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

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

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

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

Discussions on the Agenda

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

Discussion

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

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

2. Agenda Item No. 2& 4

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

Discussion

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

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

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

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

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

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

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

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

Decisions

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

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

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

Discussion

1) Director, APTRANSCO, shared the status of implementation of SAMAST for Andhra Pradesh, including implementation of ABT at the State level (attached as Annexure-V).

2) Draft DPR on SAMAST, which was approved by APTRANSCO in November last year had estimated a budget of Rs. 177.5 Cr. In the 9th Meeting of the Technical Committee held on 29th Dec 2016 at CERC, New Delhi, the issue of location of meters was discussed. In the meeting, it was clarified that the shifting of measuring points from LV side to HV side was not required and hence the replacement of HV side CT/PT and the associated cost was also not required in the Draft DPR.

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

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

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

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

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

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

Decisions

i) On the question of legality of the concept of QCA, there was a consensus on the following legal interpretation that the FOR Model Regulations allow a generator

the option to interface with SLDC directly or through a QCA. Hence, rights of the generator are protected as he has choice in this matter.

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

c. Update in respect of other States

Discussion

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Decisions

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

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

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

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

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

a. Analysis of Hydro Resources in Telangana and Andhra Pradesh

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

Discussion

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

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

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

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

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

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

Decisions

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

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

Discussion

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

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

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

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

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

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

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

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

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

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

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

Decisions

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

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

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

Annexure-I

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

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

18	Shri S. K.Soonee, Advisor	POSOCO
19	Shri K.V.S Baba, CEO	POSOCO
20	Shri A. GopalRao, CMD	TSNPDCL
21	ShriD. PrabhakarRao, CMD	TSGENCO/TSTRANSCO
22	Shri. G NarsingRao, Director (Projects & Grid operations)	TSTRANSCO
23	Shri G. Raghuma Reddy, CMD	TSSPDCL
24	ShriAjitPandit, Director	Consultant

Status on Implementation of Scheduling, Accounting, Metering and Settlement of Transactions in Electricity (SAMAST) in the state of TELANGANA

SAMAST implementation in TSTRANSCO as per the checklist prepared by FOR (Forum of Regulators)

- Identification of Intra State Entities, Demarcation of Interface boundary for each Intra State Entity.
- Assessment of Meters - Main, Check and Standby.
- Assessment of IT infrastructure (Hardware and Software) requirement, Preparation of Detailed Project Report.

- In the 19th Board meeting of TSTRANSCO held on 30.05.2017 approval was given for implementation of SAMAST in TSTRANSCO for total Project cost of Rs. 84.65 crores.

- The Hon'ble TSERC had convened a meeting on 09.06.17 with TSTRANSCO to discuss on formulation of operational framework and governance structure for implementation of SAMAST.

- In the Minutes of the meeting communicated the Commission had directed to submit the DPR on SAMAST to Hon'ble CERC and CEA under intimation to the Commission.

- As per the instructions, the same was submitted to the Hon'ble CERC and NLDC .

- NLDC advised to revise the DPR and re-submit the same inline with approved DPRs of other States.

- It is noted that only 15-20% of estimated amount of DPR was sanctioned from PSDF for the states implementing SAMAST.

- As the SAMAST implementation is a time bound program, the funding percentage shall be increased for early completion of the process.

- Further, as proposed by TSTRANSCO in the meeting, the Commission directed to constitute a committee to study the feasibility and procedure for implementation of SAMAST and nominated Joint Director/ TSERC to be a member of the committee.

- Subsequently, a committee was formed with members from various utilities (TSERC, TSGENCO, TSSPDCL, TSNPDCL, TSTRANSCO) after getting approval for the same from TSPCC.

- Subsequent to the discussions held during the meetings of the committee, a questionnaire was prepared to be sent to all the states implementing SAMAST, to study existing Metering configuration and modifications done to the existing CERC regulations exclusively for the purpose of preparing the Intra state regulations by respective SERCs.

Operating Constraints for implementation of SAMAST

- AMR project has to be commissioned in full shape. As of now, the OFC communication is available upto 220kV level. For implementing OFC communication upto 132kV level, DPR is submitted to NLDC for about 185 Crores.

- The OFC communication shall be implemented upto 33kV level for implementation of AMR in SAMAST project.

- At present Load-Generation balance is carried out on manual basis. Introduction of 5 minutes time block and settlement requires Automated Load-Generation balance and accurate forecasting of Demand and Availability is necessary by the Discoms and Generators. Hence, AGC at state level also has to be implemented.

- As of now , Intra state DSM is yet to be notified and 15 minute time block has to be fully implemented in Intra state. In this circumstances, it is felt very difficult to go with 5-minute time block in TSTRANSCO. This is possible only after implementing AMR duly replacing all boundary meters with 5-minute integration meters.

Deviation Settlement Framework in the state of Telangana at present

CGS	Interstate Deviation settlement Mechanism, CERC regulation dated 6th January 2014 (frequency based).
TSGENCO	No deviation mechanism for deviation from schedule.
Captive power plants (CPP) and EHT Private developers (EHT PDs)	For DISCOM direct purchases penalty will be levied as per P.O. terms and conditions for deviation from schedule. For sale in IEX (STOA) Interstate Deviation Settlement Mechanism, CERC regulation dated 6th January 2014.
Independent power plants (IPP) (Singareni)	No Deviation settlement mechanism.
DISCOMS	Between TSNPDCL & TSSPDCL settlement of deviation between drawl and entitlement (Ratio 70.55 : 29.45, TSSPDCL & TSNPDCL) is being calculated by BSS (Balancing and settlement system) methodology approved by erstwhile APERC adopted by TSERC. (There is no regulation for this methodology).
EHT Consumers	CERC regulation dated 6th January 2014 (upto 12% under drawals).

Thank You

Forecasting, Scheduling and Deviation Settlement framework in the State of TELANGANA

LOAD FORECASTING PROCEDURE

- The Load forecasting is carried out on Day-Ahead, Monthly and Yearly basis.

- The basic parameters considered for Day-Ahead forecast of Demand & Availability are:-

Demand:

a) Demand pattern of the state for the previous day.

b) Demand pattern of the state for the current day.

c) Day of the week(Week day/Holiday/Festival etc).

d) Weather Report.

Availability:

a) Availability from all LTA/MTOA/STOA Generators.

b) Planned LC’s resulting in Real time curtailment.

c) Planned Overhauls.

d) Status of units under forced/planned outage.

e) Expected Industrial Consumer purchases.

f) Expected Renewable Generation.

g) Spinning reserve of 500 MW.

Based on above forecast of Demand & availability the Day ahead forecast will be finalised by 11.00 am so as to decide the quantum of Power to be traded in the exchange.

- The basic parameters considered for Monthly & yearly forecast and Availability are:-

Demand:

a) Demand pattern of the state for the corresponding month for the previous year.

b) Agriculture Demand season for the corresponding month for previous year

c) Historic Load growth registered

d) Correction Factor for weather variations

e) Any other issues which can impact the Demand pattern

Availability:

- Monthly availability from all Generating stations based on actual Generation levels in previous year keeping Generation Target as reference.

a) Planned overhauls of CGS, State and LTA Generating units.

b) 5 years average Hydel Generation.

c) RE Generation based on previous year trend.

d) New addition of upcoming RE Generation

e) Spinning reserve of 500 MW.

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- Considering the above factors the forecast of Demand and availability on monthly basis for the year will be arrived in terms of energy and Peak Demand expected to be incident on the system.

- The forecast will be further updated on monthly basis based on latest Demand trend and availability.

- At present the entire process is being carried out using Excel.

- CEA has identified Telangana State as the Pilot State for implementation of the Module “Power Procurement Cost Optimization” .

- All the generators are being followed to give Day Ahead Forecast. A Web Based Project is prepared to furnish the availability details by RE Generators Online

SCHEDULING PROCEDURE BEING FOLLOWED FOR ALLOCATION OF POWER TO DISCOMS

- The day ahead schedules for allocation of Power to TS Discoms are prepared as follows:

1. Entitlement of TSTRANSCO from CGS stations for day ahead is collected from SRLDC, Bengaluru.

2. Availability of TSGENCO & Singareni Generating stations for the Day ahead is also collected.

3. Day ahead purchases from Intra-state generators is collected.

4. Day ahead purchases through Inter-state OA(Short term) is collected from SRLDC.

5. Power purchases by TSTRANSCO & Industrial consumers through IEX is also collected.

6. Net Transfer of Capacity (MW) from A.P to Telangana is collected from Shared projects.

7. Hydel Generation is scheduled as per approved discharges (given by Water Board).

8. Estimated RE Genration based on previous day Trend keeping Weather Condition in View.

9. Based on the above, total entitlement Block- wise (15 minute Block) for State control area will be arrived.

10. The entitlement of the Discoms - TSSPDCL and TSNPDCL apportioned in the following ratio.

TSSPDCL	:	70.55%
TSNPDCL	:	29.45%

- Day-ahead requisition is collected from Discoms.

- The total entitlement arrived for each DISCOM is compared with day-ahead requirement given by the DISCOMS and the minimum of these will be allocated to respective DISCOMS.

- The un-requisitioned power, if any, will be allocated to the other DISCOM based on requirement.

- Final allotments will be communicated to the DISCOMS on day-ahead basis.

THANK YOU

TS SLDC

Forecasting , Scheduling and Deviation Settlement Mechanism of Solar & Wind Generators.

- As per the instructions of Hon'ble CERC, the Forum of Regulators released Model Regulations on Forecasting, Scheduling and Deviation Settlement of Wind and Solar Generating Stations at the State level & Hon'ble TSERC has directed TSSLDC to submit comments on Model Regulations.

- As per the directions of Hon'ble TSERC, TSSLDC has submitted comments on "Model Regulations on Forecasting, Scheduling and Deviation Settlement of Wind and Solar Generating Stations at the State level" accepting the deviation charges as per Model Regulations issued by Forum of Regulators.

- High lights of the comments by TSSLDC.

1. Hon'ble commission has to indicate the eligibility of QCA(Qualified coordinating Agency for wind & Solar generators).
2. Specific direction may be issued by Hon'ble commission to create exclusive pool account for Wind & Solar generators and under whom control this pool account shall be maintained.

3. For covering the deficit in the overall pool, at the end of the year the SLDC may approach the National Funds such as PSDF or NCEF. Eligibility and sanction limit may be specified. Presently allocations are being made for system development from the PSDF fund. A specific provision shall be made in the regulation for covering the deficit in the overall pool account if any.

- As on today 175 Nos Solar Generators (with the capacity from 0.75 MW to 143 MW) with the Total Capacity of 2539 MW and 100.8 MW capacity of Wind Generators are installed in Telangana State and aapproximately 1300 MW capacity of Solar & Wind Generators is yet to be commissioned by end of December 2017.

