agriculture & Farmers Welfare	National Policy for Management of Crop Residue, 2014	• Control of burning of crop residue to prevent environmental degradation by promotion of in-situ management of crop residue • Diversified use of crop residue for various purposes including power generation • Capacity building and awareness about ill effects of crop residue burning and its effective utilization and management • Formulation and implementation of suitable law and legislative/policy measures to curb burning of crop residue
Supreme Court of India	24th October, 2017	• Ban of use of Furnace oil and Pet-Coke in states of Uttar Pradesh, Haryana and Rajasthan effective from 1st November, 2017
Supreme Court of India	17th November, 2017	• Application for examining feasibility of existing technologies and present a workable scheme on use and disposal of crop stubble taken on record. • Petition with similar application pending before Hon'ble Chief Justice of India for disposal
National Green Tribunal	Order dated 10th December, 2015 in application no. 118 of 2013	• Prohibition of burning of agricultural residue burning in any part of NCT of Delhi, Rajasthan, Uttar Pradesh, Haryana and Punjab

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Enabling policies/regulations and orders (2/3)

National Green Tribunal		• National Policy for Management of Crop Residue, 2014 in conjunction with action plans of state governments to be implemented in States of Rajasthan, Uttar Pradesh, Haryana and Punjab without any default and delay • State governments of Rajasthan, Uttar Pradesh, Haryana, Punjab and NCT of Delhi to educate farmers about harmful effects of crop residue burning • Farmers to be educated about alternative uses of crop residue • State governments to evolve mechanism for collection, transportation and utilization of crop residue • State Governments to provide incentives to farmers for not burning crop residue in open • State Governments required to pass directions to withdraw assistance to farmers who persist with burning crop residue in open • In case of persistent defaulters, coercive and punitive action including prosecution to be taken • Fines to be imposed in form of environmental compensation on the defaulters

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Enabling policies/regulations and orders (3/3)

National Green Tribunal		• States to provide machines, mechanisms and equipments for removal, collection and storage of agricultural residue or its costs thereof • Pollution control boards of Rajasthan, Uttar Pradesh, Haryana, Punjab and NCT of Delhi to monitor ambient air qualities in major cities and submit data to NGT District magistrates of Rajasthan, Uttar Pradesh, Haryana, Punjab and NCT of Delhi to form a team to physically inspect and prevent burning of crop residue • State governments should in coordination with the Indian Space Research Organization (ISRO), National Remote Sensing Agency (NRSA) and State Remote Sensing Agency (SRSA) develop a real-time monitoring mechanism to monitor the place, date and time of burning agricultural residues and issue alerts to all district-level functionaries.

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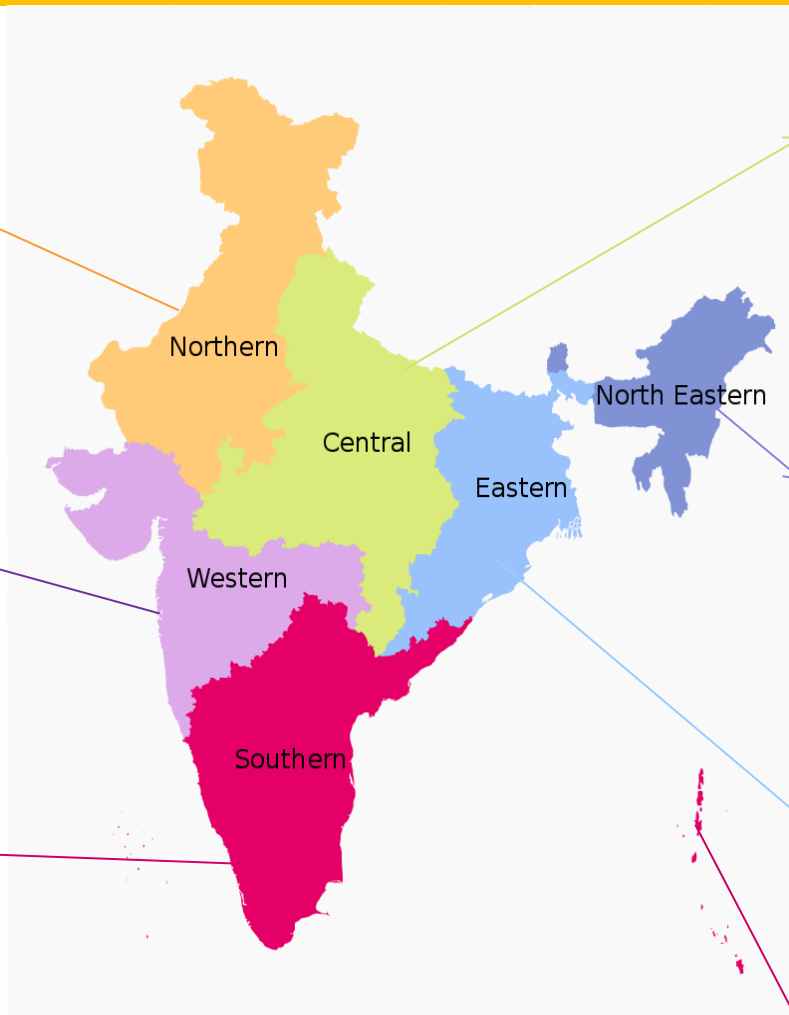
India Waste Generation-Fact Sheet

States	MMT/Annum
Chandigarh UT	0.12
NCT of Delhi	3.83
Haryana	1.65
Himachal Pradesh	0.13
Jammu & Kashmir	0.65
Punjab	1.50
Rajasthan	2.37
Total	**10.25**

States	MMT/Annum
Daman & Diu	0.01
Dadra & Nagar Haveli	0.02
Goa	0.09
Gujarat	3.70
Maharashtra	8.24
Total	**12.06**

States	MMT/Annum
Andhra Pradesh	2.38
Karnataka	3.65
Kerala	0.58
Tamil Nadu	5.68
Telangana	2.69
Total	**14.97**



States	MMT/Annum
Uttar Pradesh	5.66
Uttarakhand	0.51
Chhattisgarh	0.72
Madhya Pradesh	2.35
Total	**9.23**

States	MMT/Annum
Arunachal Pradesh	0.07
Assam	0.41
Manipur	0.06
Meghalaya	0.10
Mizoram	0.07
Nagaland	0.13
Tripura	0.15
Sikkim	0.03
Total	**1.03**

States	MMT/Annum
Bihar	0.44
Jharkhand	0.90
Odisha	0.90
West Bengal	3.17
Total	**5.39**

Others	MMT/Annum
Andaman & Nicobar Islands	0.04
Puducherry UT	0.18
Total	**0.22**

Total waste generation as on Nov'17: 53.16 MMT/Annum*

*Source: Reply to Lok Sabha Q. no. 2974

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Waste to Energy-Benefits

- **Technological benefits:**
  - Volume of MSW reduced by 90%
  - It is widely accepted and globally supported technology
  - It is dominant waste disposal system in majority of countries

- **Environmental Benefits:**
  - Controlled & continuous processing & disposal of Municipal Solid Waste in scientific manner
  - Advanced emission control system for treating of exhaust gases
  - No open storage of waste
  - Energy is recovered from waste and renewable power is generated
  - Landfill otherwise used for waste disposal diverted
  - Promoting resource utilization
  - No foul odour

- **Social Benefits:**
  - Eliminates manual handling and segregation of waste
  - Eliminates exposure to MSW – improving health & hygiene, reducing spread of diseases.
  - Contributes in developing best practices in waste processing & disposal in Solid Waste Management

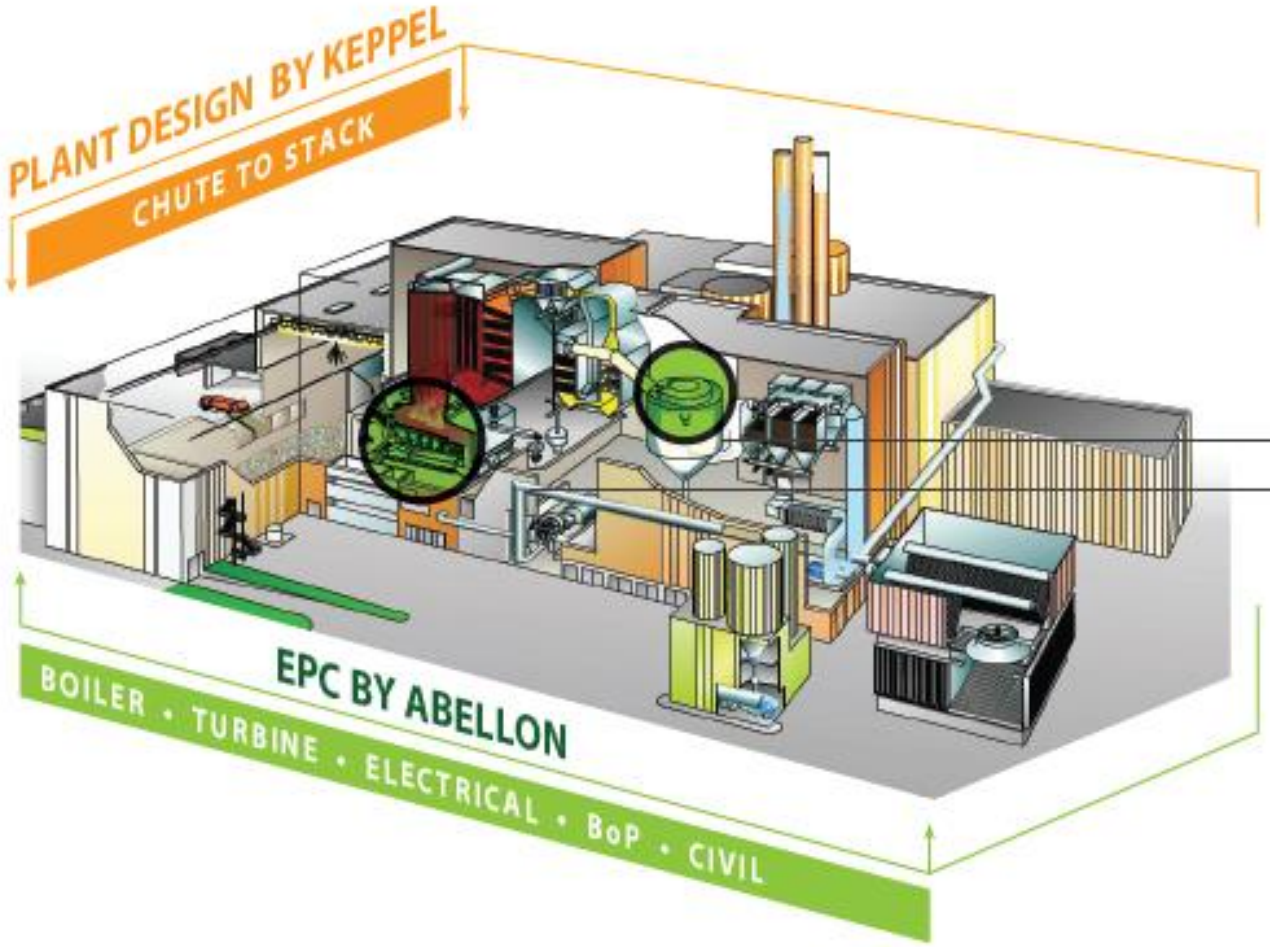
- **Other Benefits:**
  - Promotes sustainable urban development – addressing the dual challenge of waste disposal and energy generation in urban area

INCINERATION TECHNOLOGY PROVEN GLOBALLY

ABELLON TECHNOLOGY PARTNER: KEPPEL SEGHERS

- Part of Keppel Corporation – multi-billion dollar group in Singapore.
- 100+ waste-to-energy projects in 25+ countries
- 500 TPD – 3000 TPD capacity range
- 33,000+ TPD waste-to-energy projects globally

GLOBAL TECHNOLOGY, ADAPTED TO INDIA



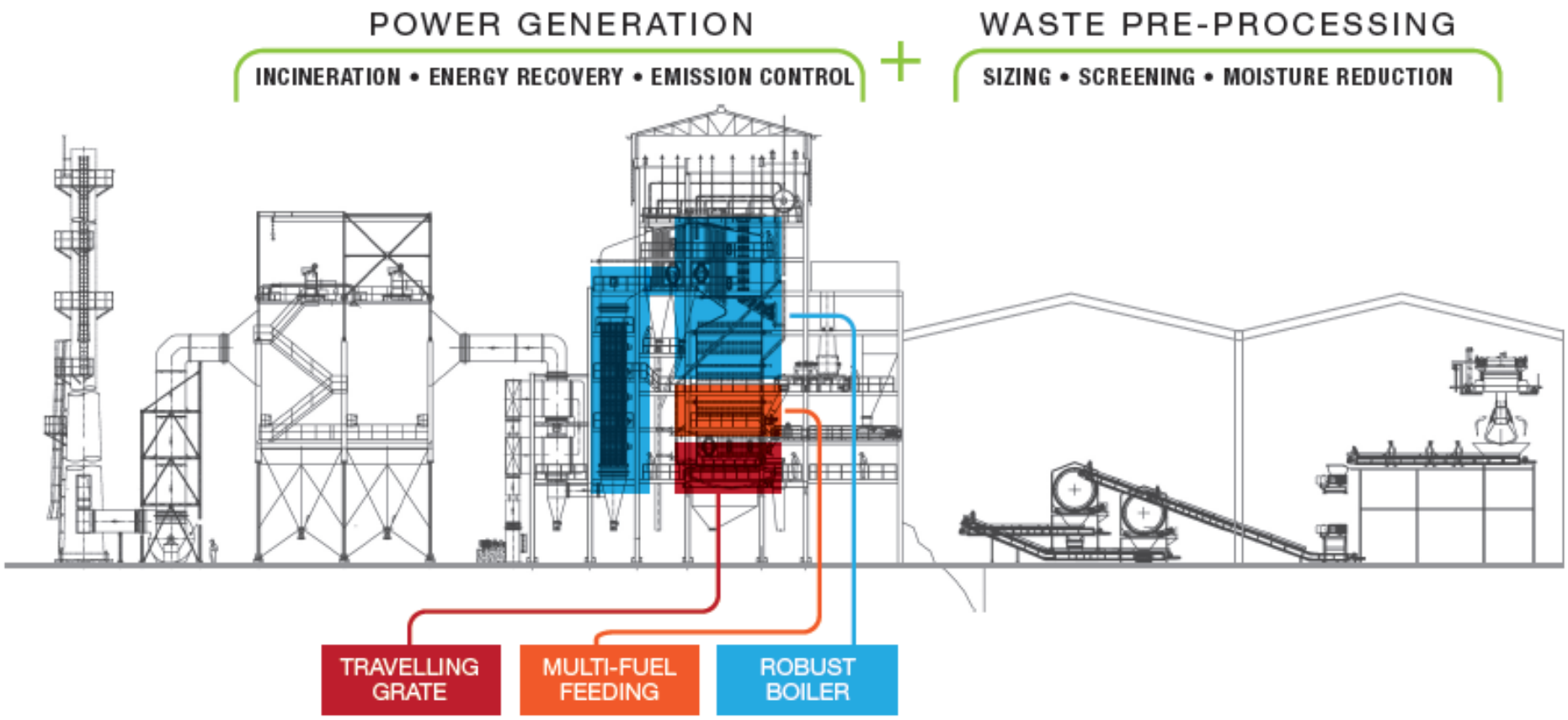
Design & Procurement Consideration

- As-is mixed waste
- High moisture
- Low energy value
- Emission control

SUPPLIED BY KEPPEL

- Furnace Grate
- Combustion Control/Logic
- Emission Control
- CEMS

WTE Technology



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Environmental Norms

Sr. No.	Parameters	INDIA		EUROPE		U.S.A.	Top 10 WtE plants performance
		MSW Rules 2000	MSW Rules 2016	EU 2000/76/EC*	DIRECTIVE 2010/75/EU	40 CFR Part 60 [EPA-HQ-OAR-2005-0117; FRL-8164-9]	
		(mg/m3)	(mg/m3)	(mg/m3)	(mg/m3)	(mg/m3)	(mg/m3)
1	Total Dust/ PM	150	50	30	30	20	3.06
2	HCL	50	50	10	10	25 ppm	7.88
3	SO_2	*ND*	200	50	50	30 ppm	12.2
4	CO	*ND*	100	50	50	100 ppm	26.3
5	TOC	*ND*	20	10	10	*ND*	0.92
6	HF	*ND*	4	2	1	*ND*	*ND*
7	NO_x	450	400	200	200	180 ppm	123
8	Cd + Th+ their compounds	*ND*	0.05	0.05	0.05	0.01	*ND*
9	Hg and its compounds	*ND*	0.05	0.05	0.05	0.05	0.01
10	Sb+As+Pb+Co+Cr+Cu+Mn +Ni+V+ their compounds	*ND*	0.5	0.5	0.5	0.14	*ND*
11	Total Dioxins & Furans ($ngTEQ/Nm^3$)	*ND*	0.1	0.1	0.1	0.1	0.02

N.D.:- Not defined

TRANSMISSION CORPORATION OF ANDHRA PRADESH LIMITED

ISO 9001:2008 CERTIFIED COMPANY

Implementation of

DEVIATION SETTLEMENT MECHANISM

for Wind and Solar generation

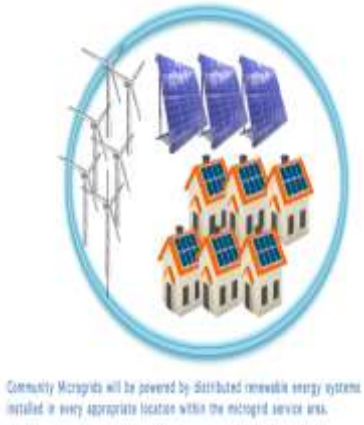
as per Regulation. 4 of 2017 of Hon'ble APERC

BY

APSLDC, APTRANSCO

VIJAYAWADA

17th Jul 2018



Registered No. HSE-49/2016

RIGHT TO INFORMATION

ఆంధ్ర ప్రదేశ్ రాజ పత్రము

THE ANDHRA PRADESH GAZETTE

PUBLISHED BY AUTHORITY

PART I EXTRAORDINARY

No.519 AMARAVATI, MONDAY , AUGUST 21, 2017 G.477

NOTIFICATIONS BY GOVERNMENT

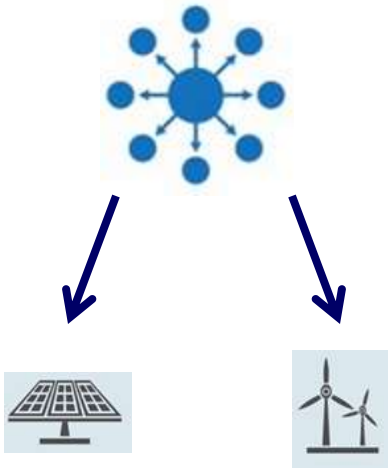
--x--

ANDHRA PRADESH ELECTRICITY REGULATORY COMMISSION

"APERC FORECASTING, SCHEDULING AND DEVIATION SETTLEMENT OF SOLAR AND WIND GENERATION REGULATION, 2017" (REGULATION No. 4 OF 2017).

NOTIFICATION

Lr.No. APERC/Secy/F.No.S-19/2017, Dated: 19-08-2017



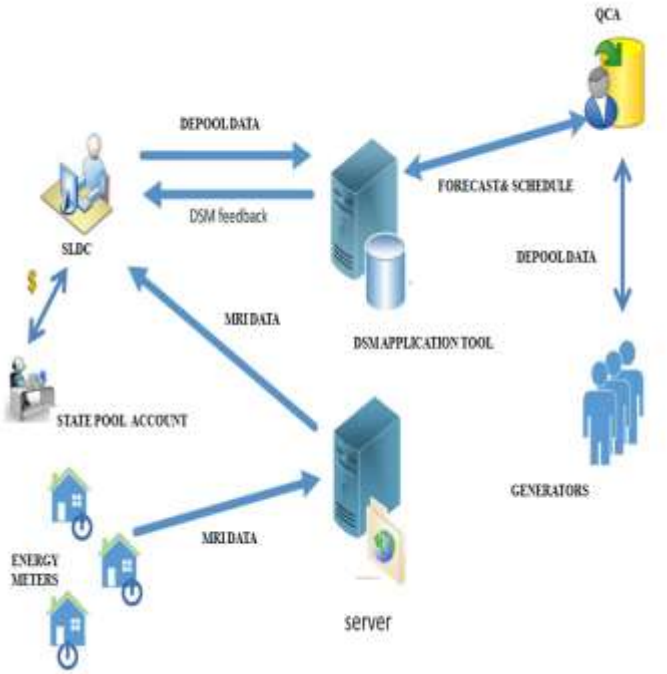
REGULATION:

- Hon'ble APERC notified the Regulation No.4 of 2017 on DSM implementation for Wind & Solar energy.

TIMELINES

- Hon'ble APERC Regulation: 4 of 2017 is in force from 21st Aug 2017
- Forecasting, Scheduling and Deviation settlement in accordance with this Regulation shall commence from the 1st of January, 2018
- Levy and collection of deviation charges commence from the 1st of July, 2018.

PROCEDURE FOR IMPLEMENTATION OF DSM

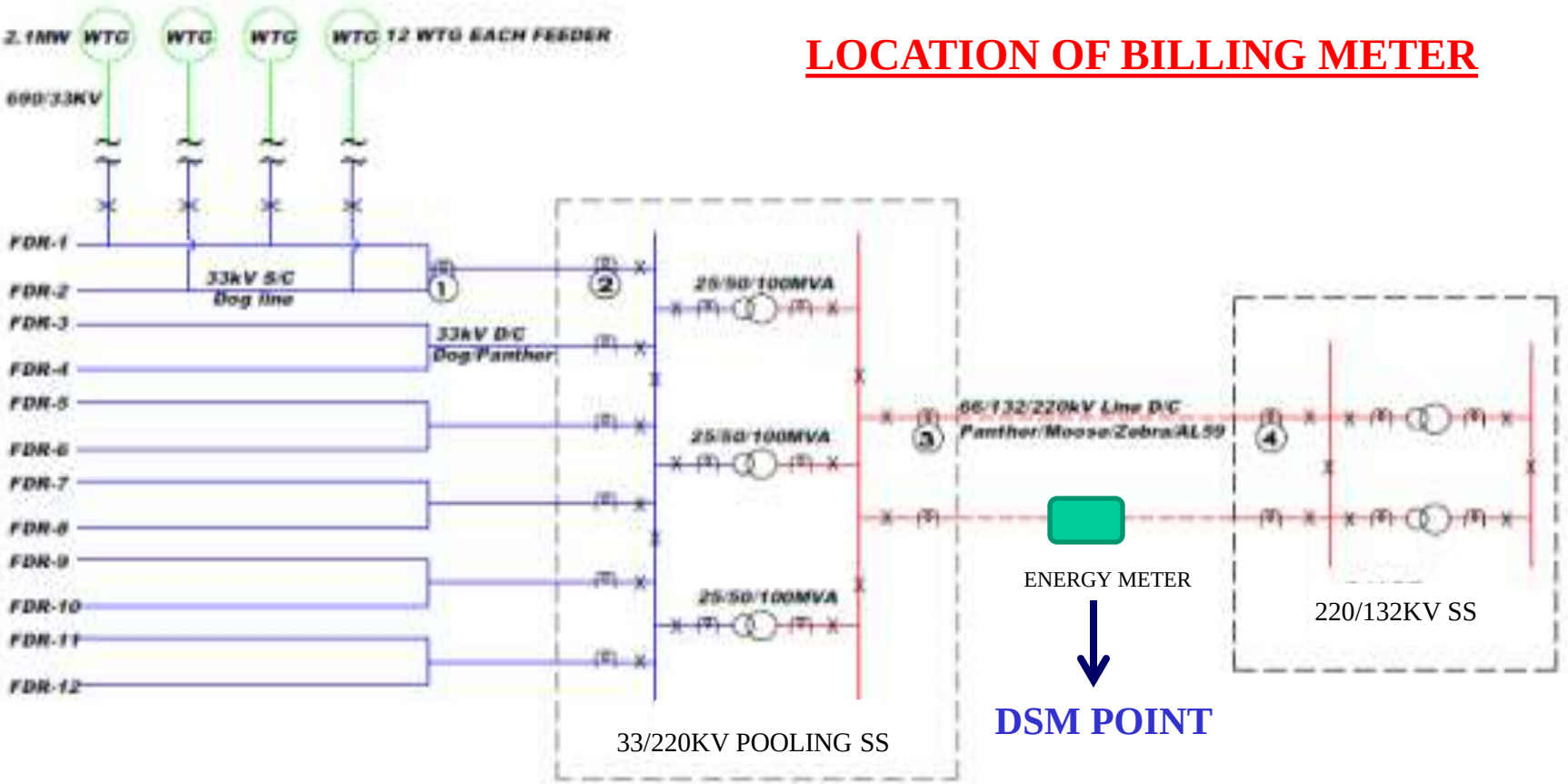


- *FORMATION OF QCA BY GENERATORS*
- *REGISTRATION OF QCA AT APSLDC*
- *FORECASTING & SCHEDULING REVISIONS AND REAL TIME SCADA DATA SEND TO SLDC BY QCA*
- *CALCULATION OF ENERGY DEVIATIONS AND DEVIATION CHARGES DONE AT SLDC*
- *DE POOLING OF DEVIATION CHARGES TO INDIVIDUAL GENERATORS AND COLLECTION OF DEVIATION CHARGES FROM THE GENERATORS BY QCA*
- *TRANSFER OF DEVIATION CHARGES TO STATE POOL ACCOUNT*

FORMATION OF QCA BY GENERATORS

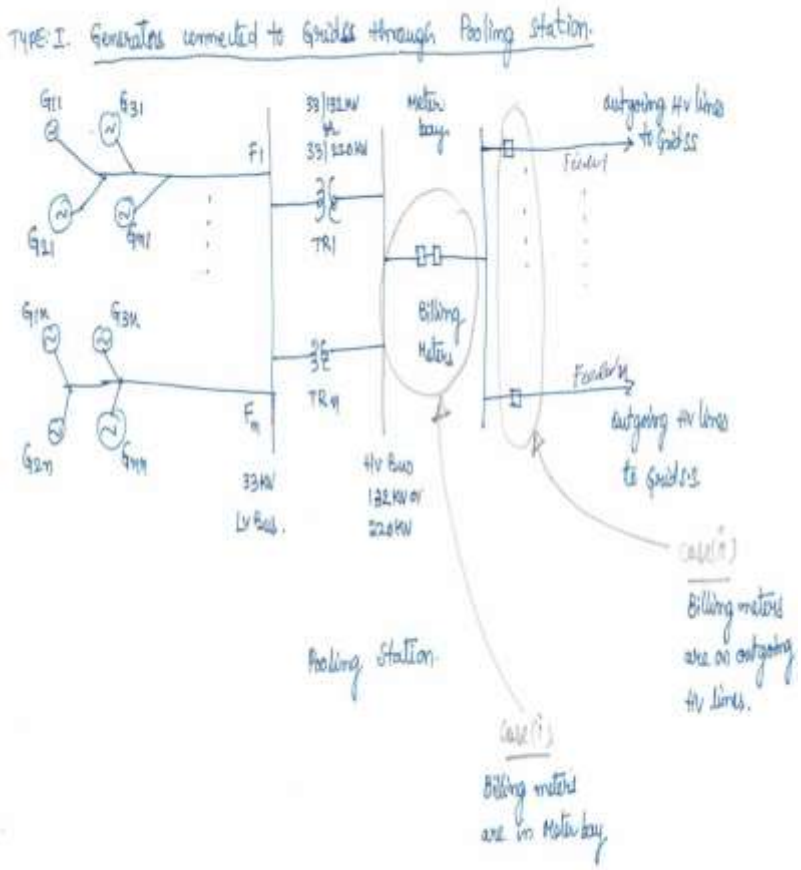
- **All the Generators to a common interface Billing meter shall appoint a QCA with consensus or one of the Generators may act as a Lead Generator with the consensus and act as a QCA**
- **The Generators shall issue a consent letter to the selected QCA.**
- **F&S shall be provided on the "Interface Billing Meters" of all wind and solar generators. Deviation calculated based on the actual generation downloaded from the Interface Billing Meter.**
- **Only one QCA will be allowed for one pooling station and QCA may have many pooling stations**
- **Deviations will be calculated per one pooling station**
- **One schedule will be allowed on one billing meter.**
- **The QCA may aggregate number of such schedules under virtual pool.**
- **Aggregation of Wind and Solar Generation is not allowed**