- As on today 2184 MW capacity of Solar generation (out of 2539 MW installed capacity) and total 100.8 MW of Wind Generation is integrated with SCADA of SLDC.
- 100% of Solar & wind generators connected at 132 KV and above voltage level is integrated with SCADA of SLDC.

- In order to facilitate large-scale integration of Solar and wind generating stations for maintaining grid stability and security as envisaged under the Grid Code, Forecasting, Scheduling and commercial mechanism for deviation of these generators is required.

- Hence, all Solar & Wind Generators were addressed on 26.04.2017 to furnish the Day ahead Schedules to the TSSLDC through mails, with periodic revisions as per the Model Regulations issued by Forum Of Regulators till the Final Regulations are issued by Hon'ble TSERC .

- Further to simplify the process of verification and consolidation of the schedules of all the Generators, TSTRANSCO has developed the Web Portal http://223.30.70.112/FNS/ to forecast the Solar and Wind power expected to be injected into the grid for the next day and communicated to all generators to register in the webpage and submit the schedules with maximum of 16 revisions per day on 22.09.2017.

- As on today 38 generators are submitting the schedules with the total capacity of around 478 MW (Out of 2500 MW) and regularly communicating with remaining generators to furnish the schedules as per Grid code.
- Deviation settlement is not carried out as the Hon'ble commission has to issue Regulation Forecasting, Scheduling and Deviation Settlement of Wind and Solar Generating Stations at the State level.

- TSTRANSCO requested in various forums to consider to establish REMC in Telangana State on top priority for Forecasting & Scheduling and monitoring of RE generators.

THANK YOU

15th Meeting of The FOR Technical Committee

At Hyderabad on 30th October , 2017

Presentation on Implementation of Scheduling, Accounting, Metering and Settlement of Transactions in Electricity (SAMAST)

(Framework at State Level)

PRESENT STATUS ON INTRA-STATE ABT ON IMPLEMENTATION OF SAMAST

INTRASTATE ABT FOR A.P STATE

- Implementation of Availability Based Tariff (ABT) at the State level is mandated in the National Electricity Policy and Tariff Policy.

- APSLDC has been shifted from Hyderabad to Vijayawada and now operated from newly constructed SLDC building at Vijayawada

- Energy Accounting is done in AP at Energy Billing Centre under the control of APSLDC.

- Imbalances between DISCOM to DISCOM settlement is carried out through Interim Balancing Settlement System, as approved by APERC.

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

INTRASTATE ABT FOR A.P STATE

- As on Sep-17 there are 911 Boundary points, that include G-T and T-D. Substation Metering points considered for the above boundary points are on LV side of Power Transformer.

- SAMAST Framework at the Andhra Pradesh State Level budgetary cost estimate was prepared and submitted to APTRANSCO and approved on 26/11/2016 for an amount of Rs 177.5Cr.

- SE/SLDC and DE/EBC attended CERC Technical meeting in NEW DELHI on 29/12/2016

- During the meeting APTRANSCO representatives have given presentation on Draft DPR on implementation of SAMAST. For implementing Intra-State ABT, the issue of location of meters was discussed. Member (Technical), MERC stated that in most of the States the losses of transformers are booked to transmission utilities. APTRANSCO had clarified that in Andhra Pradesh also, transformer losses are currently booked to transmission utilities. However, once the boundary meters are shifted to HV side, that too incurring additional cost of Rs. 150 Cr., the transformer losses would be booked to distribution licensee.

INTRASTATE ABT FOR A.P STATE

- After careful verification, members of the Committee agreed that shifting of measuring points from LV to HV side in APTRANSCO is not required in the instant case and hence the replacement of HV side CT/PT is also not required.

- As per the remarks and suggestions of Technical Committee of CERC, APTRANSCO prepared the revised DPR (Part-1) with cost estimate for Hardware components considering ABT meters for boundary points on LV side of the Power Transformers including corresponding class of accuracy CTs & PTs where ever not available, Calibration Meters, AMR Instruments Facility, Infrastructure, Installation and Testing, Software, Communication Component, Infrastructure Development Component, Training and Capacity Building Component.

INTRASTATE ABT FOR A.P STATE

- Implementation of the SAMAST framework at the Andhra Pradesh state level – Documentary proofs for the rates (along with Taxes Bifurcation) and Time lines for implementation along with requisite formats A1, A2, A3, A4 and A5 prepared and applied for PSDF funding for an amount of Rs 52.727Cr, on 20.02.2017.

- Based on PSDF application a mail was received from NLDC stating that only Servers and Software components are considered for PSDF funding.

- Accordingly cost estimate is revised for about Rs 11Cr and will be submitted to PSDF for funding once approved by APTRANSCO

- For balance funds cost estimate for Rs.12Cr for meters and AMR (Part-II) will be submitted to PSDF for consideration

APTRANSCO Boundary Points Details

Sl. No.	DISCOM	Metering Point Type	Sub category	No. of Metering Points				Category Total	DISCOM Total
				0.2S class	0.2 class	0.5 class	Total		
1	EPDCL	PTR LVs	132/11kV	0	0	0	**0**	**154**	**234**
2	EPDCL	PTR LVs	132/33kV	152	0	0	**152**		
3	EPDCL	PTR LVs	220/33kV	2	0	0	**2**		
4	EPDCL	PTR LVs	132/66kV	0	0	0	**0**		
5	EPDCL	EHT Consumers	220/400kV Industrial	10	0	0	**10**	**80**	
6	EPDCL	EHT Consumers	132kV Industrial	44	4	0	**48**		
7	EPDCL	EHT Consumers	132kV Rly. Traction	22	0	0	**22**		
8	SPDCL	PTR LVs	132/11kV	5	1	0	**6**	**364**	**490**
9	SPDCL	PTR LVs	132/33kV	346	2	0	**348**		
10	SPDCL	PTR LVs	220/33kV	10	0	0	**10**		
11	SPDCL	PTR LVs	132/66kV	0	0	0	**0**		
12	SPDCL	EHT Consumers	400KV/220kV Industrial	34	0	0	**34**	**126**	
13	SPDCL	EHT Consumers	132kV Industrial	49	5	0	**54**		
14	SPDCL	EHT Consumers	132/220kV Rly. Traction	37	1	0	**38**		
T-D SUB-TOTAL:				**711**	**13**	**0**		**724**	**724**
15	APTRANSCO	APGENCO	G-T	60	0	0	**60**	**60**	**187**
16	APTRANSCO	NTPC	G-T	6	0	0	**6**	**6**	
17	APTRANSCO	IPPs	G-T	27	0	0	**27**	**27**	
18	APTRANSCO	CPPs	G-T	30	0	0	**30**	**30**	
19	APTRANSCO	APGPCL	G-T	6	0	0	**6**	**6**	
20	APTRANSCO	132kV EHT PDs	G-T	58	0	0	**58**	**58**	
G-T SUB-TOTAL:				**187**	**0**	**0**	**187**	**187**	
TOTAL:									**911**

Energy Meters required for implementing SAMAST at AP state level including inter-state open access consumers (224 no's) and Generators (70 no's) and Future G-T, T-D for FY 2018-19 (17 no's) for APTRANSCO boundary points (911 no's), total 1222 no's boundary points considered. For main and check meters 5 min integration energy meters considered and existing LV side boundary meters will be utilized as standby meters.

REMAINING COMPONENTS COST ESTIMATE

S.No	Description	Qty	Amount in Rs Lakhs
1	Meters	**2444**	**875**
2	Calibration	**488**	**146**
3	AMR	**2490**	**122**
Total		**5422**	**1143**

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

Status on implementation of Regulations on Forecasting, Scheduling and Deviation Settlement by Hon'ble APERC

- **REGULATION:**

  Hon'ble APERC notified the Regulation No.4 of 2017 (DSM for Wind & Solar) on 21st Aug 2017

- **Applicability**

  All wind and solar generators connected to the Grid, including those connected through pooling stations and supplying power to the DISCOMs, or to third parties through open access or for captive consumption through open access, and selling power within or outside the State.

- **TIMELINES**

  - 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 January, 2018
  - Levy and collection of deviation charges shall commence from the 1st July, 2018.
  - Formation of QCA by generators shall be completed by 1st January, 2018

- **SLDC:**

- The SLDC shall give appropriate directions to the Generators/QCA on or before 1st December, 2017.
  - Guidelines for registration of QCAs
  - Information on technical specifications and protocol for sharing information
  - Forecasting Tools,
  - Alternative means of communication
  - Formats of forecast submission
  - Static data of WTGs
  - Protocol for sharing data
  - Operation of State Pool Account
  - In case of default by QCA/Generators
  - De-pooling of energy deviations and deviation charges,
  - Operation of virtual pool and State Pool Account.

- SLDC prepared the procedure for implementation of DSM regulation
- SLDC is planned for developing (in-house) web based software with funding from PSDF for
  - Registration of QCA
  - Collection of Technical Information (static data of WTGs),
  - Receiving day ahead, week ahead forecast and revisions from QCA/Generator
  - Uploading the Energy meter Dumps, JMRs by Discoms/STU
  - Preparation of implemented Schedules
  - Calculation of energy deviations and deviation charges
  - Publishing the Deviation Energy account
  - Online financial transactions with Pool Account by QCA/Gen,
  - Upload of de-pooling statements by QCA.

- The SLDC will provide the User IDs to all the concerned QCAs and Discoms/STU to access the SLDC website which is being developed in -house for handling DSM
- The SLDC will receive the Forecasting/Scheduling and revisions through on line web based software and prepares and publish the Energy Account online.
- Monitoring of timely payment of Deviation charges and De-pooling by QCA for about 1950 WTGs(3700MW) and 103 no's(2037MW) Solar Plants already synchronized to the Grid.
- Formation of State Pool Accounts for Intra state and Inter state transactions.
- SLDC is signing an MOU with NIWE for forecasting on behalf of SLDC.

- **Generators :**

- Only one QCA will be allowed per one pooling station.
- Appointing a QCA on behalf of all the generators in a pooling station or one of the generators may act as a QCA in that pooling station.
- All the Generators connected to the pooling station shall submit an undertaking /agreement with QCA and bank account details to the SLDC.
- Providing Static data and Real time data in coordination with QCA.

➢ Qualifications for registration of QCA with SLDC:

- QCA shall submit the appointing letter/ Agreement from all the concerned Generators to SLDC during registration.
- QCA will be the single point of contact for all matters on behalf of generators
- The QCA should be a company incorporated in India under the Companies Act, 1956/2013.
- The QCA shall have the experience in the field of Wind/Solar Power forecasting and scheduling for a minimum period of 2 years.
- The QCA shall have capability to handle multiple plant owners connected to a Pooling Sub Station in order to be well positioned to de-pool deviation charges.
- The QCA must have working experience in different terrain & regions as wind/Solar generation depends on these factors and such experience facilitates better scheduling.

- 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 generator. Considering this the net worth of the QCA from 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.