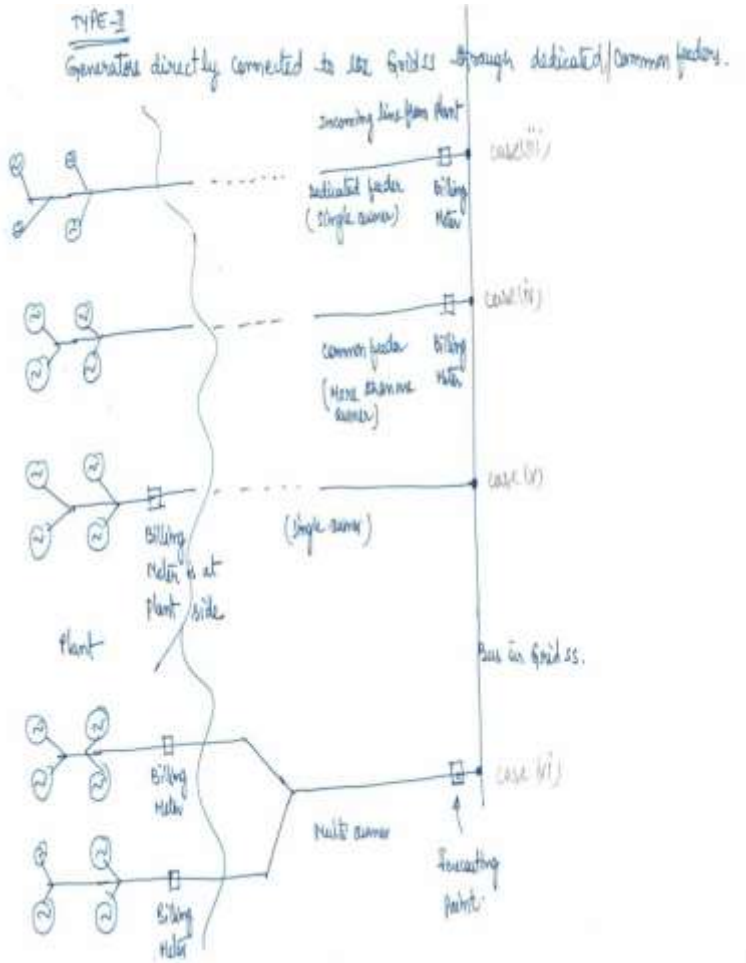
LOCATION OF BILLING METER



Location of Billing Meters

Generators directly connected to the Grid SS through dedicated or Common feeer





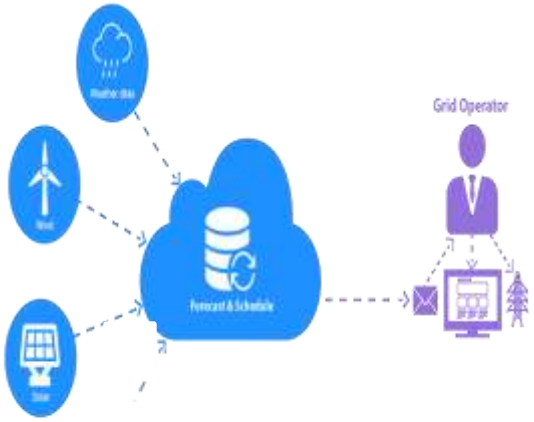
REGISTRATION OF "QCA" AT SLDC:

(QCA) Qualified Coordinating Agency

- The selected QCA shall apply for registration with SLDC.
- QCA shall upload the consent letter issued by the concerned Generators in the Web software for registration.
- Onetime Registration fee of Rs.5000/- shall be paid by QCA.
- QCA shall Pay the security deposit of Rs.45000/- per MW for wind and Rs.22500/- per MW for solar in the form of BG with a validity of 15 months .

Forecasting & Scheduling revisions and Real time SCADA Data to SLDC

(Responsible entity :QCA)



- **Login IDs provided to QCAs**
- **The QCA has an option to upload the Forecasting data in "JSON" format.**
- **QCA has to up load Generation forecast/Schedules and AVC on Week ahead, Day ahead as well as Intra-day basis to SLDC web portal.**

Calculation of Energy Deviations and Deviation Charges at SLDC:

- ***Implemented Schedules:***

  Implemented Schedules are auto generated in DSM software

- ***Collection of Energy Meter Dumps (Actual Energy generation)***

  Discom /STU will upload the MRI dumps to DSM web tool.

  SLDC will collect the MRI dumps from the Discom /STU

- ***Calculation of Energy Deviations & Deviation charges***

  Calculation of the Energy Deviations and corresponding deviation charges in block wise on monthly basis is being done through DSM software

- ***Publishing the deviation account in the SLDC Web site***

  The SLDC will publish the Deviation data i.e., Energy deviations and corresponding deviation charges in the SLDC DSM web software and shall be open to the respective entities for checking/verification for a period of 7 days. In case any mistake is detected by QCA, on report by QCA the SLDC shall forthwith make a complete check and rectify the mistakes and publish the final deviation Account.

De pooling of Deviation charges to individual Generators by QCA and collection of deviation charges from the generators.

- **The SLDC will up-load the Generator MRI data (Actual generation in 15 Min block wise) in DSM web tool**
- **QCA can access the concerned Actual Generation data.**
- **The de pooling of deviation charges among the generators shall be carried out by the QCA**

Transfer of deviation charges to State pool Account

State Pool Account:

- **A separate account is opened, and all payments on account of Deviation Charges shall be credited to this "APSLDC State Pool Account" through ECS.**
- **QCA shall Undertake commercial settlement of forecasting deviations including payment of deviation charges to the State Pool Account on behalf of the concerned generators.**
- **QCA shall Undertake de-pooling of payments received on behalf of the concerned generators from the State Pool Account and settling them with the individual generators.**

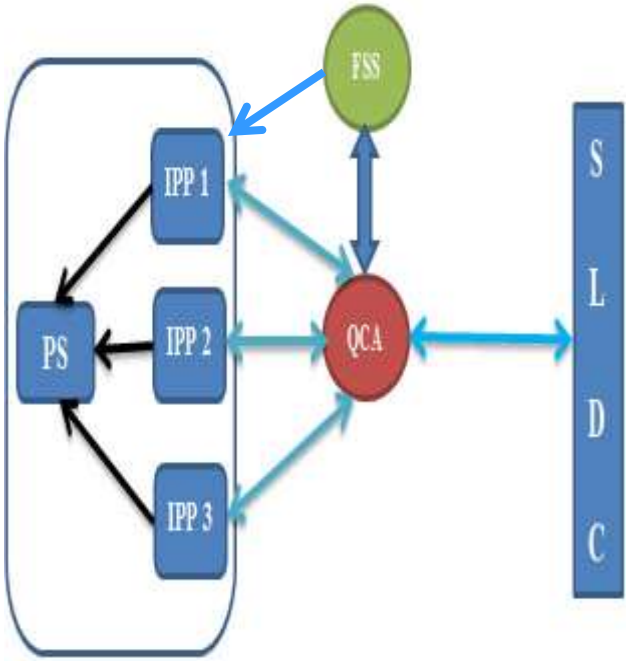
Upload of De pooling Statement by QCA.

- **The QCA shall upload the de-pooling statement and payments made to the State pool Account to the APSLDC web portal.**

STATUS OF RENEWABLE ENERGY POWER PROJECTS COMMISSIONED IN THE STATE OF ANDHRA PRADESH AS ON 30.06.2018.

PARTICULARS	Number	Capacity in MW
Wind Generators	311	3995
Solar Generators	106	2209
Total	417	6204

QCAs tied up capacities (up to 30.06.2018)



Sl.No	Type	Total Installed Capacity in MW	QCA	No.of DSM Points	Capacity in MW		Balance Capacity to be tied up in MW
1	Wind	3847.2/3995	Statkraft	38	3245	96.3%	147.8 (3.7%)
2			R E Connect	12	602.2		
3	Solar	2094.3/2209	Statkraft	13	766.4	94.9%	112.5 (5.09%)
4			R E Connect	8	35.6		
5			Manikaran Analytics Ltd	40	770.3		
6			TATA Power	9	240		
7			AVI Solar	1	2		
8			Del2Infinity	3	30		
9			NTPC	1	250		

WEB BASED DSM APPLICATION TOOL

SLDC prepared the procedure for implementation of DSM regulation and provided in DSM TOOL, uploaded on web site www.aptransco.gov.in

SLDC is developed(in-house) web based DSM APPLICATION TOOL (software) for

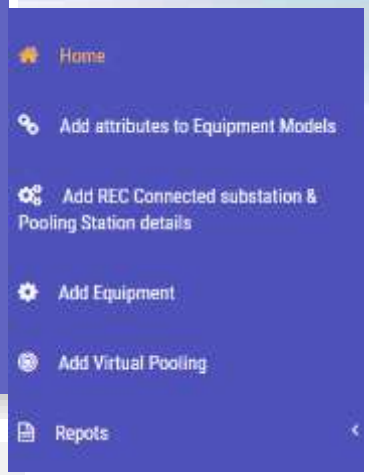
- Registration of Generator and QCA
- Technical Information (static data) from Generator
- Receiving day ahead, week ahead & Intra-Day forecast/schedule,
- AVC and revisions from QCA
- Auto generation of implemented Schedules
- Uploading the Energy meter Dumps by DISCOMS/STU
- Calculation of energy deviations and deviation charges
- Publishing the Deviation Energy account
- Online financial transactions with Pool Account by QCA
- Upload of de-pooling statements by QCA.

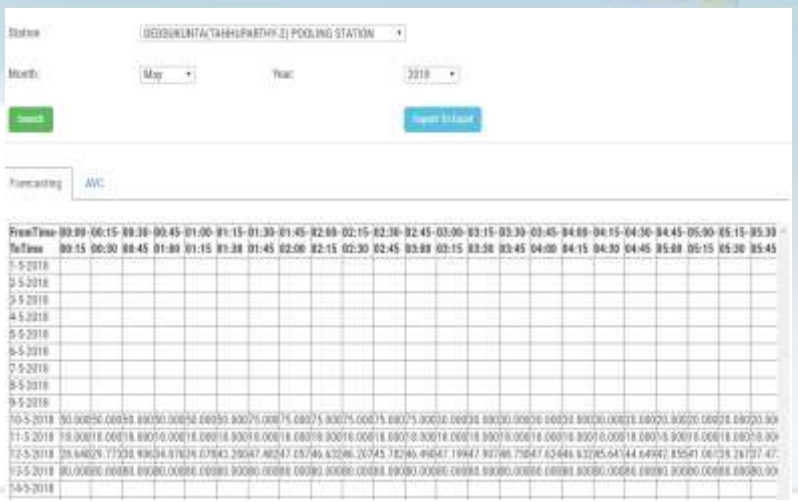
Modules are under development

DSM APPLICATION TOOL

APTRANSCO

Deviation Settlement Mechanism





SignIn Page

Welcome to AP Transco, RE Deviation Settlement Mechanism !

Not a Member? New Generator User » New QCA User »

User Id

Password

Sign In

Remember me

forgot password?

- Documents -

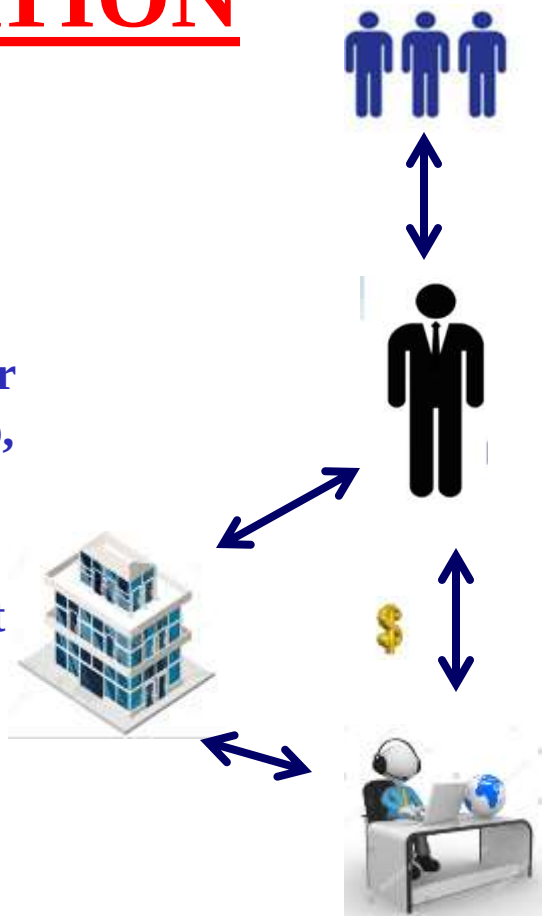
Regulation | DSM Procedure | BG Format

Registered Generator | Application level | QCA Register Approval | QCA Approved level

SlNo	QCA	Name Of Generator	Type of Generation	Location	Phone No	Mobile No	E-Mail
1	20180221766	KR Test QCA	Forecasting	vijayawada-4	9491049370	9491049370	remcapsldc@gmail.com
2	20180301748	Statkraft Markets Pvt Ltd	Forecasting and Scheduling, Power Trading	403, 4th Floor, Salcon Rasvilas Building, Saket District Centre, New Delhi 110017, India.	+ 911166161200	9999310557	anwar.alam@statkraft.com
3	20180410162	Tata Power Trading Company Limited	Power Trading, Advisory Services, REC Mechanism, O	2nd Floor, Shatabdi Bhawan, B-12 & 13, Sector-4, Noida 201301, U.P.	+91 120 6102000	9644410332	qcaap@tatapower.com
4	20180410594	Avi Solar Energy Pvt Ltd	Solar EPC, O&M(Ground Mount & Roof Top), SCADA Pro	#146/4, Shanthala Plaza, 2nd Floor, 8th Main, 14th Cross, Malleshwaram, Bangalore-560003	+91 8023568018	+91 9980286408	eschedule@avisolar.com
5	20180410880	Manikaran	Qualified	2nd Floor, D 21, Corporate	011-65651994	9163536666	headops@manikarananalytic

DSM IMPLEMENTATION

- APSLDC provided User IDs to all the concerned Generators, QCAs and Discoms /STU to access the DSM software.
- 9 no.s QCAs are registered, 3848 MW out of 3955MW for wind and 2094 MW out of 2209 MW for solar are tied up, i.e. 5942MW out of 6204MW are tied up.
- APSLDC is receiving the Forecast/Schedule, AVC and revisions through on line web based software. At present F&S, AVC are receiving through e-Mail also.
- DSM calculations from Jan-18 to May-18 months are being done, using excel macros as a mock exercise.
- A separate account is opened, and all payments on account of Deviation Charges shall be credited to this "APSLDC State Pool Account".



DSM CALCULATION

New Regulation

Error (%) = 100 X (Scheduled Generation – Actual Generation)

Available Capacity*

Deviation within +/- 15%	No penalty	Full payment
Deviation from 15% to 25%	Penalty of Rs 0.50 on	Per Unit Deviation
Deviation from 25% to 35%	Penalty of Re 1.00 on	Per Unit Deviation
Deviation greater than 35%	Penalty of Rs 1.50 on	Per Unit Deviation

IMPLEMENTATION OF FORECASTING AND SCHEDULING IN THE STATE OF ANDHRA PRADESH - ABSTRACT

MONTH	FORECAST RECEIVED MW	% OF FORECAST RECEIVED	% OF "DEVIATION LESS THAN ± 15%"	APPROX PENALTY THAT CAN BE LEVIED (Rs. In Lacs)
Jan-18	854	14.23	92	17.70
Feb-18	1561	26.02	85	69.83
Mar-18	4800	77.73	97	26.00
Apr-18	5500	89.07	95	21.00
May-18	2315	37.34	86	105.44

DSM CALCULATIONS (Energy) – MAY 2018

Installed Capacity MW	Date		DEVIATION ENERGY in kWh										
			OVER INJECTION					UNDER INJECTION					Total
	From	To	less than 15%	between 15% to 25%	between 25% to 35%	more than 35%	Total	less than 15%	between 15% to 25%	between 25% to 35%	more than 35%	Total	
2	3	4	5	6	7	8	9(5+6+7+8)	10	11	12	13	14(10+11+12+13)	15(9+Abs(14))
100.0	1-May-18	31-May-18	**22,92,657**	**7,35,514**	**4,53,623**	**4,78,369**	**39,60,163**	**-43,63,029**	**-8,26,629**	**-4,90,751**	**-3,98,626**	**-60,79,035**	**1,00,39,198**
120.0	1-May-18	31-May-18	2728475	903578	573775	545043	4750870	-5684043	-713173	-189868	-59935	-6647018	1,13,97,888
105.0	1-May-18	31-May-18	43255	2944134	938134	609949	639938	5132154	-3062430	-422481	-135294	-43677	-36,63,882
197.4	1-May-18	31-May-18	7302335	2347235	1546925	1070408	12266903	-4030083	-255140	-12485	0	-4297708	1,65,64,610
226.8	1-May-18	31-May-18	9656834	3253610	2001061	2032429	16943935	-2320067	-70614	-4160	0	-2394842	1,93,38,777
298.0	1-May-18	31-May-18	7876037	2663587	1636751	1673693	13850068	-9165271	-413158	-114800	-27705	-9720934	2,35,71,001
67.0	1-May-18	31-May-18	2105519	862200	642491	1374019	4984230	-3074589	-553897	-194225	-49041	-3871752	88,55,982
112.5	1-May-18	31-May-18	4355589	1529803	880990	611476	7377858	-2118928	-81975	-2343	0	-2203245	95,81,103
10.0	1-May-18	31-May-18	173612	59138	35542	48742	317034	-583011	-41996	-5416	-1803	-632226	9,49,260
159.2	1-May-18	31-May-18	3694621	1343870	774638	666279	6479407	-6015082	-236664	-40992	-6822	-6299559	1,27,78,966
104.0	1-May-18	31-May-18	2319156	834189	527742	635657	4316744	-5223727	-678421	-157223	-44879	-6104250	1,04,20,994
10.0	1-May-18	31-May-18	235283	92852	64231	98653	491019	-490131	-31115	-3242	-195	-524683	10,15,701
56.0	1-May-18	31-May-18	933568	328640	222739	340661	1825608	-3278330	-429356	-121662	-45198	-3874546	57,00,154
48.0	1-May-18	31-May-18	748673	231628	148973	184953	1314225	-2652715	-393973	-138510	-44395	-3229593	45,43,818
102.5	1-May-18	31-May-18	1623975	590105	386532	534675	3135288	-6559003	-1172335	-460427	-264645	-8456409	1,15,91,698
24.0	1-May-18	31-May-18	675783	199583	114970	208298	1198633	-631843	-104095	-44905	-16965	-797808	19,96,440
25.3	1-May-18	31-May-18	518268	167345	102963	125418	913993	-1126030	-216688	-78419	-29039	-1450175	23,64,168
148.9	1-May-18	31-May-18	4426174	1451193	843819	1012528	7733713	-4734934	-602851	-151424	-47569	-5536778	1,32,70,490
39.9	1-May-18	31-May-18	1165462	389954	230888	233712	2020016	-904242	-107149	-13037	-4113	-1028540	30,48,556
37.4	1-May-18	31-May-18	267854	3421	0	0	271275	-974064	-118028	-38795	-16502	-1147388	14,18,663
119.7	1-May-18	31-May-18	2764836	732192	386934	279039	4163000	-3390058	-260398	-55226	-14971	-3720652	78,83,652
100.8	1-May-18	31-May-18	2287735	603033	285780	213895	3390443	-3035800	-237190	-94228	-53040	-3420258	68,10,700
40.0	1-May-18	31-May-18	1680160	627880	428060	678913	3415013	-710978	-27693	-6368	-1598	-746635	41,61,648
39.1	1-May-18	31-May-18	829134	167144	77978	19218	1093473	-772190	-17538	-3795	0	-793523	18,86,995
24.0	1-May-18	31-May-18	670055	192055	107975	103403	1073488	-777320	-60018	-6235	-455	-844028	19,17,515
2315.5			6,13,75,046	2,32,53,880	1,34,13,514	1,37,79,424	10,79,26,331	-6,74,83,310	-1,07,12,521	-28,51,014	-12,62,787	-8,38,65,258	18,74,44,092
				4,80,44,195					**-1,47,02,625**				6,27,46,820

DSM CALCULATIONS (Penalty) – MAY 2018

Installed Capacity MW	Date		DEVIATION AMOUNT in Rs.										
			OVER INJECTION					UNDER INJECTION					Total
	From	To	less than 15%	between 15% to 25%	between 25% to 35%	more than 35%	Total	less than 15%	between 15% to 25%	between 25% to 35%	more than 35%	Total	
2	3	4	5	6	7	8	9(5+6+7+8)	10	11	12	13	14(10+11+12+13)	15(9+Abs(14))
100.0	1-May-18	31-May-18	**0**	**3,67,757**	**4,53,623**	**7,17,554**	**15,38,934**	**0**	**-4,13,315**	**-4,90,751**	**-5,97,939**	**-15,02,005**	**30,40,939**
120.0	1-May-18	31-May-18	0	451789	573775	817564	1843128	0	-356586	-189868	-89903	-636356	24,79,484
105.0	1-May-18	31-May-18	0	469067	609949	959907	2038922	0	-211240	-135294	-65515	-412049	24,50,972
197.4	1-May-18	31-May-18	0	1173618	1546925	1605611	4326154	0	-127570	-12485	0	-140055	44,66,209
226.8	1-May-18	31-May-18	0	1626805	2001061	3048644	6676511	0	-35307	-4160	0	-39467	67,15,978
298.0	1-May-18	31-May-18	0	1331793	1636751	2510539	5479084	0	-206579	-114800	-41558	-362936	58,42,020
67.0	1-May-18	31-May-18	0	431100	642491	2061029	3134621	0	-276948	-194225	-73561	-544735	36,79,355
112.5	1-May-18	31-May-18	0	764901	880990	917214	2563106	0	-40988	-2343	0	-43330	26,06,436
10.0	1-May-18	31-May-18	0	29569	35542	73113	138224	0	-20998	-5416	-2704	-29118	1,67,342
159.2	1-May-18	31-May-18	0	671935	774638	999418	2445991	0	-118332	-40992	-10232	-169557	26,15,547
104.0	1-May-18	31-May-18	0	417094	527742	953486	1898322	0	-339211	-157223	-67318	-563752	24,62,074
10.0	1-May-18	31-May-18	0	46426	64231	147979	258636	0	-15558	-3242	-292	-19092	2,77,727
56.0	1-May-18	31-May-18	0	164320	222739	510992	898051	0	-214678	-121662	-67797	-404137	13,02,188
48.0	1-May-18	31-May-18	0	115814	148973	277429	542215	0	-196986	-138510	-66593	-402089	9,44,304
102.5	1-May-18	31-May-18	0	295053	386532	802013	1483598	0	-586167	-460427	-396968	-1443562	29,27,160
24.0	1-May-18	31-May-18	0	99791	114970	312446	527208	0	-52048	-44905	-25448	-122400	6,49,608
25.3	1-May-18	31-May-18	0	83673	102963	188126	374761	0	-108344	-78419	-43558	-230321	6,05,082
148.9	1-May-18	31-May-18	0	725596	843819	1518791	3088206	0	-301426	-151424	-71353	-524203	36,12,409
39.9	1-May-18	31-May-18	0	194977	230888	350567	776432	0	-53574	-13037	-6169	-72780	8,49,213
37.4	1-May-18	31-May-18	0	1711	0	0	1711	0	-59014	-38795	-24752	-122561	1,24,272
119.7	1-May-18	31-May-18	0	366096	386934	418558	1171588	0	-130199	-55226	-22456	-207881	13,79,468
100.8	1-May-18	31-May-18	0	301516	285780	320843	908139	0	-118595	-94228	-79560	-292383	12,00,521
40.0	1-May-18	31-May-18	0	313940	428060	1018369	1760369	0	-13846	-6368	-2396	-22610	17,82,979
39.1	1-May-18	31-May-18	0	83572	77978	28826	190376	0	-8769	-3795	0	-12564	2,02,939
24.0	1-May-18	31-May-18	0	96028	107975	155104	359106	0	-30009	-6235	-683	-36926	3,96,033
2315.5			0	1,06,23,940	1,30,85,329	2,07,14,121	4,44,23,389	0	-40,36,286	-25,63,828	-17,56,754	-83,56,867	5,27,80,257

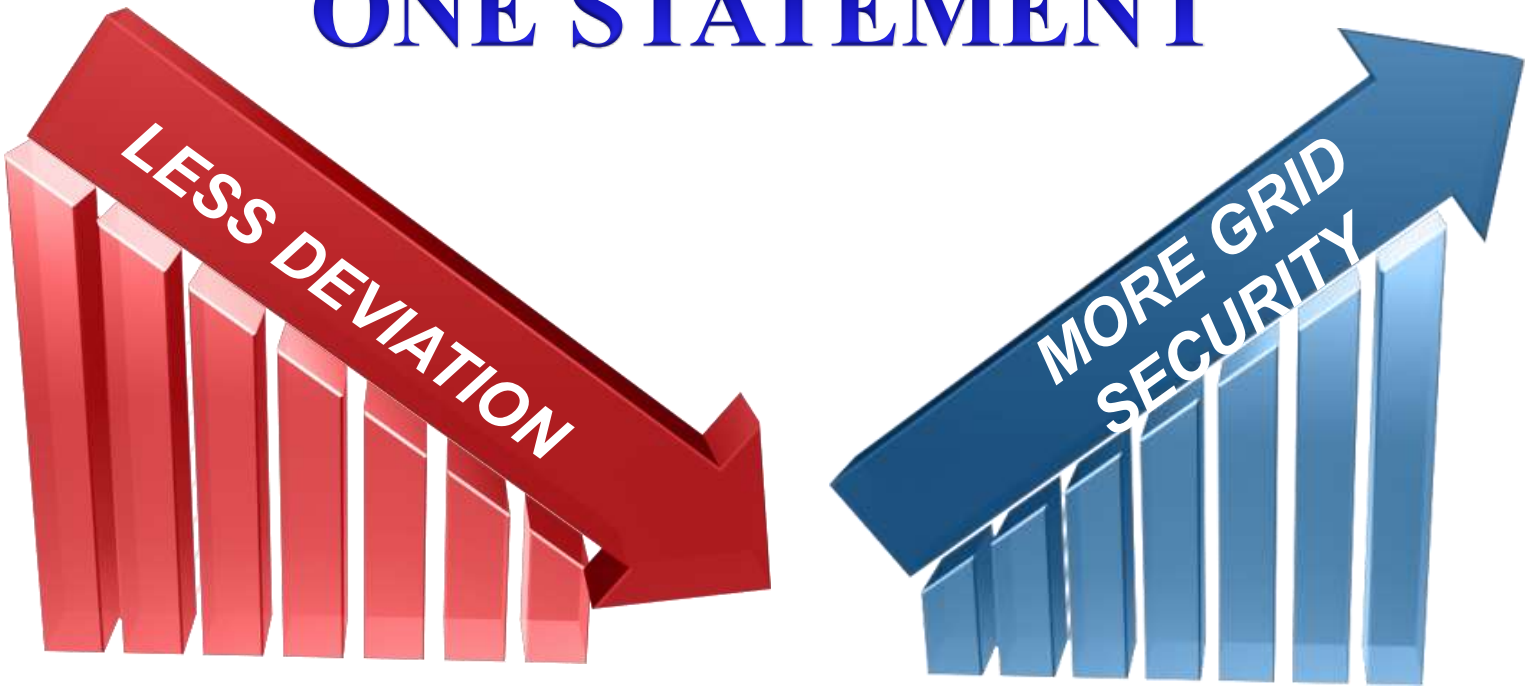
DSM CALCULATIONS (under virtual pool aggregate) – MAY 2018

Inter State Open Access Wind Turbine Generator Week Wise Deviation Charges Settlement

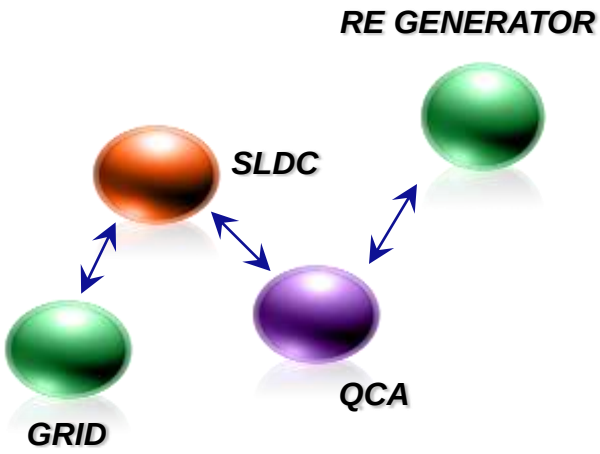
I. Abstract of Energy Deviation														
Name of Generator :		QCA												
Settlement Period :		1-May-18						to	31-May-18					
Date				Deviation Energy when Over Injection (in units)					Deviation Energy when Under Injection (in units)					Net Injected Energy (in uniits)
From	To	Total Gen in MU	Total Sch in MU	less than 15%	between 15% to 25%	between 25% to 35%	more than 35%	Total	less than 15%	between 15% to 25%	between 25% to 35%	more than 35%	Total	Total Under injection and Over injection
1-May-18	31-May-18	279.58933	251.84984	5,91,91,838	1,30,00,304	31,13,531	5,81,418	7,58,87,092	-4,80,31,156	-1,16,441	0	0	-4,81,47,597	12,40,34,689

II. Abstract of Deviation Amount														
Name of Generator :		QCA												
Settlement Period :		1-May-18						to	31-May-18					
Date				Deviation Amount for Over Injection Receivable from Generator(in Rs)					Deviation Amount for Under Injection Receivable from Generator(in Rs)					Net Amount Received by APPCC (in Rs)
From	To			less than 15%	between 15% to 25%	between 25% to 35%	more than 35%	Total	less than 15%	between 15% to 25%	between 25% to 35%	more than 35%	Total	Total receivable by APPCC
1-May-18	31-May-18			0	65,00,152	31,13,531	8,72,127	1,04,85,810	0	-58,221	0	0	-58,221	1,05,44,031

ONE STATEMENT



CONCLUSION



- Discourage deviation from Schedule
- Operate within the freq band
- Ensure grid security