- The QCA shall have equivalent systems in place for seamless flow of information to and from SLDCs in order to facilitate scheduling, revision of schedule, intimation of outages/grid constraints etc.

- QCA shall have capability to provide real time monitoring systems in place for seamless flow of information to and from SLDCs.

- QCA should have an established team of Renewable Resource Analysts, modelling Statisticians, Software developers and 24x7 operation and monitoring team.

- QCA will abide by Andhra Pradesh Gazette Published by Authority APERC Regulation No. 4 of 2017, Notification Lr.No. APERC/Secy/F.No.S-19/2017, Dated: 19-08-2017.

- QCA shall pay a Bank Guarantee for the amount equivalent to Rs. 10600 per MW for solar generation and Rs. 43200 per MW for wind generation.

➢ **DISCOMs/STU:**

- STU/DISCOM shall download the SEM data and upload to the SLDC website on monthly basis.

PRESENT STATUS ON IMPLEMENTATION

Sl.No	ROLE	RESPONSIBLE ENTITY	PRESENT STATUS
1	Procedure for implementation of DSM	SLDC	Prepared
2	Formats for data Exchange	SLDC	Prepared
3	Protocol for data exchange	SLDC	In-house Software development activities planned and funding from PSDF is requested.
4	Selection of QCA by Generators & Submission of Agreements with QCA and Bank A/C details of QCA to SLDC	Generators	Meeting conducted on 27.10.2017 with generators
5	Registration of QCA at SLDC	QCA & SLDC	Guide lines/Qualification for QCA registration is prepared. Online registration process will be implemented. In-house Software development activities planned and funding from PSDF is requested.
6	Submission of Static data	QCA	Online submission of static data process will be implemented. In-house Software development activities planned and funding from PSDF is requested.

Sl.No	ROLE	RESPONSIBLE ENTITY	PRESENT STATUS
7	Forecasting by SLDC	SLDC	SLDC is signing an MOU with NIWE. Meeting with NIWE was conducted on 24-10-17
8	Submission of Forecasting & Revisions by QCA	QCA SLDC	In-house Software development activities planned and funding from PSDF is requested.
9	Actual Generation from Energy meter dumps	STU/DISCOMs	Presently Energy Meter dumps are being collected manually. AMR project proposed and requested PSDF funding. Funding for this project is not considered by PSDF
10	Preparation of Implemented Schedules	SLDC	In-house Software development activities planned and funding from PSDF is requested.

Sl.No	ROLE	RESPONSIBLE ENTITY	PRESENT STATUS
11	Calculation of Deviation energy and Charges	SLDC	In-house Software development activities planned and funding from PSDF is requested.
12	Publishing the deviation energy account in SLDC Web site	SLDC	In-house Software development activities planned and funding from PSDF is requested.
13	Offering comments by QCA on deviation energy account will be published within a week	QCA	Login IDs will be provided to all QCAs
14	Final statement of Deviation energy account	SLDC	Final energy account will be published
15	De pooling of Deviation charges	QCA	Upload of De pooling Statement by QCA
16	Collection of Deviation charges from the generators	QCA	Upload of deviation charges Statement by QCA
17	Transfer of deviation charges to State pool Account	QCA	Upload of Transfer details by QCA

➢ CHALLENGES:

- Absolute Error **(%) = 100** X [Actual Injection — Scheduled Generation] / (AvC)

- Available Capacity(AVC) provided by the Gen/QCA. It is difficult to ascertain correctness of AVC by SLDC as there is no data exchange from turbine/Inverter level to SLDC.

- Formation of QCA with consensus among all the generators in a Pooling Station.

- Termination of QCA registration if majority of generators are not satisfied with the performance of QCA, the registration of QCA will be terminated.

QUERIES RAISED BY WIND & SOLAR GENERATORS DURING THE MEETING CONDUCTED BY SLDC 27TH OCT-17

- SLDC Requested the Generators to form the QCA by 1st Dec 2017

- If no consensus among the Generators in a pooling station.
  - SLDC accept the registration of the QCA, if they are chosen by majority of Generators in that pooling station.
  - SLDC proposed that balance generators who are not willing to join with QCA to have separate connectivity and Energy Meters.

- In case of non payment of deviation charges to QCA by some generators?

- SLDC formulated to collect BG from the QCA as the QCA is Single point of Contact.

- Some of the Generators suggested that the generators would submit BG directly to SLDC in order to avoid mishandling of BG by QCA.

- Generators want to aggregate Solar & wind Generation.
  - SLDC monitors the Solar and Wind Generation separately in Real time. It is not advisable to Aggregate Wind & Solar Generations.

- Deviations Calculations in case of Curtailments for grid security and outages.
  - SLDC will replace the schedule with actual generation, hence no deviation.

- Generators expressed inability in relaying weather data, availability of generation at Turbine level to SLDC in real time.

Thank You

Idam Infrastructure Advisory Pvt. Ltd.

Agenda Item - 3

Status update for implementation of SAMAST and DSM

(West Bengal, Tamil Nadu, Haryana)

For Discussions during 15th Meeting of FOR Technical Committee

October 30, 2017

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

Status Update on DPR preparation on SAMAST implementation in West Bengal:

Scheduling, **A**ccounting, **M**etering **a**nd **S**ettlement of **T**ransactions in Electricity

Profile and ABT Status of West Bengal

Boundary meters considered for preparation of Deviation Bill

Entities	Constituent	No. of feeders	Installed Main meters
WBPDCL Generating Stations (G<>T)	BTPS	16	16
	STPS	9	9
	KTPS	14	14
	BkTPP	11	11
	SGTPP	8	8
NHPC Generating Stations (G<>T)	TLDP-III	1	1
	TLDP-IV	2	2
IPP/CPP (G<>T/C)	HEL	2	2
	TATA POWER, HALDIA	4	4
	PCBL	1	1
	CPL	2	2
	IPC(H)L	2	2
SOLAR (G<>T)	SIIPL	1	1
Distribution Licensees other than WBSEDCL (T<>D)	CESC	18	18
	DPL	4	4
	IPCL	2	2
	Total	**97**	**97**
WBSEDCL	126 S/S	T<>D	371* (TBD)

- **Additionally 44 nos . of Region-STU boundary meter data is also considered**

- Intra-state ABT, Energy accounting and Deviation settlement for all intra-state entities since 1.4. 2008 through **WBERC BSC Code Regulations, 2008**.
- Frequency linked DSM similar to CERC
- DSM liability is transferred to DISCOMs.
- 100% boundary metering is yet to be achieved.
- Data conversion through manufacturer's software & meter data processing by in-house software.
- SLDC issues following accounts/statements on its Website
  - weekly- deviation and reactive account,
  - Monthly- Declared capacity, Scheduled Energy, infirm energy generation statement, Energy Drawal Statement
  - OA charges- Intra-State STOA charges and SLDC Charges

Interface Metering at Intra-State level			
Main meters	Check meters	Standby meters	Total
97	97	79	273

Check List for Preparedness assessment of WB for SAMAST implementation:

Sr. No.	Activity	Present Status
1	Identification of Intra State Entities	completed
2	Demarcation of Interface boundary for each Intra State Entity	completed
3	Assessment of Meters - Main, Check and Standby	completed
4	Assessment of AMR logistics requirement, IT infrastructure	In process
5	Approval of the State-specific SAMAST scheme by SERC	In process
6	Commencement of load forecasting by SLDC	Since inception of SLDC
7	Commencement of Interchange Scheduling by SLDC for all the Intra State Entities	Done
8	Establishment of State Regulatory Pool Account	Done
9	Formation of State Power Committee for Energy Account preparation	Yet to be formed
10	Completion of Boundary Metering and AMR System (as per DPR)	Yes (non-operational)
11	Implementation of Recommended IT Infrastructure (Hardware and Software)	Presently Using In-house IT infrastructure
12	Deviation rates as notified of WBSERC	As per CERC
13	Preparation of Energy Account by SPC/SLDC and publication of Website	Yes . By SLDC

Exiting ABT system under operation at state level—1/2

SLDC	G-T	RES-T	ISTS - InSTS	D-T	HT-T	OA-T	Total
West Bengal	72	1	44	397	0	0	514

D-T: Tie lines between Distribution and Transmission Grid

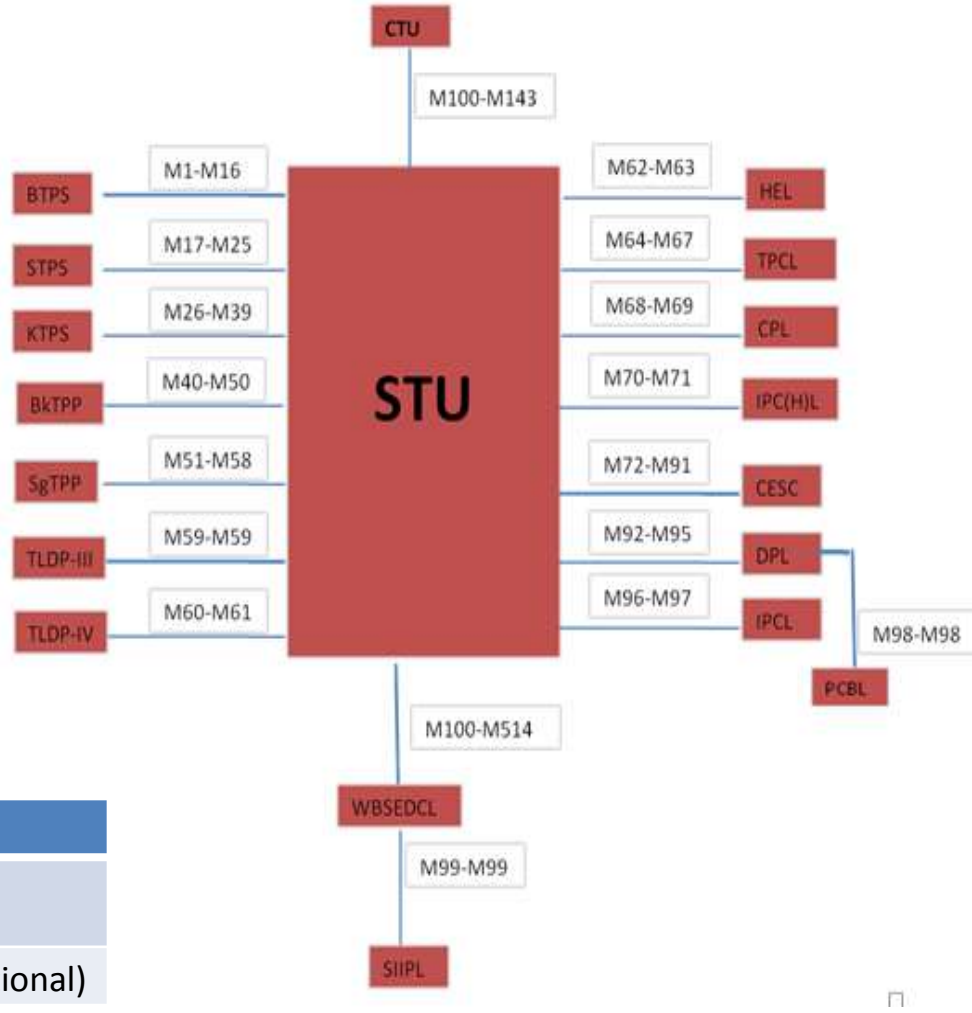
H-T: Tie lines between HT consumer and Transmission Grid

OA – T: Tie lines between Short-Term OA User and Transmission Grid

Existing SCADA/EMS System:

- Real-time SCADA data is available at WBSLDC end through combination of OPGW and PLCC communication medium.
- All interface data with respect to state constituents are available at SLDC control room.