Thank You

RECONNECT ENERGY

The Energy Solutions Company

Vibhav Nuwal
Co-founder & Director

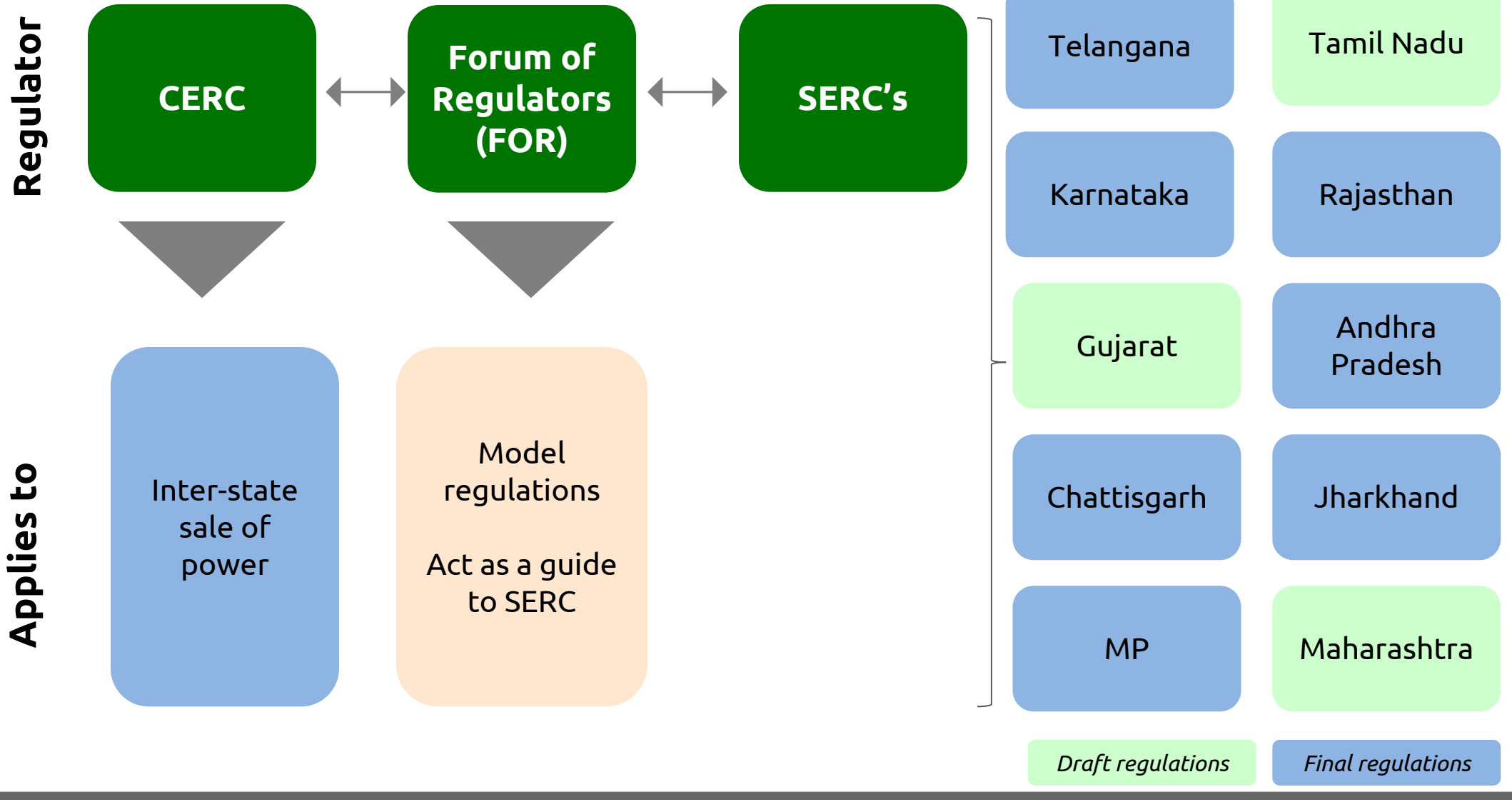
Swagatika Rana
Manager (F&S Services)

July 17, 2018

Agenda:

- **Setting the context:**
  - Status of regulations
  - Our work as QCA
- **Our experience as a QCA:**
  - How do forecasting models work?
  - General scope of a QCA
- **Analysis of forecasting performance:**
  - Case-studies

Status of DSM Regulations



RECONNECT ENERGY

Capacity that we work on

Utility Scale

GETCO

~ 5,500 MW

IWTMA
INDIAN WIND TURBINE MANUFACTURERS ASSOCIATION

~ 4,100 MW (Raj.)

~ 4000 MW + Demand (Trial basis)

पावर सिस्टम ऑपरेशन POSOCO

WRLDC & SRLDC (RE + Demand; on Trial basis)

MW Scale (Wind & Solar)

<u>As QCA:</u>

Karnataka ~ 4600 MW (119 PSS, 350+ Generators)
Rajasthan ~3,600 MW

AP* ~750 MW

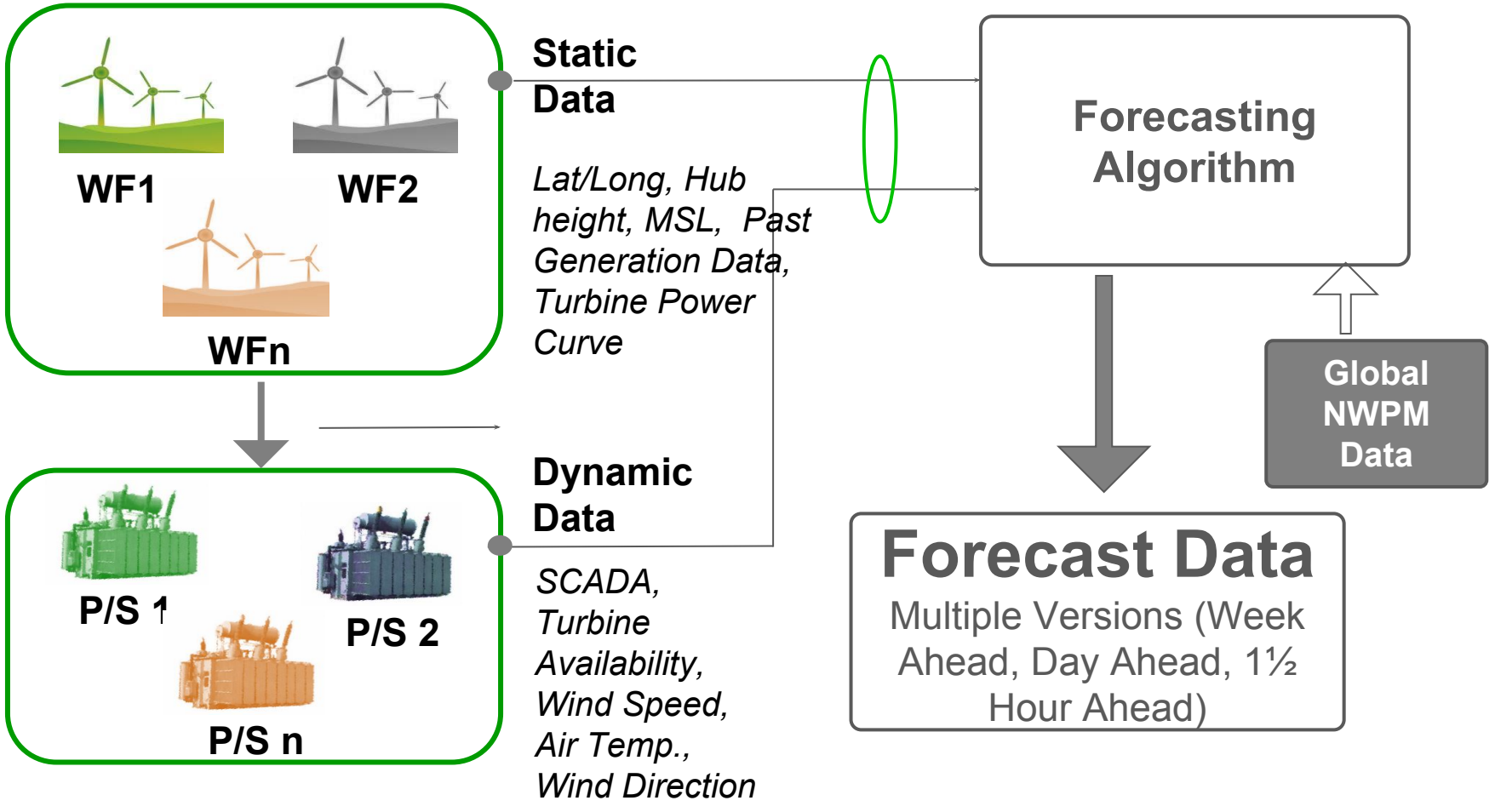
MP* ~1700 MW

<u>In other states:</u>

~ 2,000 MW

** Registration as QCA in progress; estimated capacity*

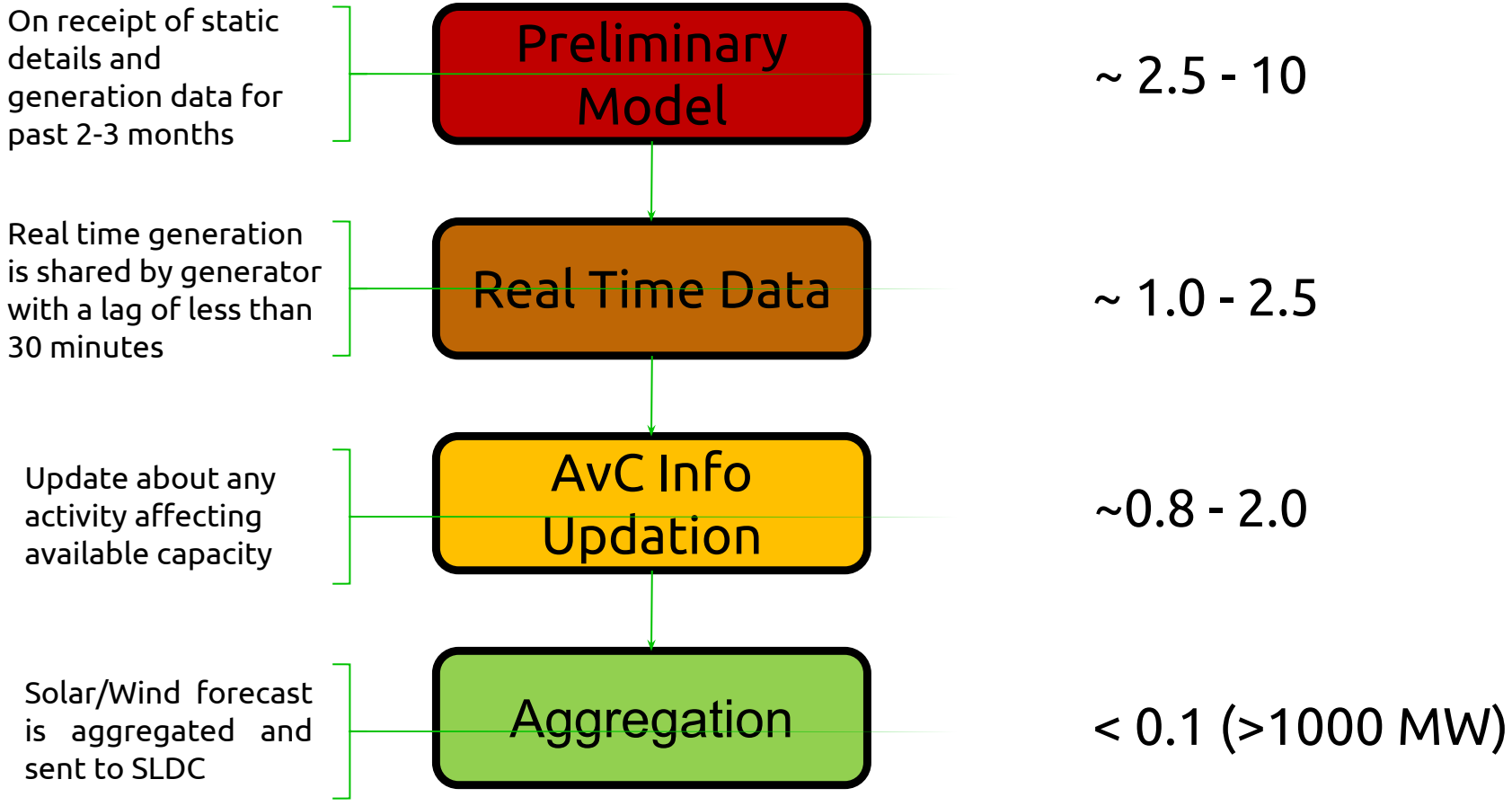
How do forecasting models work?