Interface Metering at Intra-State level				
Main meters	Check meters	Standby meters	Total	AMR
470	363	112	945	YES*(Non-operational)



Existing ABT Metering arrangement

Exiting ABT system under operation at state level---2/2

Meter data acquisition

- **Main meter data (97)** feeders and boundary meter (44) with STU-regional periphery
- **Raw meter data** are being received at WBSLDC **through e-mail**.
- Converting raw meter data into **.npc format** through the **software** provided by **meter manufacturers**.
- **Uploading** converted meter **data into the Server.**

Meter data processing

- **Data validation** through different error checking process and subsequent correction if required.
- **Finalization of** feeder-wise, block-wise meter data for **preparation of deviation bill** and other energy accounting reports and certificates.

Scheduling

- Real time block wise, **constituent wise Scheduling** is being done in **Microsoft Excel**.
- Preparation of **Final Schedule**.
- **Uploading Final** schedule into the server is being used for **preparation of deviation bill.**

Regional UI Energy Accounting

- **Uploading master frequency** information into server
- **Verification of regional UI bill** w.r.t. West Bengal
- **Uploading the verified block-wise** Regional UI for West Bengal into Server.

Deviation Bill for state entities

- Ascertain Block-wise **WBSEDCL schedule** (derived)
- **Ascertain Block-wise WBSEDCL actual drawal** (derived)
- **Apply notified Rules** and regulation and **calculate deviation charge**.
- Spool deviation bill related data from server and prepare Deviation bill in Microsoft Excel & publish the bill.

Gap analysis and issues in existing Energy Accounting system:

- **WBSEDCL boundary meters** are not considered for Energy accounting due to inadequate infrastructure
- During Deviation Bill processing, summation of all constituents schedule and region-state boundary schedule is considered as WBSEDCL drawal schedule.
- Similar principle is followed for meter data also for WBSEDCL
- **Raw meter data** is received at WBSLDC from all constitutes **through E-mail**.
- **Completion of boundary metering and AMR system**, however necessary communication systems and recommended Hardware and Software is not in place, hence existing AMR system can not be used.
- **Most of the existing Meters (85%) are Secure make and its software protocol is not open Source protocol**. Facing difficulties in development of AMR software compatible with meter data. Needs to address this issue urgently.
- **In-house software** used for scheduling, meter data processing and short term Open Access applications processing have **limitations of compatibility and scalability**

Cost Estimate : Key components

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

Premise for cost estimate and limitations

- Estimation of quantities for Metering and Communication infrastructure is based on no. of Interface points, no. of intra-state entities as identified by WBSLDC.
- At present, no OA Entity has been identified as connected to transmission interface. However, the same could increase in future.
- While ABT meters are in place at interface points, the cost of Metering infrastructure has been considered taking into account requirements to be compatible with future standards and communication.
- Cost Estimate of Hardware Component-II (Servers, storage, laptops etc), Software Component and Training and Capacity building is based on assumptions on similar lines for other States (AP, TN, MP).
- Interactions and support from ERLDC team acted as useful guidance to WBSLDC team.
- However, validation of inputs/assumptions from STU and approval of management to DPR is necessary to proceed further.

Overall Budgetary Cost Estimation considered for DPR:

S. No.	Item Description	Cost Estimate (INR Lakh)	Cost Estimate incl. Contingency (INR Lakh)
	Summary of Key Cost Components		
1.1	Hardware component-I	1,252	1,290
1.2	Hardware component-II	157	164
1.3	Software component	532	558
1.4	Communication component	203	213
1.5	Infrastructure component	236	248
1.6	Training, Capacity Building & Annual Operating Cost	117	122
1.7	Contingency (est @ 3% on Metering and @5% on other cost)	100	
1	**GRAND TOTAL**	**2,596**	**2,596**

Item Description	Cost Estimate (INR Lakh)
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**

INR 1306 L

Status Update on F&S and DSM Regulations for Tamilnadu:

Meetings with TNERC

Update on interactions/support to TNERC

- **During the 11th Meeting of the Technical Committee**, TNERC presented the issues and challenges being faced while drafting the F&S Regulations for Tamil Nadu due to highest penetration of RE and sought support of the consultant (Idam) for revamping the F&S and DSM Framework for Tamil Nadu.
- **Consultant studied and revised the draft F&S Regulations of TNERC and presented the same before the Commission during the meeting held on October 09, 2017.**
- The Commission appreciated the revisions proposed by consultant and instructed its staff, representatives of TANGEDCO, TANTRANSCO, and SLDC to study and comment on the revised provisions that will be published for stakeholders' consultation.
- Idam also presented various issues of DSM Framework to be devised for Tamil Nadu.
- As suggested by the Commission, consultant is also preparing **the draft DSM Regulations of TNERC** and same will be submitted to the Commission for consideration.
- Meeting with TNERC has been proposed in 1st Week commencing from 6th November,2017.

TNERC : Draft F&S Regulations and Draft DSM Regulations

F&S Regulations

- Applicable for only Variable RE Generators connected to Intrastate Transmission Network
- Variable RE Pooling station is the basic building block for scheduling.
- Introduction of QCA, Contours for QCA, Implementation procedures, information exchange, De-pooling behind pool meter are the unique features applicable only for Variable RE generation F&S and DSM
- Deviation-RE formula and allowable deviation for RE and deviation charges for variable RE are different for Variable RE
- Periodic review of F&S Regulations may be required considering rate of development of variable RE and experience gained in F&S of variable RE over the period.

DSM Regulations

- Applicable to conventional generators and OA consumers and Discoms
- Deviation formula and Deviation settlement rules are different for conventional generators and RE generators
- DSM Price vector to be stipulated and linked to regional framework
- Volume Cap and Additional deviation charge provisions introduced in DSM Regulations
- Besides, there are inter-linkages of several provisions under MYT/Tariff Regulations and OA Regulations.

- It is suggested that, TNERC may notify two separate Regulations for RE F&S and Deviation Settlement Mechanism.
- Regulatory process for finalisation of both Regulations to be taken up simultaneously.

TNERC draft F&S Regulations – 1/2

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

TNERC draft F&S Regulations – 2/2

S. No	Particulars	FOR Model F&S	TNERC (draft)
7	**Reference point for DSM**	Pooling station	• Pooling Station (incl. Discom S/S) • Existing RE Gen. need to be mapped. • Definitions of Interconnection Point and Metering Point to be verified considering existing practices
8	**Apportion of Energy Deviations & DSM Charges among RE generators at a pooling S/S**	In proportion to actual generated units or available capacity	In proportion to actual generated units
9	**Telemetry and Communication Requirement & Responsibility for providing telemetry and Communication**	Data relating to power system output and weather By Generator	Data relating to power system output and weather By Generator/QCA
10	**Procedure for Data Telemetry and Communication**	Detailed procedure to be evolved by SLDC	Contours of Detailed procedure by SLDC have been outlined in Regulations
11	**DSM For Sale Outside State Specified**	Yes	Yes, subject to conditions (TBD)
12	**Meeting Shortfall of DSM Pool**	PSDF and NCEF	Net annualised impact of shortfall funding (virtual pool) apportioned to all RE Generators in proportion to their deviations.

Status of implementation of SAMAST in Haryana:

Scheduling, **A**ccounting, **M**etering **a**nd **S**ettlement of **T**ransactions in Electricity

Haryana : Update on DSM Regulations and SAMAST implementation

Forecasting, Scheduling and DSM Regulation progress for Haryana

- Subsequent to 14th Technical Committee meetings and presentations at HERC, copies of Model F&S Regulations and Model DSM Regulations shared with HERC
- In case of Haryana, Forecasting and Scheduling framework is relevant mainly from Solar perspective and Utility scale solar power penetration is low considering land constraints.
- HERC Grid Code Regulations does not specifically cover Scheduling and Despatch Code for Haryana.
- HERC will prepare Scheduling and Desaptch Code first and then proceed for F&S and DSM Regulation.
- HERC has scheduled meetings tentatively, on 10th/11th Nov 2017.

Status Update on DPR Preparation

- Draft DPR Template and information requirement/check list etc. shared with SLDC
- Preliminary assessment for DPR preparation is in process.
- HPVNL/SLDC have sought inputs from Discoms (UHBVN & DHBVN) and Generating Company (HPGCL).

Idam Infrastructure Advisory Pvt. Ltd.

Thank You

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15th Meeting of the Technical Committee
Forum Of Regulators (FOR)