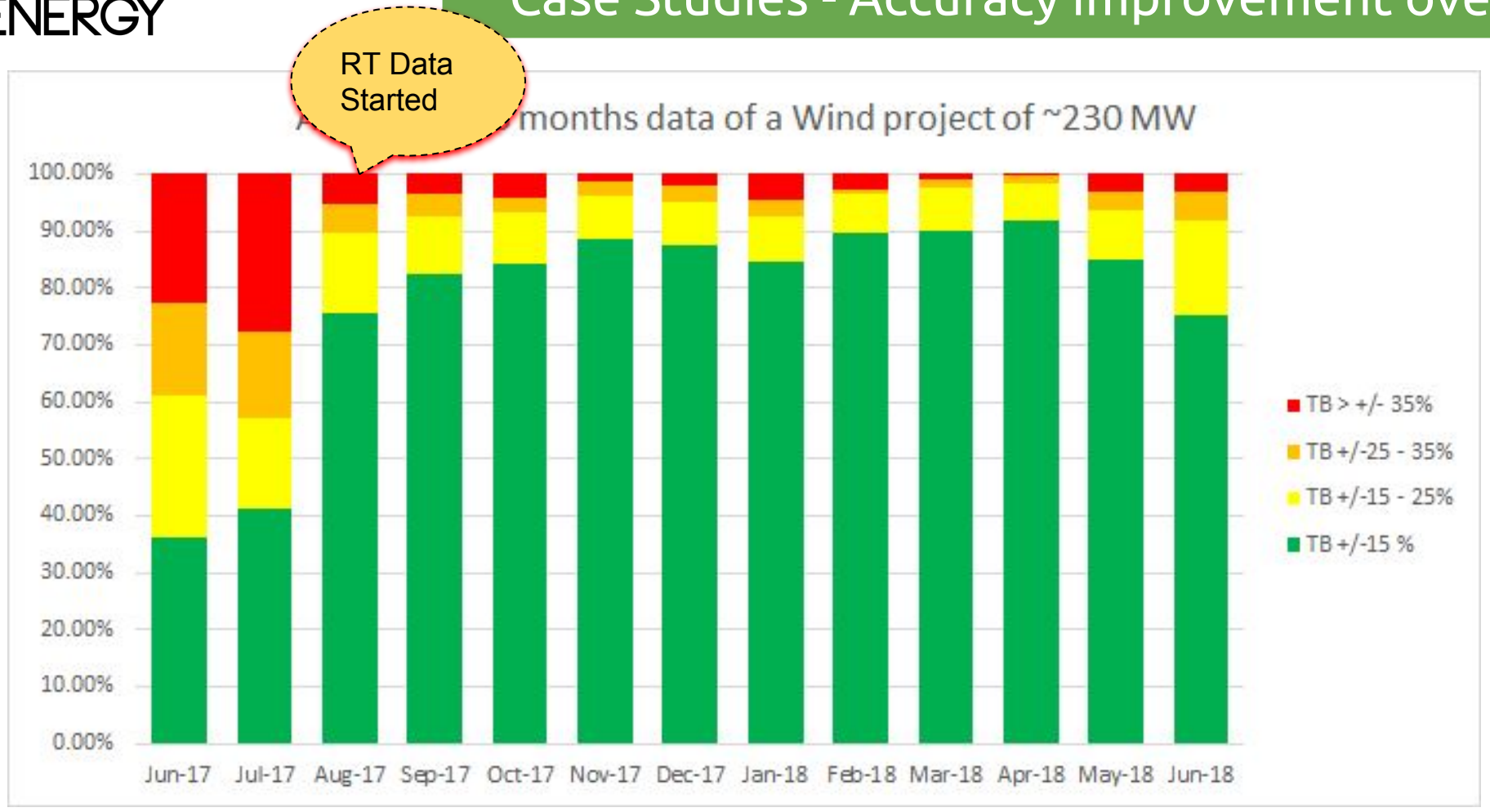
General scope of a QCA

Forecasting	• Historical Weather/SCADA Data integration • Actual Generation/SCADA Data Integration • Calibrated, non-calibrated forecast & intra-day revisions
Scheduling	• Forecast data, generator specific availability data, weather data integration • Coordination with SLDC, RE OEMs, RE Generators
Physical Layer Integration	• **Hardware Layer** – meter/weather data integration • Integration of Input Data Layer (wind farm SCADA, Pooling Station SCADA, Meter Data etc.) • Communication Channel with DISCOMs, SLDC, OEMs and RE Generators
MIS and Information	• MIS, data reporting, data checks & balancing, quality control • Generator, SLDC, OEM, RE Farm specific modules
De-pooling & Settlement	• Intra-State RE DSM Settlement with SLDC and • Individual S/S or Generating Units

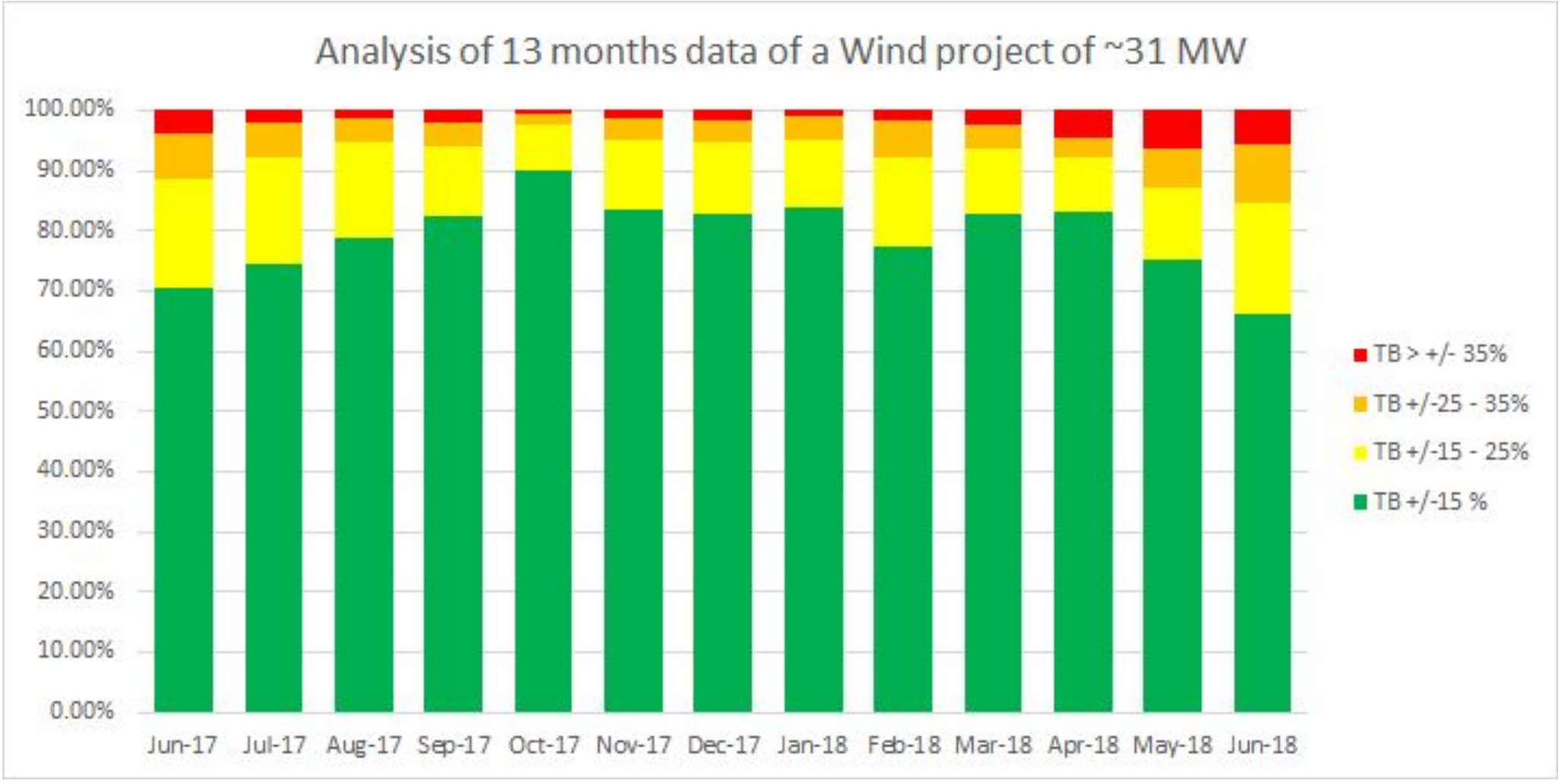
DSM Impact


Expected DSM: Paisa/Unit
On receipt of static details and generation data for past 2-3 months
Preliminary Model
~ 2.5 - 10
Real time generation is shared by generator with a lag of less than 30 minutes
Real Time Data
~ 1.0 - 2.5
Update about any activity affecting available capacity
AvC Info Updation
~0.8 - 2.0
Solar/Wind forecast is aggregated and sent to SLDC
Aggregation
< 0.1 (>1000 MW)

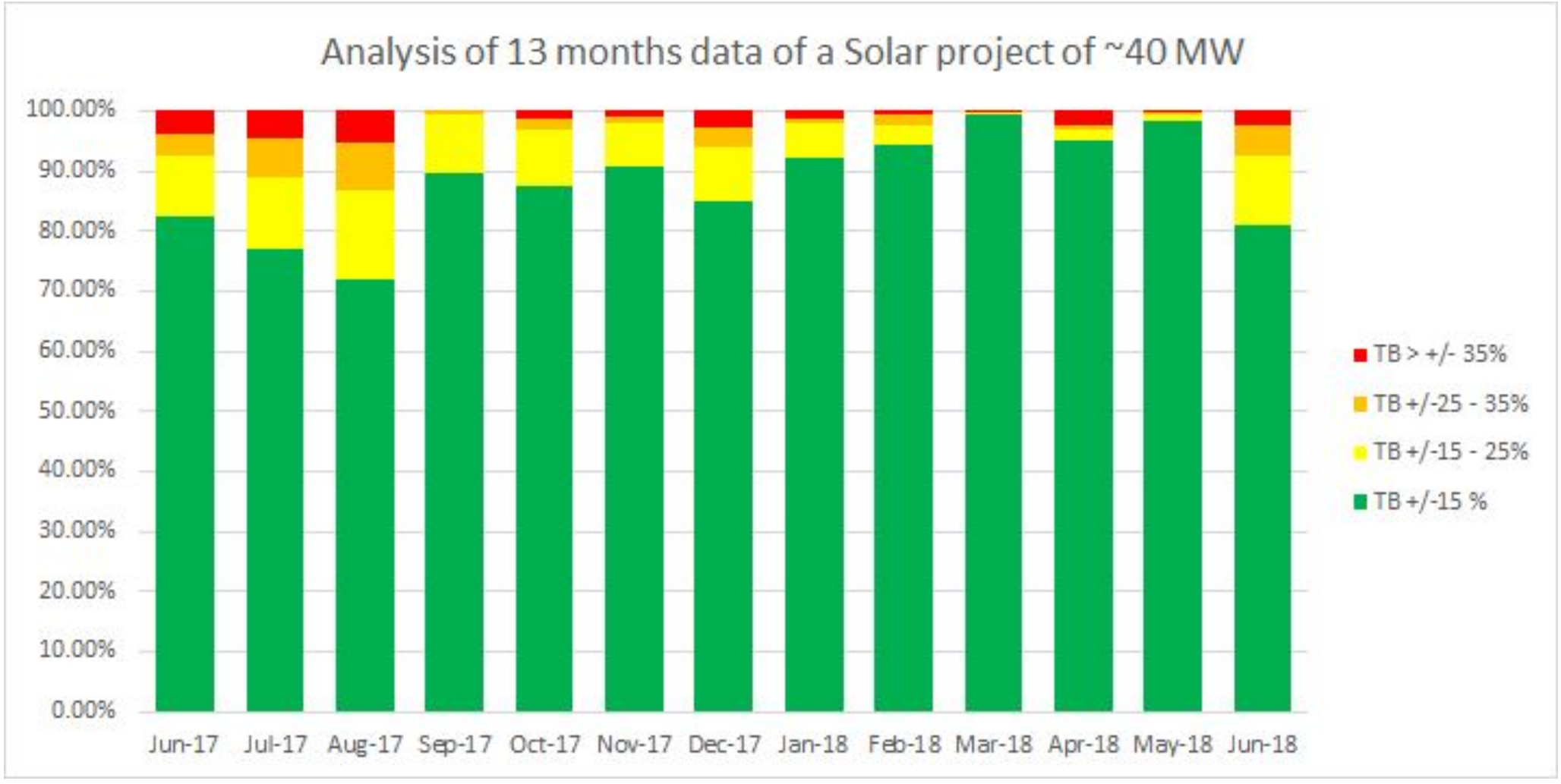
Case Studies - Accuracy improvement over time



Case Studies - Accuracy improvement over time

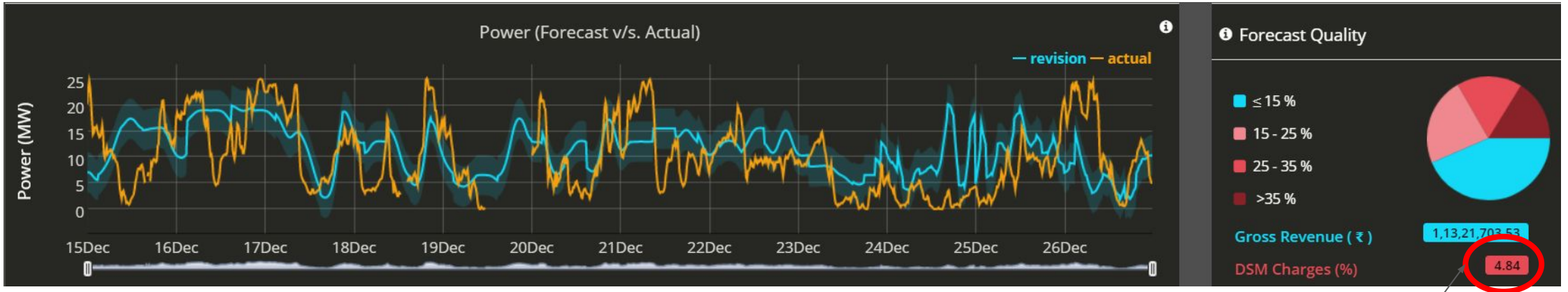


Case Studies - Accuracy improvement over time

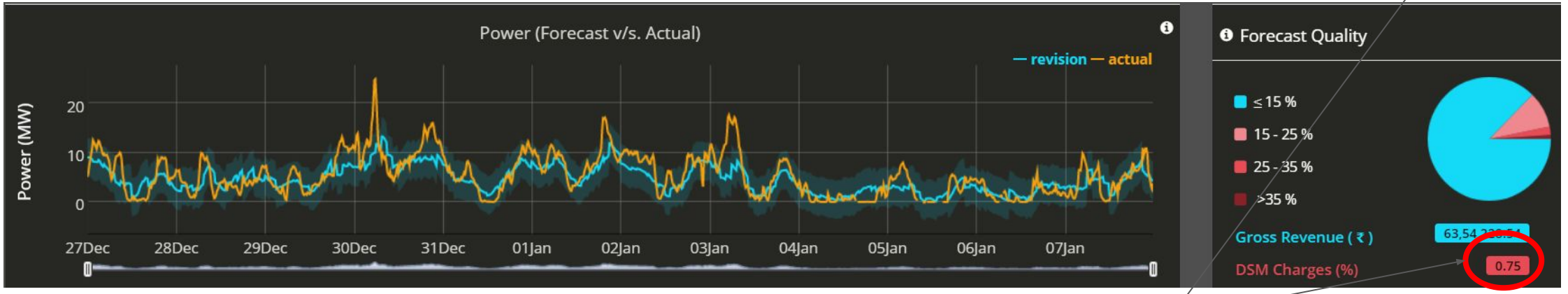


Case Studies - Impact of real-time data on accuracy - Wind

Two weeks F&S performance without real-time data



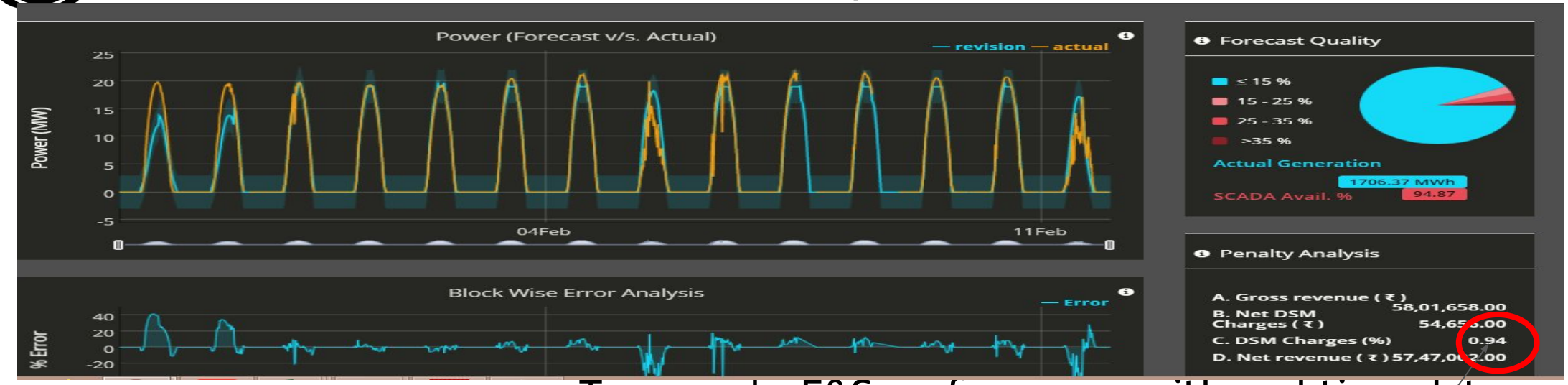
Two weeks F&S performance with real-time data