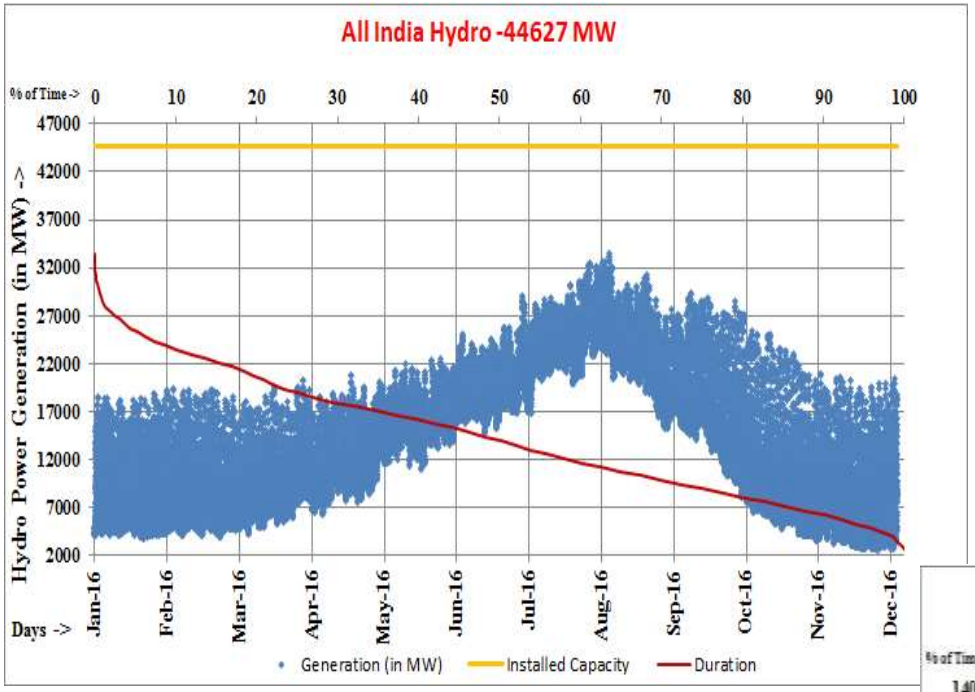
Monday, 30th October, 2017
Hyderabad

Agenda No. 5

Andhra Pradesh and Telangana

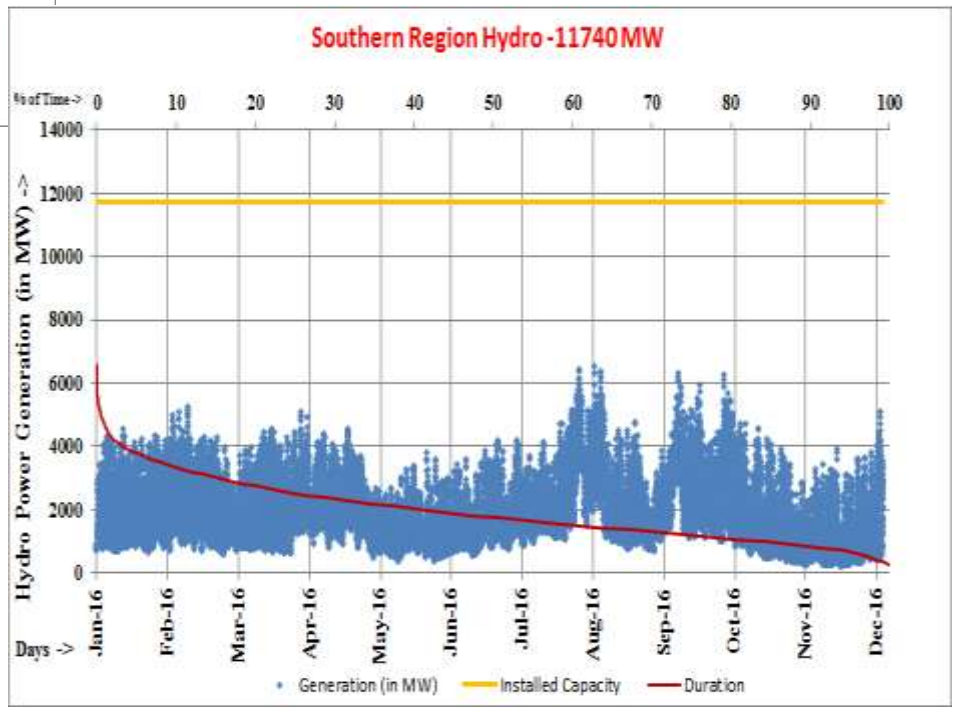
- Analysis of Hydro Resources
- Demand Pattern Analysis/Load Forecasting

Hydro Generation – All India and Southern Region



All India

Southern Region



FOLD-POSOCO Report on Operational Analysis for Optimization of Hydro Resources

Key Recommendations

- Optimization & Incentives for Flexibility
- Ancillary Services from hydropower
- Coordinated Scheduling & Despatch
- Transmission Planning impacting Hydro Flexibility
- Multi Part Tariff
- Silt Forecasting & Coordinated Flushing
- Inflow Forecasting
- Review of Standards
- Revisiting Hydrological Constraints
- Renovation & Modernization

Report

on

Operational Analysis for Optimization of Hydro Resources & facilitating Renewable Integration in India

June 2017

Forum of Load Despatchers
India

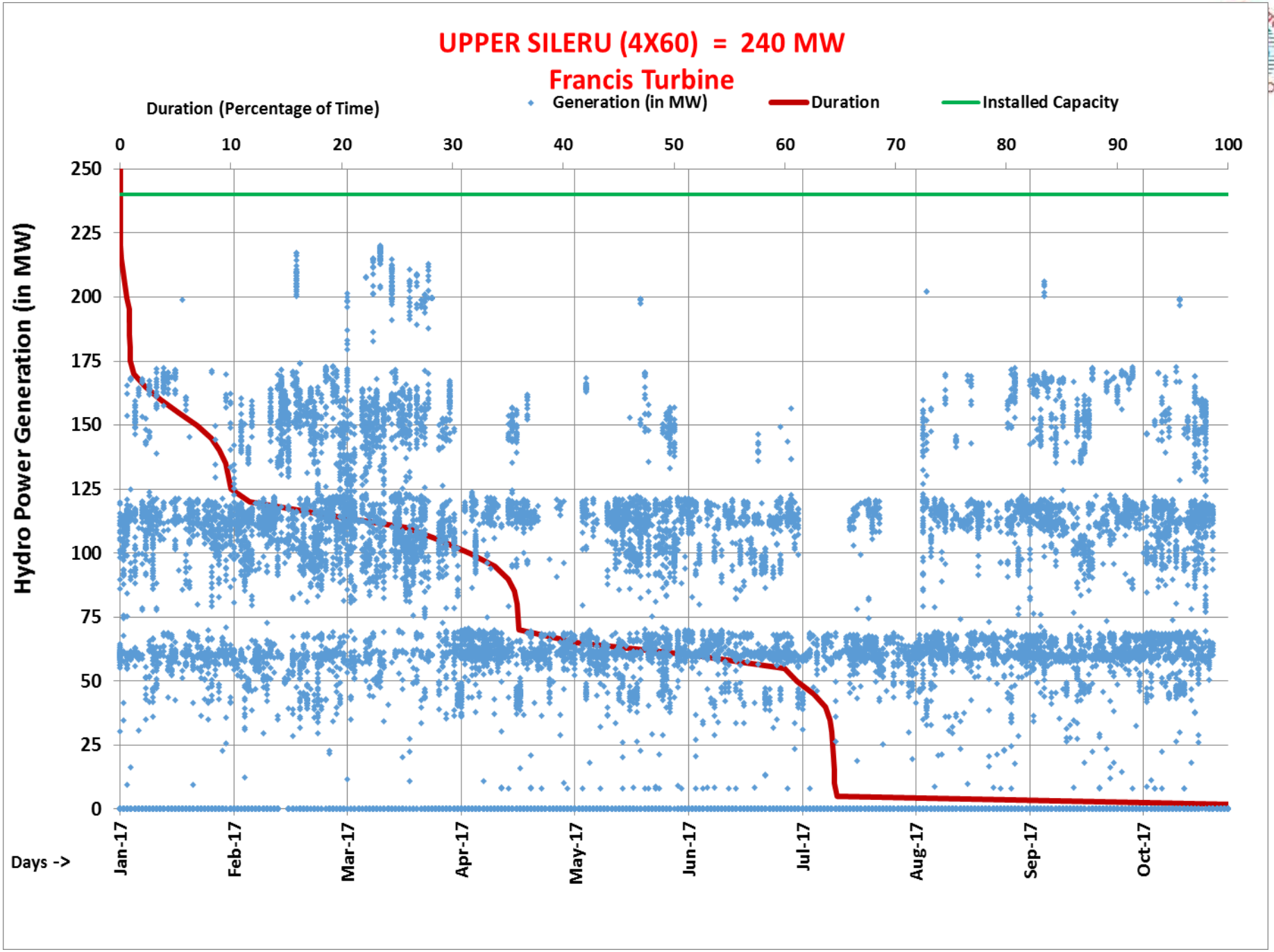
https://posoco.in/download/fold-posoco-report-on-operational-analysis-for-optimization-of-hydro-resources/?wpdmdl=14168

Hydropower Resources in AP & Telangana

S.No.	Hydropower Plant	Installed Capacity (MW)
1.	Upper Sileru	240
2.	Lower Sileru	460
3.	Srisailam RB	770
4.	Srisailam LB	900
5.	Nagarjuna Sagar Main Power House	815.6
6.	Upper Jurala	234
7.	Lower Jurala	240
8.	Donkarayi	25
9.	Machkund	120
10.	Nagarjuna Sagar Tail Pond	50
11.	Nagarjuna Sagar Right Canal	90
12.	Nagarjuna Sagar Left Canal	61.2

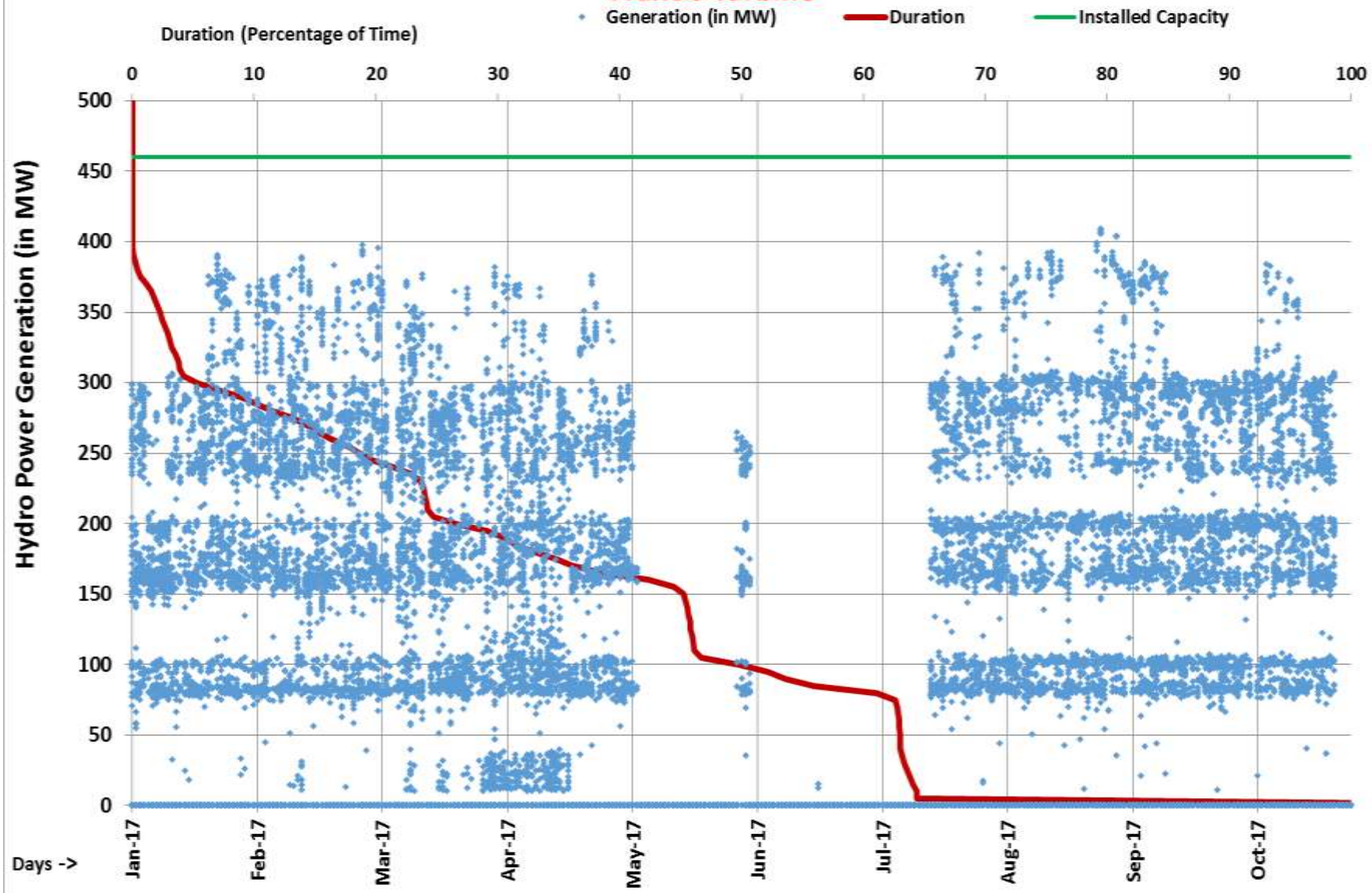
Major Reservoirs	Full Reservoir Level (m)	Min. Draw Down Level (m)	Effective Storage Capacity at FRL (MCM)	Energy Content at FRL (MUs)
Srisailam	269.75	243.84	7106	1392
Nagarjuna Sagar	179.83	150.88	6538	1398

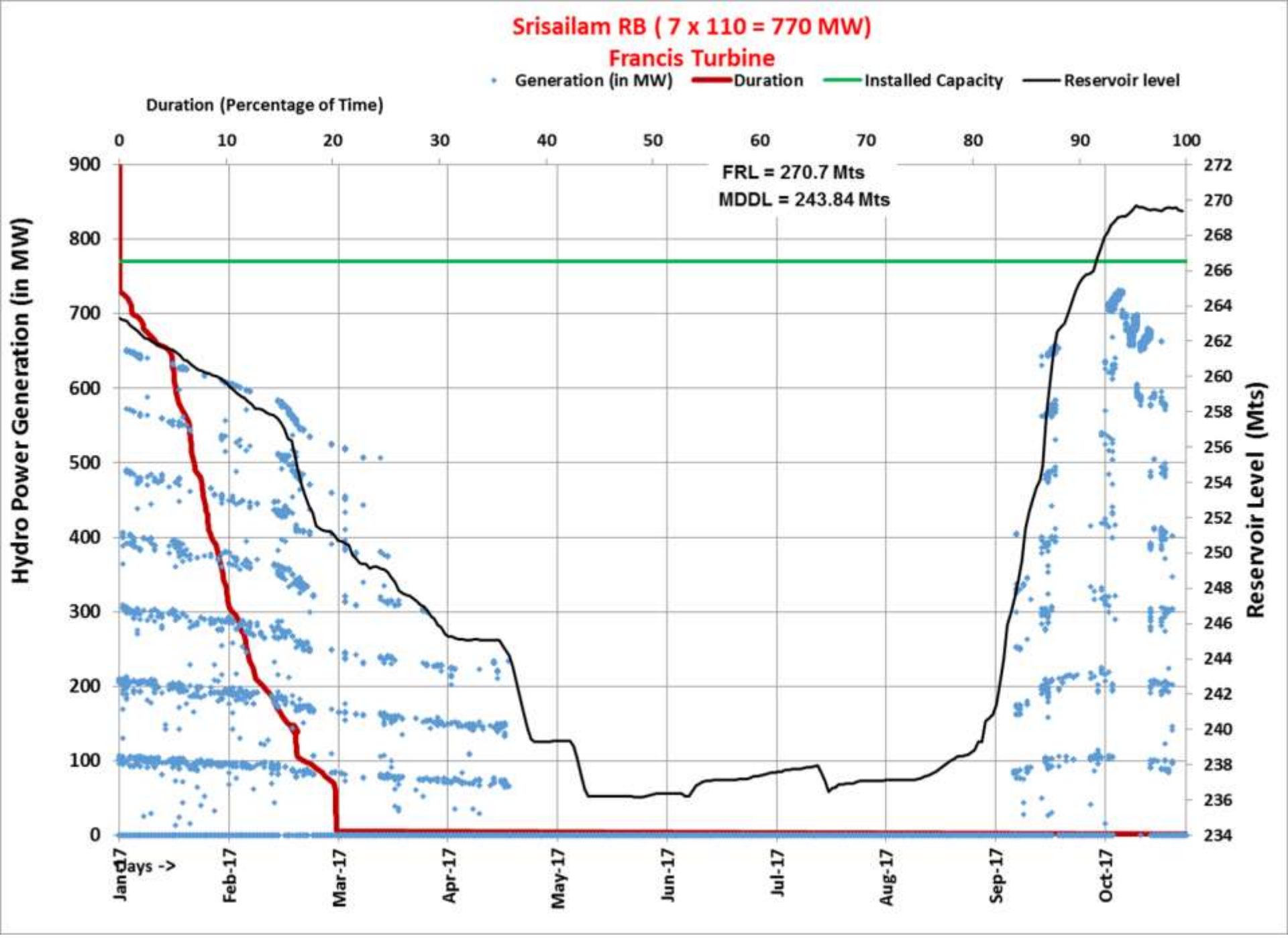
Source: CEA


UPPER SILERU (4X60) = 240 MW
Francis Turbine
Duration (Percentage of Time)
Generation (in MW)
Duration
Installed Capacity
0
10
20
30
40
50
60
70
80
90
100
Hydro Power Generation (in MW)
250
225
200
175
150
125
100
75
50
25
0
Days ->
Jan-17
Feb-17
Mar-17
Apr-17
May-17
Jun-17
Jul-17
Aug-17
Sep-17
Oct-17