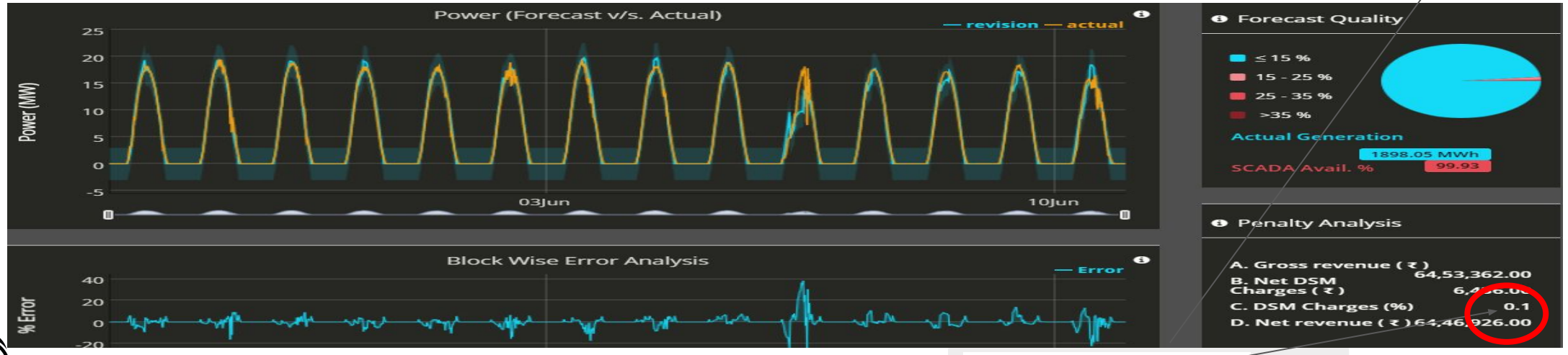
Significant improvement

Case Studies - Impact of real-time data on accuracy - Solar

Two weeks F&S performance without real-time data

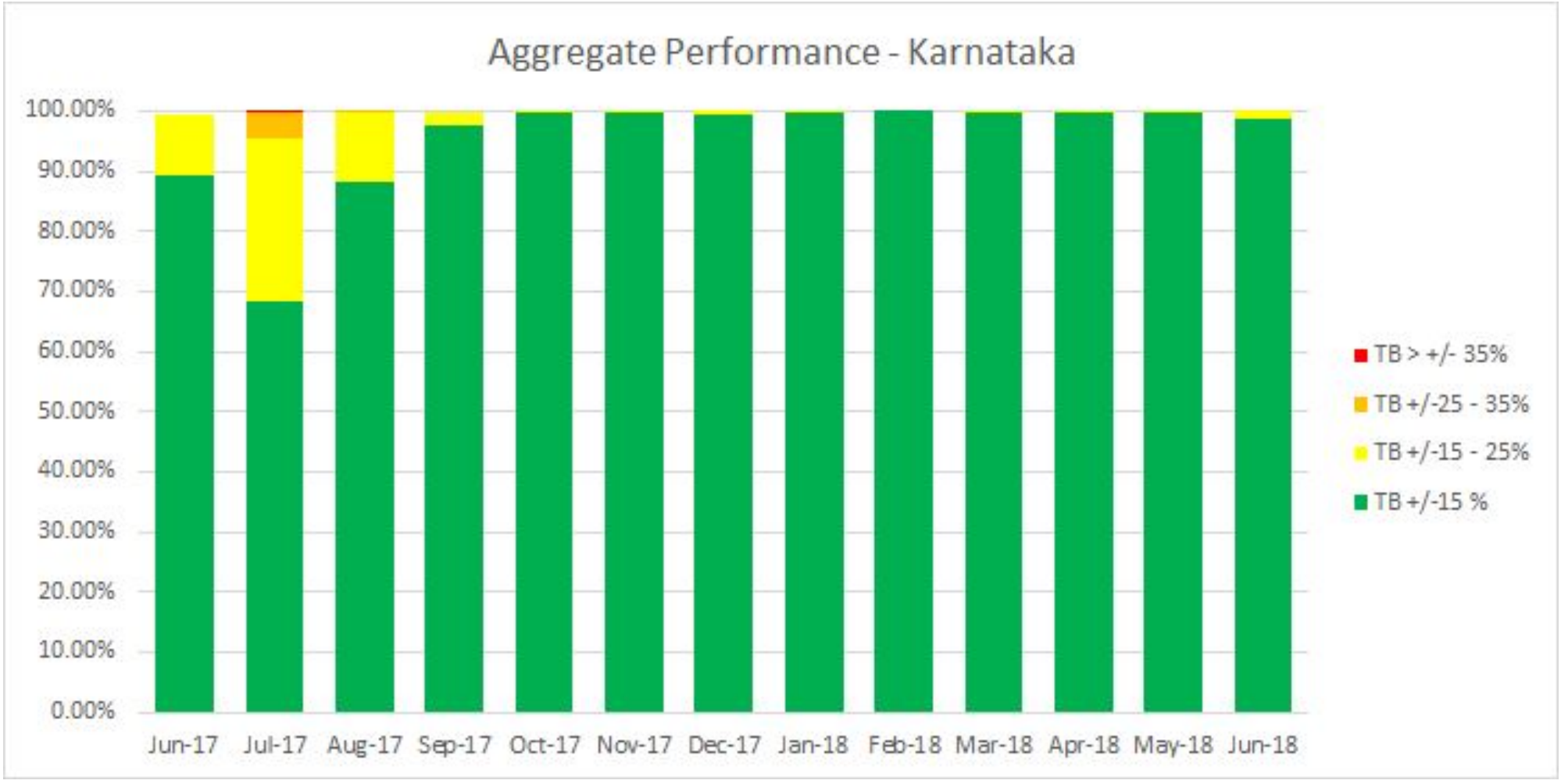


Two weeks F&S performance with real-time data

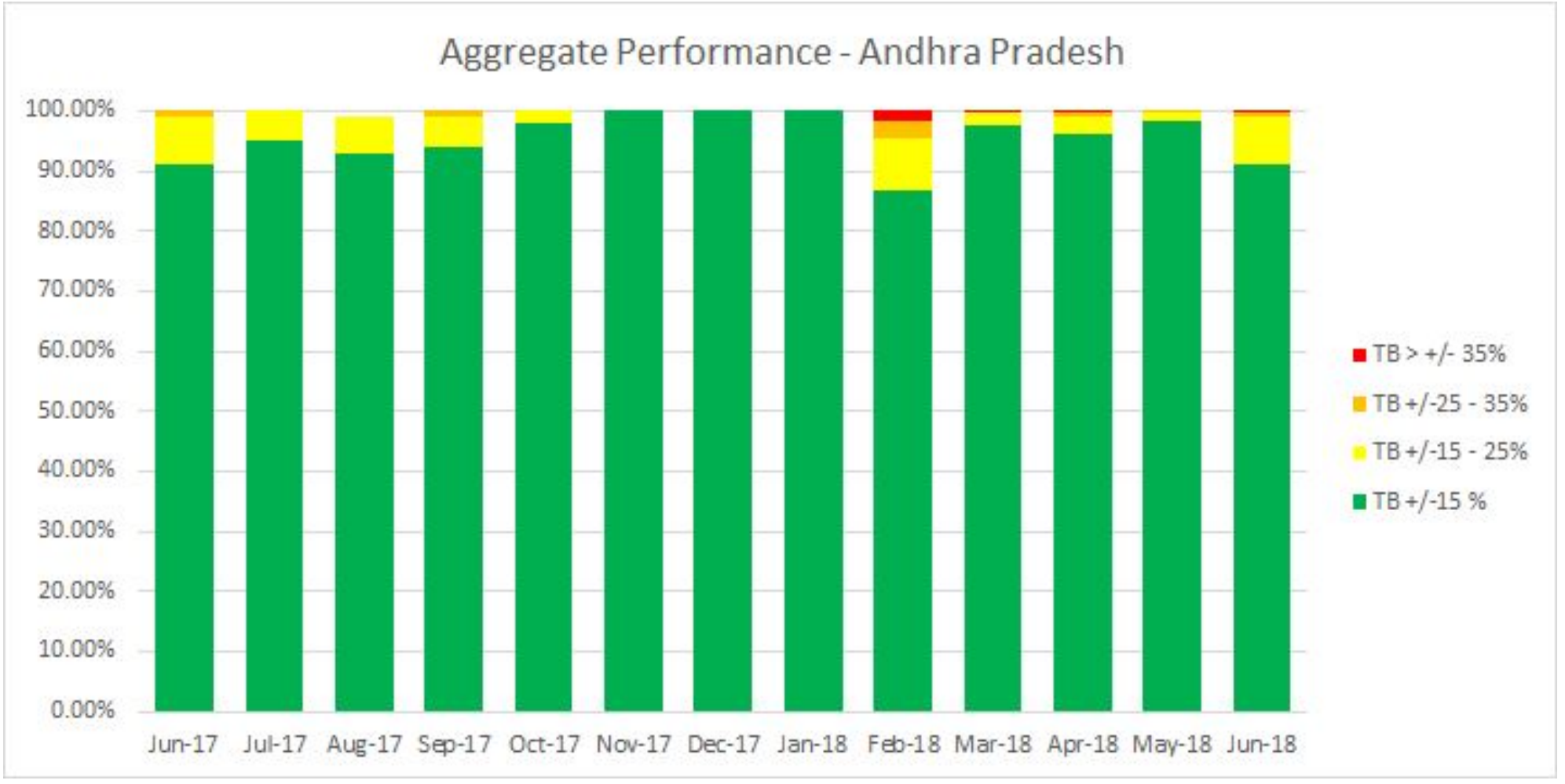


Significant improvement

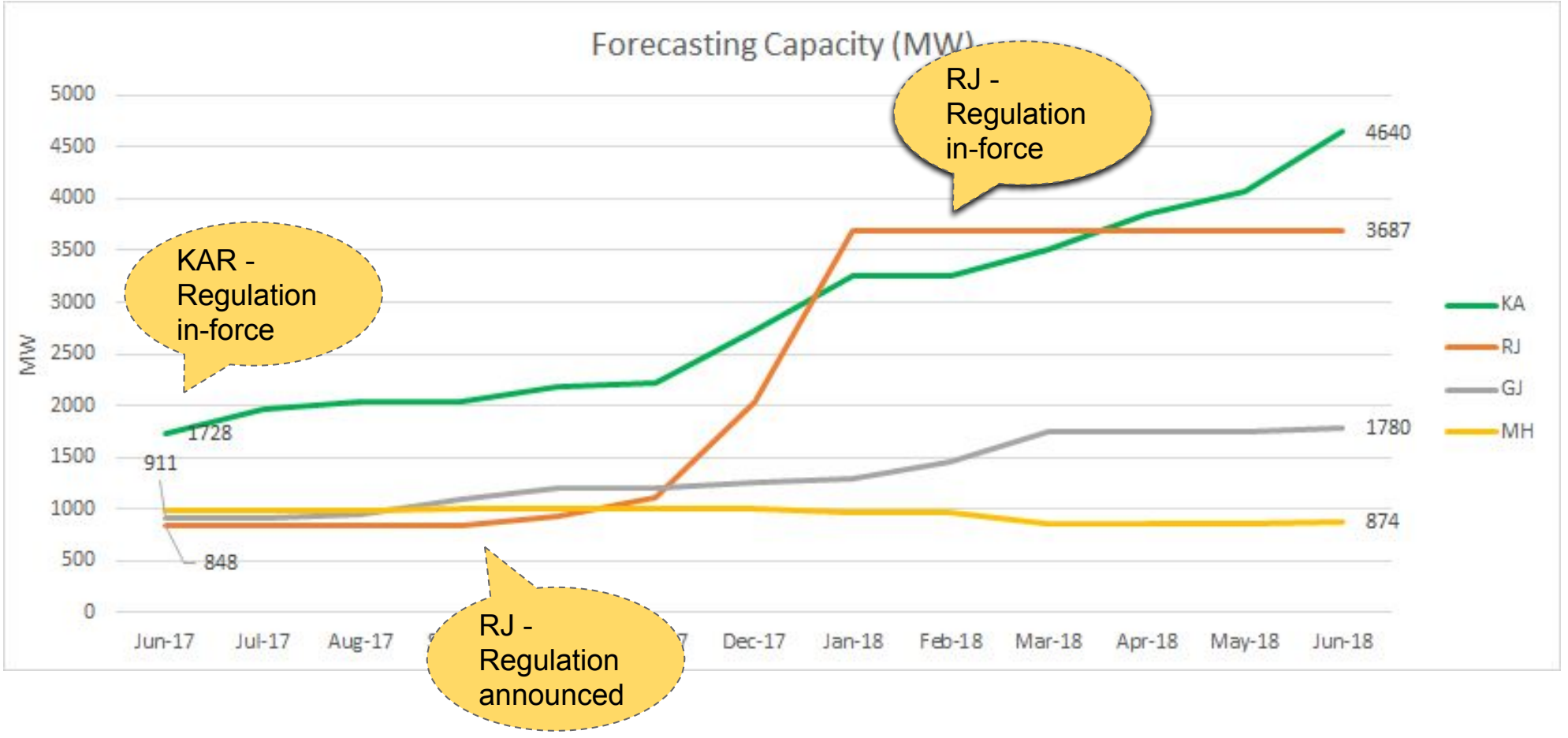
Case Studies - Impact of aggregation in Karnataka



Case Studies - Impact of aggregation in Andhra Pradesh



Forecasting Capacity additions for REConnect Energy



about

RECONNECT ENERGY

RECONNECT ENERGY

The Energy Solutions Company

We are market leaders in our businesses

Data Analytics

GRIDConnect

Electricity Markets

clickpower.in

REC Market

Approval under consideration of CERC

RECONNECT ENERGY

Best Indian Start-up, Indo-German Boot Camp (GIZ), Social Impact Lab - **Berlin, Germany**