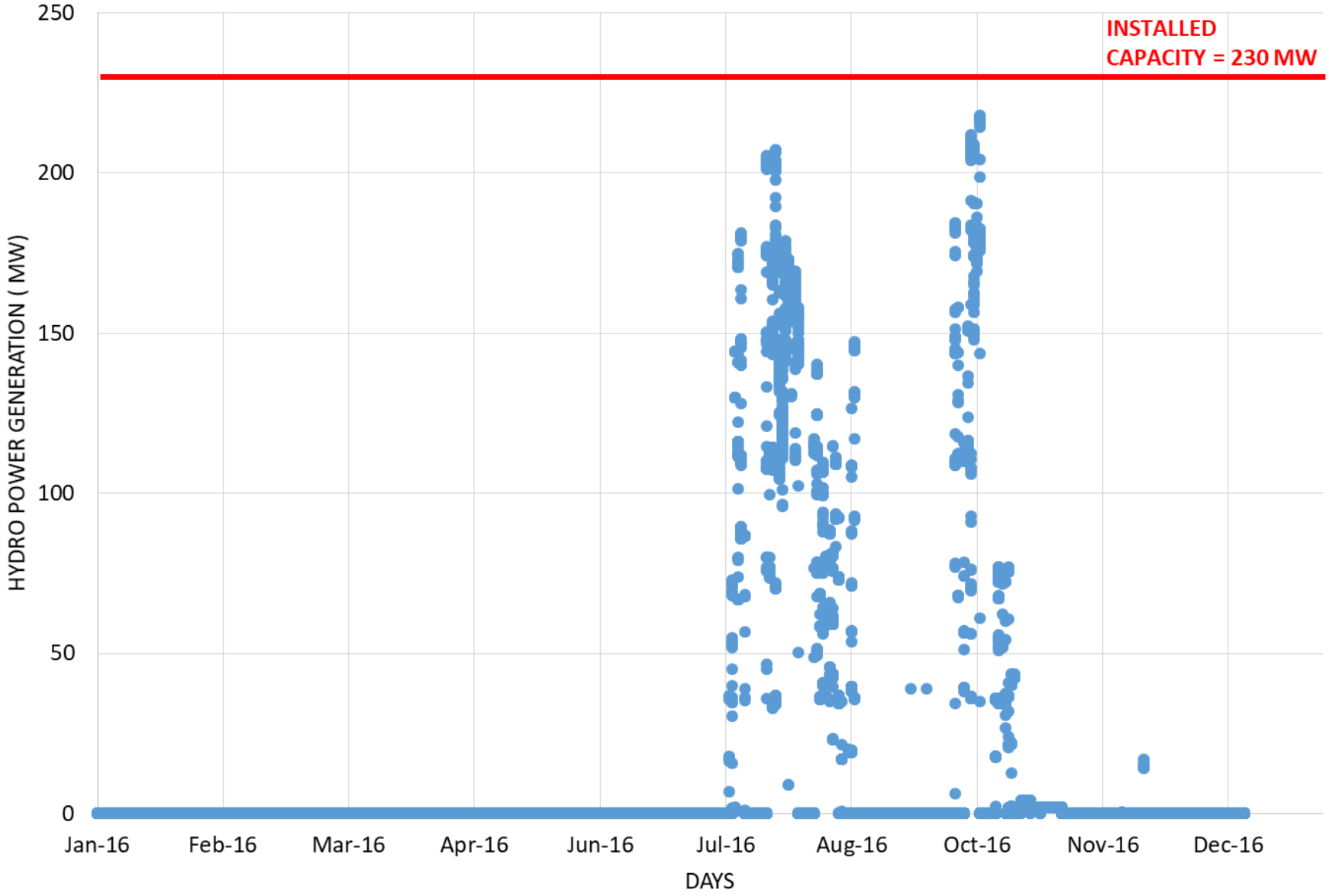
LOWER SILERU (4X115) = 460 MW

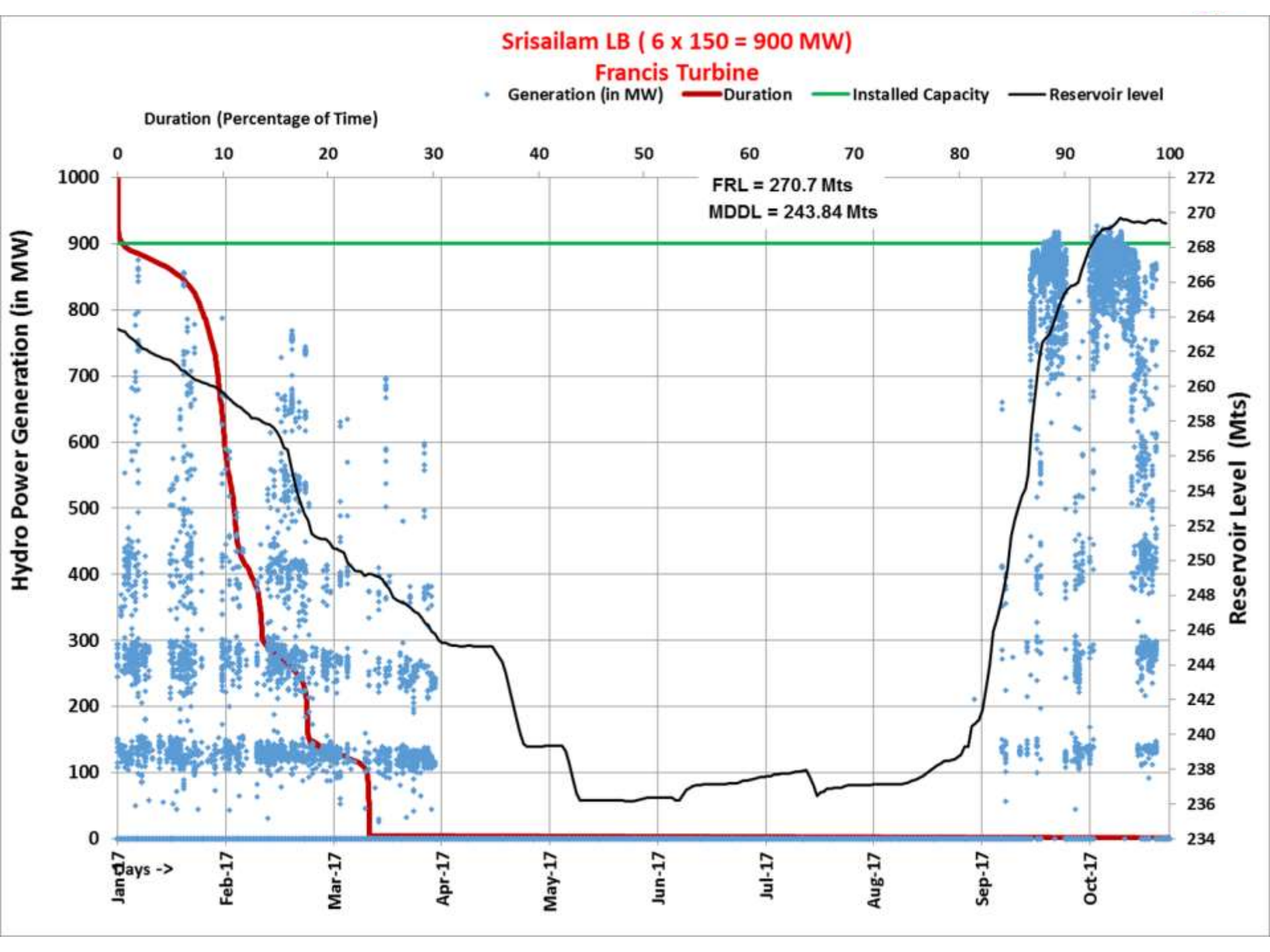
Francis Turbine

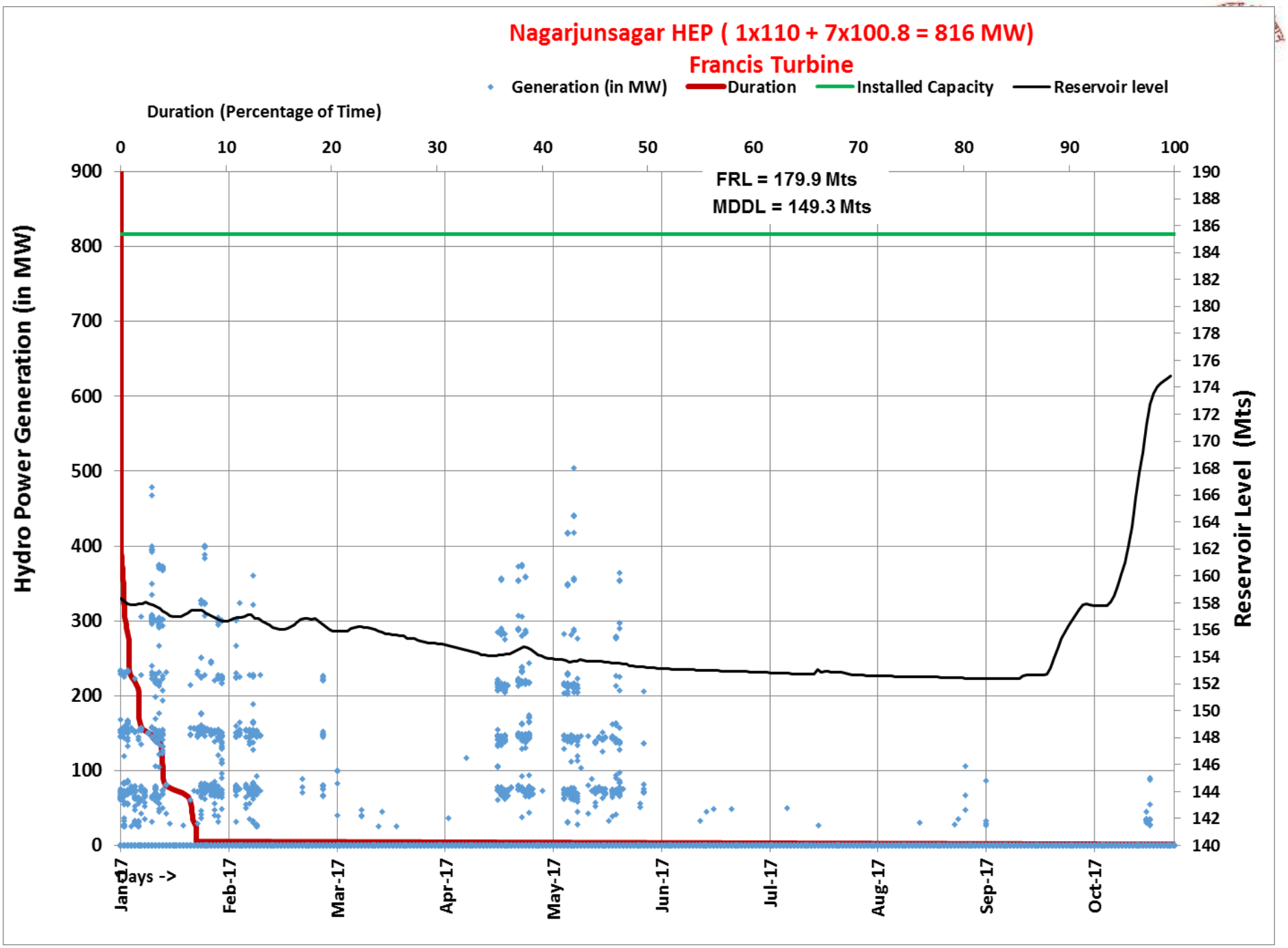



Srisailam RB (7 x 110 = 770 MW)
Francis Turbine
Generation (in MW)
Duration
Installed Capacity
Reservoir level
Duration (Percentage of Time)
FRL = 270.7 Mts
MDDL = 243.84 Mts
Hydro Power Generation (in MW)
Reservoir Level (Mts)
Days ->
Jan-17
Feb-17
Mar-17
Apr-17
May-17
Jun-17
Jul-17
Aug-17
Sep-17
Oct-17