Top 30 Global Energy Start-ups, NewEnergy Expo-2017, **Astana, Kazakhstan**

Top 50 Indian Start-ups, The Smart CEO - 2016, Bangalore, India

Best Wind Energy Forecaster of the Year (2014/15/16/17), Indian Wind Energy Forum

Technology Start-up Enterprise of the Year (Energy & Utilities) - 2017, 24MRC Network, India

Top 100 Global Energy Start-ups, Start-up energy transition Awards, Berlin, Germany

Equity Partner

INFUSE VENTURES

- India's First Cleantech Venture Fund
- **An MNRE + IIM Ahmedabad** initiative
- **Core Focus – To promote innovation in Indian Clean-Tech space with focus on Energy & Renewables**
- Key venture fund partners of INFUSE are…

Ministry of New and Renewable Energy

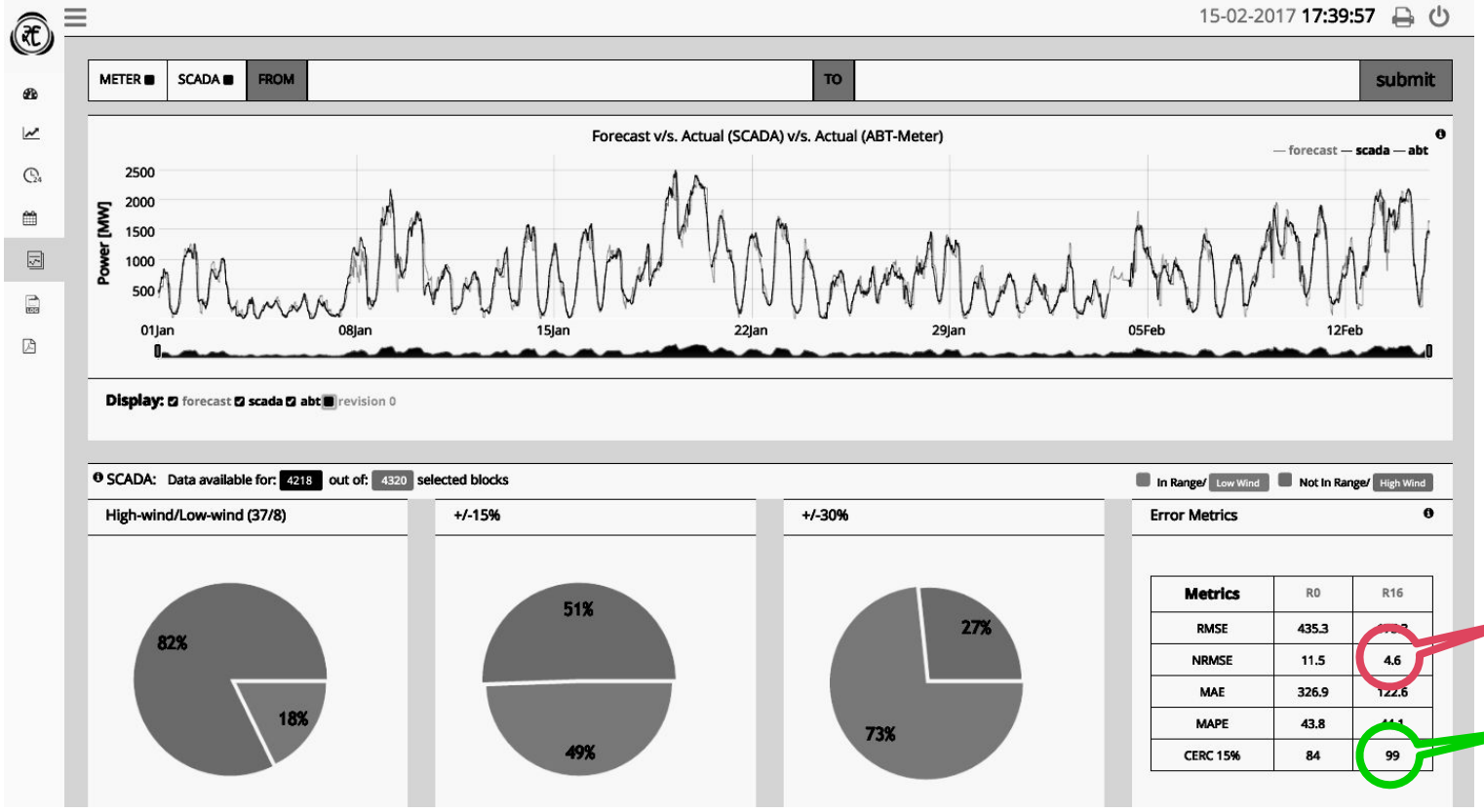
IIM AHMEDABAD

clie

IFC International Finance Corporation WORLD BANK GROUP

bp

GRIDConnect : Proprietary In-house Technology



Black - Actual Power

Light Grey - REConnect Forecast

National Benchmark: 7.0

% Accuracy as per Central Regulator's Definition

★ Technology and IP - Fully Owned and Developed by REConnect Energy

- Technology Stack: Python, R, PhP, mySQL

RECONNECT ENERGY

Asim Ahmed,
2Y Work Exp, (M.Sc, Uni. of Manchester, UK)

Madhusudan, 15Y Work Exp. in IT Platforms
(MBA: RSM, the Netherlands)

Ram Kumar,
12Y Work Exp, (MBA,: Symbiosis)

Vibhav Nuwal, 15Y Work Exp. in Finance, Energy
(MBA, Columbia Uni)

Vishal Pandya, 11Y Work Exp. in Power Markets
(M.Tech, Power Systems, IIT Bombay)

del2infinity

Abhik Kumar Das

Direct Experience as QCA: 1017MW

Hired by other QCA : Not Applicable

In-Direct Experience of Forecasting (F&S Provider): Not applicable

Interesting Experience as QCA

- Companies or IPPs are not allowed to act as QCA, individually, though there are provision for the same

- Some people(s) / specific person of SLDC must not call IPPs to direct which QCA have to choose (A common problem for low capacity factor plants)

- No logical reasoning has been provided till date, how aggregated forecasting by QCA of different substations is stabilising the grid and complying with the essence and spirit of the Regulation or Act; (We have filed various RTI to various SERC, SERC has put it on record that they donot have any report or studies on this regards)

- SLDC should open the technical reasoning;
- Issues will be raised before courts also;
- Matter has been filed in Karnataka & A.P. High Court;
- For resolving same matter different SERC is giving different logic. For same problem there cannot be different laws or regulations
- Court may take up all regulation together to understand and scrutinise as it had done last time before Delhi High Court;
- Court may ask, that SLDCs are receiving data for last 1 year now, for many states, now SLDC may have to disclose or prove how much stability they have achieved and where all they are lacking and why?
-

- In case of any dispute with QCA and IPP, there is no provision for interim submission of forecasting and scheduling by the company;

- As per regulation, there is no provision and it must be included

- In case, there are DSM and all the BG is invoked by SLDC, then all the QCA will become bankrupt, no measures have been taken to ensure that QCA should disclose which all SLDC they have submitted their BGs.

- Regulations never favors the QCA(s)

- Even if the QCA or F&S is not acting properly and suffering huge penalty, there is no scope for change of QCA in the regulation

- Who will take the call & how? Proper guidelines should be maintained. (A common problem for low cap plants in the station)

- Even, if the IPP suffers still they will be forced to stay with the same QCA and pay higher penalty. Minority rights of IPPs in any substation is being violated.

- How to optimize the minority rights is a big question and a proper regulation must be introduced
- Each IPP should be free to appoint its QCA, and should be in a position to change as and when QCA fails to perform

- Regulation states that, the financial strength of the QCA must be such that it should be in a position to handle the risk of penalties due to deviation charges applicable to generators. Considering this the net worth of the QCA for forecasting & scheduling services must be in positive amounting to at least Rs. 2.75 Crores in the current financial year which should reflect from its audited balance sheet or CA‟s certificate.
- If the QCA's financial strength is already exposed for more than its networth in other state, then what is the point to have such insolvency criteria, as the QCA will not be able to make any payment as it is not a solvent company at all

- Is the financial criteria is important for QCA or the technical abilities?

- Are we solving the stability issue in the grid or trying to minimize the penalty of large IPPs using the name of available capacity?
- In every RTI or papers SERC or SLDC is stating ‘aggregated forecasting’ will reduce penalty for IPPs, whether being a State SLDC should look into reducing penalty for IPPs and compensate the same from tax payers money for spending more on stabilizing the grid. A question raised in High Court during argument
- It is high time that IPPs should get bonus for accurate forecasting !
- In case of accurate forecasting backing down should not be allowed !
- If all RE generators can provide aggregated forecasting then why thermal generators should not also be allowed to provide aggregated forecasting? A question raised in the RERC during court proceeding.

Some SLDCs are forcing us to submit forecasting in following format which we feel is not correct or in accordance with regulation. May not sustain in case challenged in court

Time	Time-Block	AvC	Schedule
09:30-09:45	39	1800	281.18
09:45-10:00	40	1800	314.05
10:00-10:15	41	1800	355.05
10:15-10:30	42	1800	391.16
10:30-10:45	43	1800	366.13
10:45-11:00	44	1800	374.71
11:00-11:15	45	1800	381.33
11:15-11:30	46	1800	385.65
11:30-11:45	47	1800	389.06
11:45-12:00	48	1800	389
12:00-12:15	49	1800	384.26
12:15-12:30	50	1800	383.37
12:30-12:45	51	1800	385.43
12:45-13:00	52	1800	388.96
13:00-13:15	53	1800	381.89
13:15-13:30	54	1800	380.6
13:30-13:45	55	1800	358.2

- If we are solving stability issue of the grid, public may need a technical report or proof on how it is being solved the issue actually?
- Courts may interfere to understand the issues & may scrutinize the factual situations
- Already **Greenko** & **MSPL** has filed cases against F&S regulation & has got ***interim stay*** on the same from Karnataka High Court. Another matter is pending before A.P. High Court filed by Greenko.
- Once DSM will be declared more cases are expected.
- Gaming should not be allowed.
- In this regards following Supreme court judgement should not be forgotten: SLDC being a state needs to act fairly and reasonably with logic & proof
- **Centre for Public Interest Litigation and others ((2012) 3 SCC 1)**
- **Reliance Natural Resources Limited v. Reliance Industries Limited (2010) 7 SCC 1**
- **Ministry of Information and Broadcasting, Government of India and others v. Cricket Association of Bengal and others 1995 (2) SCC 161**

Thank you !

Experiences on QCA

Tata Power Trading Company Ltd.

TATA POWER
Lighting up Lives!

Purpose of QCA

Objective:

To facilitate large-scale grid integration of Solar and Wind generation while maintaining grid stability through forecasting, scheduling and commercial mechanism for deviation settlement.

Proposal for a new entity:

Challenge in direct interaction of number of wind and solar generators with respective RLDC/ SLDC.

Secondly, benefits of aggregation on forecasting accuracy need to be well documented.

State wise Aggregation Concept

Karnataka:

Implemented Aggregation at QCA level thereby encouraging large-scale grid integration of Solar and Wind generation. Considered aggregation in all 96 nos. time blocks of 15 minute with 16 revisions.

Andhra Pradesh:

Implemented Aggregation at QCA level. Permitted aggregation of wind energy in all 96 nos. time block with 16 revisions, 54 nos. time blocks for Solar energy with 9 revisions.

Rajasthan, Madhya Pradesh & Telangana:

Concept of Aggregation at QCA level was not introduced. Permitted aggregation at Pooling Station level only. Multiple Generators connected with same pooling station shall have relatively less charges for deviation as compared to single generator connected with a pooling station.

Mode of submission of schedules/ revisions

State	Mode of schedule submission	Remarks
Karnataka	Through e-mail, specifying wind and solar aggregated capacities.	No acknowledgment.
Andhra Pradesh	Uploading of individual generator's schedule on its web portal.	Uploaded schedules available on portal.
Rajasthan	Through e-mail, specifying PSS level aggregated capacities. Uploading of schedules on SLDC portal in near future.	One time Acknowledgement given for day ahead.
Madhya Pradesh	Through e-mail, specifying PSS level aggregated capacities.	
Telangana	Through e-mail, emphasis on QCA software.	

Payment Security against charges for deviation

State	Solar	Wind
Karnataka	10,600/- per MW	43,200/- per MW
Andhra Pradesh	22,500/- per MW	45,000/- per MW
Rajasthan	10,000/- per MW	40,000/- per MW
Madhya Pradesh	110% of average weekly liability	
Telangana	Generator shall furnish PSM directly to SLDC	

Linking of DSM settlement with receipt of payment from respective DISCOM towards sale of energy **may** eliminate the requirement of payment security against charges for deviation.

Mode of submission of Load Survey data

State	Mode of meter data submission	Remarks
Karnataka	Collection of downloaded SEM load survey data from DISCOM and submission to SLDC by QCA on monthly basis.	Difficulty in receiving data in time.
Andhra Pradesh	DISCOM will download SEM data and submits directly to SLDC.	Preferable
Rajasthan	Collection of downloaded SEM load survey data from DISCOM and submission to SLDC by QCA on monthly basis.	Difficulty in receiving data in time.
Madhya Pradesh	Collection of downloaded SEM load survey data from DISCOM and submission to SLDC by QCA on weekly basis.	Difficulty in receiving data in time.
Telangana	Collection of downloaded SEM load survey data from DISCOM and submission to SLDC by QCA on weekly basis.	Difficulty in receiving data in time.

Guidelines on Load curtailment/ Grid constraint

State	Guidelines
Karnataka	Time blocks with grid constraint shall not be considered for DSM. No clear procedure available on load curtailment.
Andhra Pradesh	Generator/QCA to obey instructions from SLDC on curtailment.
Rajasthan	Clear guidelines given in procedure.
Madhya Pradesh	More clarity needed.
Telangana	Provision shall be introduced in QCA software.

Concerns

- Delay in implementation of regulations by few states – impacting grid stability.
- Uniformity needed in forecast formats instead of state specific schedule format.
- Uniformity needed in real time data transfer as some developers have adopted to transmit data in 10 min block duration instead of 15 min duration.
- Clarity on deviation charges calculations and aggregation benefits of Inter-state and Intra-state transactions at Pooling station by respective SLDCs.
- Provision facilitated by TSERC in Actual generation data transmission from ABT meter modem to QCA server on 15 min basis may be replicated by each SLDC/DISCOM.
- Different payment security (BG) formats in different states.
- Sharing of Energy deviation and charges for deviation is awaited from RE regulations implemented states.
- QCAs need to undergo frequent changes in its software relevant to state specific regulation.
- Generators connected to CTU are not under purview of QCA.

“Journey Continues..

We value your inputs, suggestions and critique.”

We take pride in Lighting up Lives!