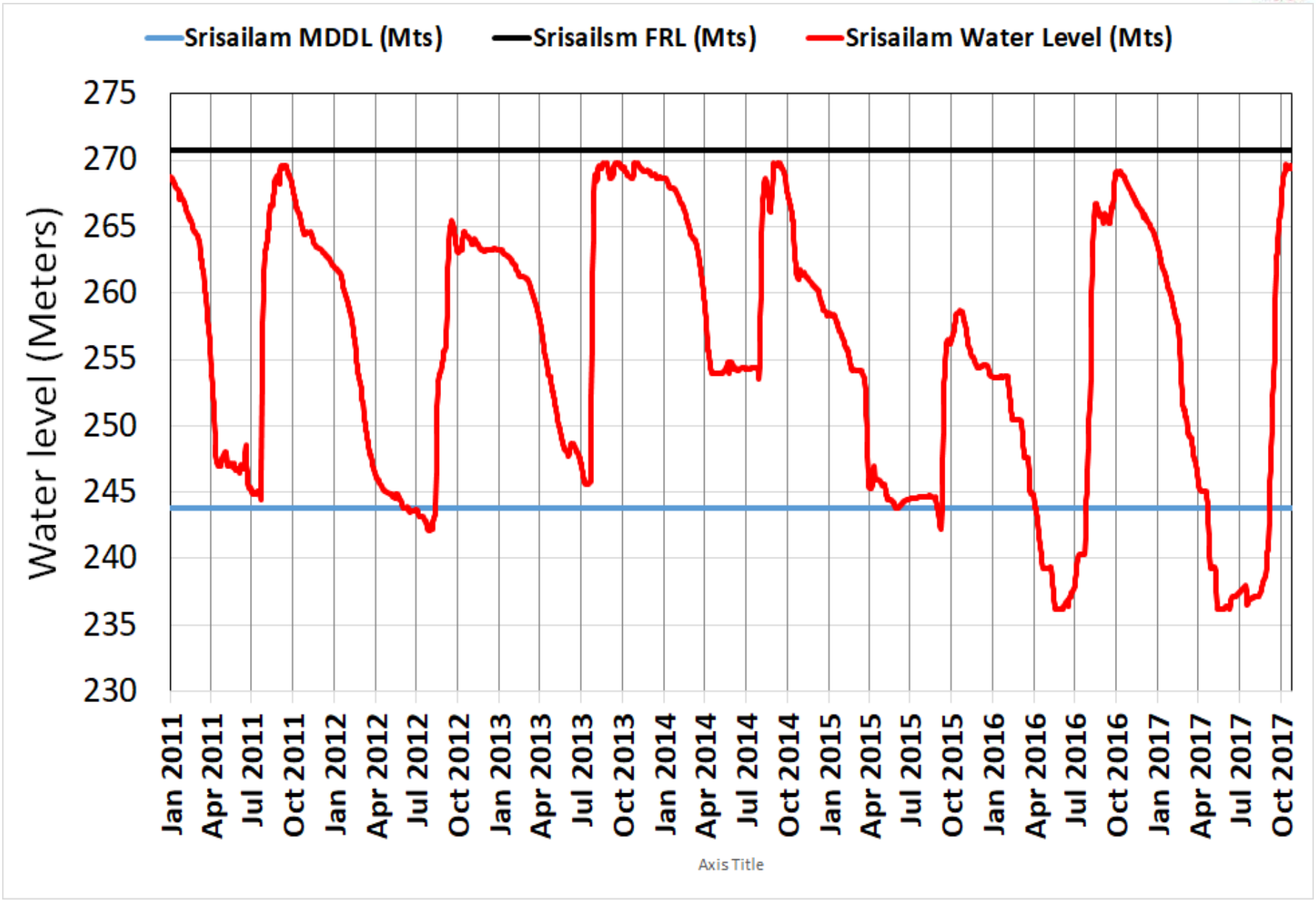
Jurala Hydro Power Generation



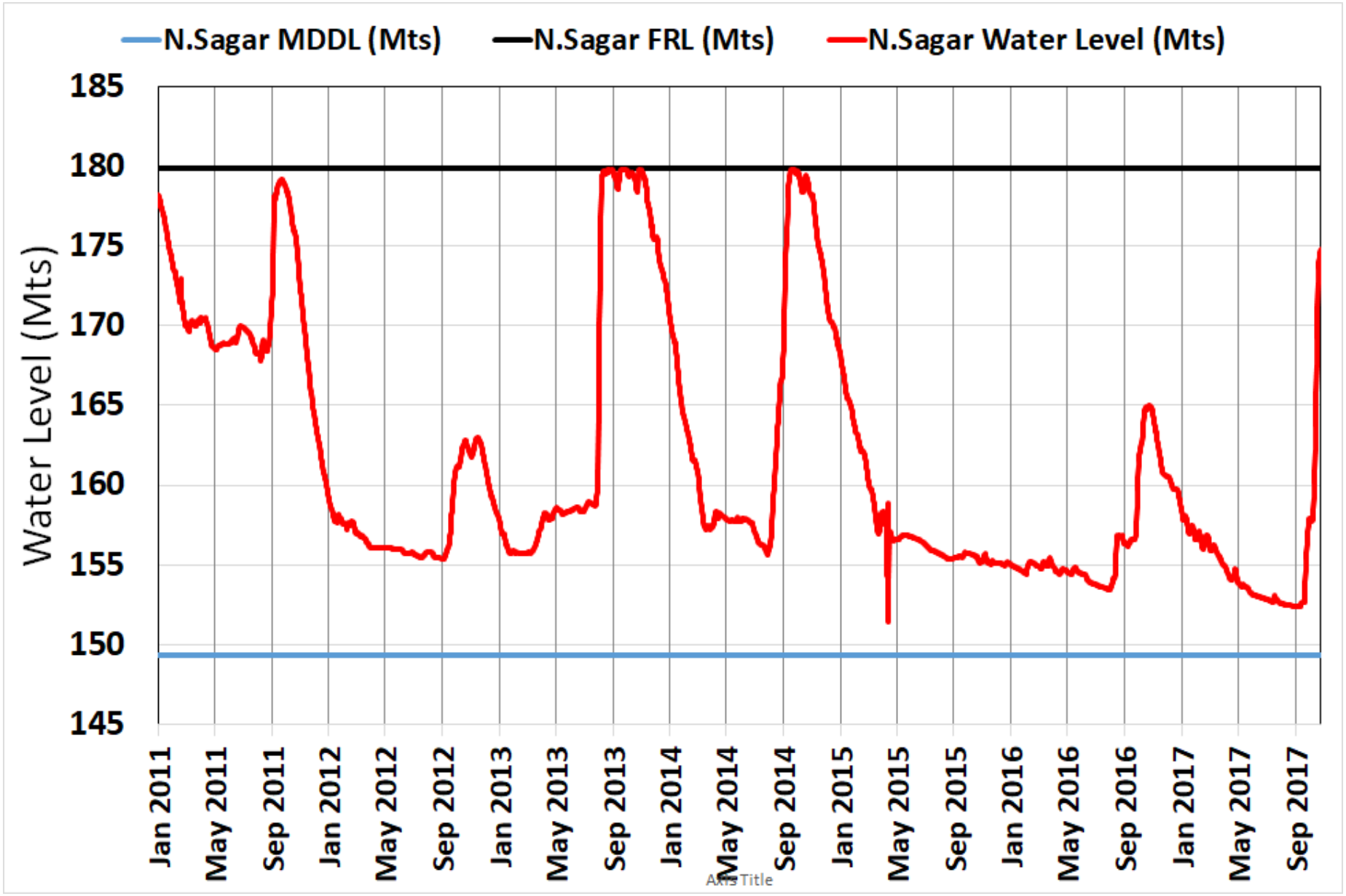

Srisailam LB (6 x 150 = 900 MW)
Francis Turbine
Generation (in MW)
Duration
Installed Capacity
Reservoir level
Duration (Percentage of Time)
FRL = 270.7 Mts
MDDL = 243.84 Mts
Hydro Power Generation (in MW)
Reservoir Level (Mts)
Days ->
Jan-17
Feb-17
Mar-17
Apr-17
May-17
Jun-17
Jul-17
Aug-17
Sep-17
Oct-17


Nagarjunsagar HEP (1x110 + 7x100.8 = 816 MW)
Francis Turbine
Generation (in MW)
Duration
Installed Capacity
Reservoir level
Duration (Percentage of Time)
FRL = 179.9 Mts
MDDL = 149.3 Mts
Hydro Power Generation (in MW)
Reservoir Level (Mts)
Days ->
Jan-17
Feb-17
Mar-17
Apr-17
May-17
Jun-17
Jul-17
Aug-17
Sep-17
Oct-17

Srisailam Reservoir Level (2011-2017)



Nagarjuna Sagar Reservoir Level (2011-2017)

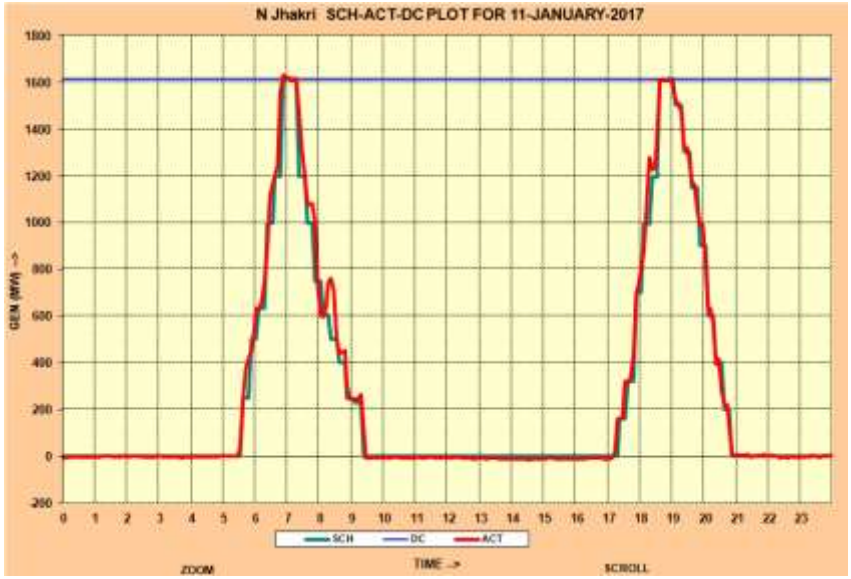


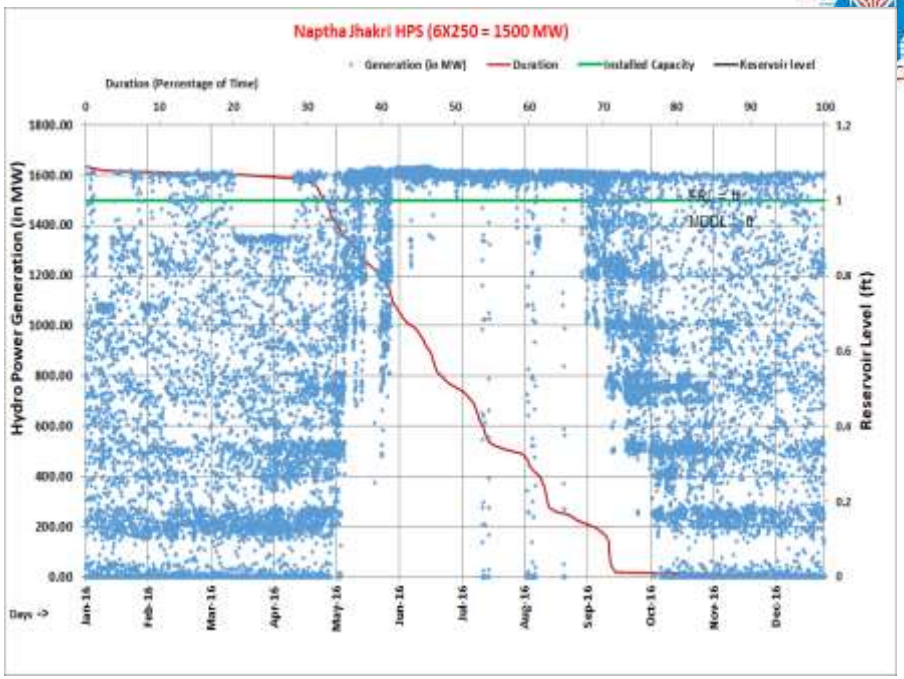
Key Derived Statistics (2016)

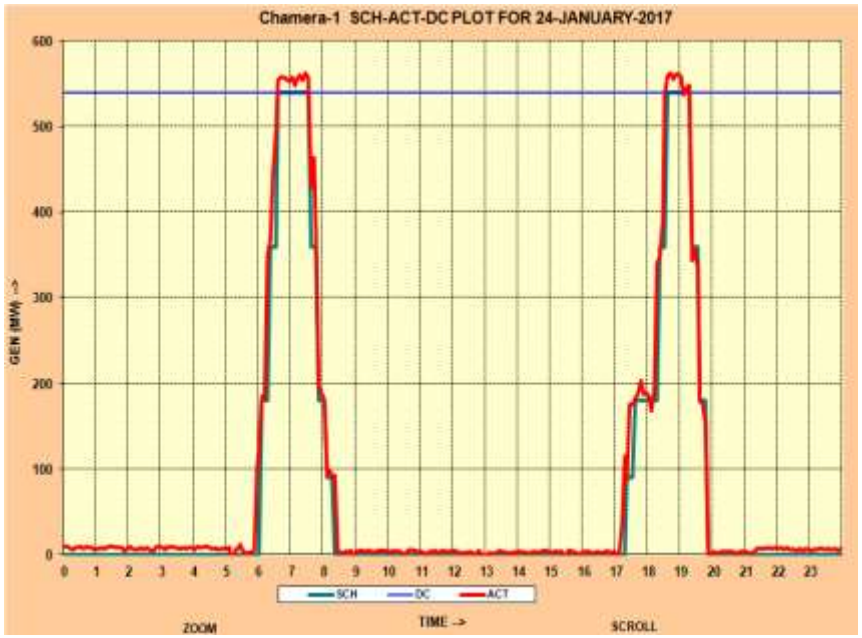
Station Name	Installed Capacity (IC) (MW)	Number of Black start drills in last 5 years	Max/IC (%)	5 min Ramp-Up rate/IC (%)	5-min Ramp-Down rate/IC (%)
Nagarjuna Sagar	815.6	6	57	21	28
Srisailam LB	900	4	> 110	42	34
Srisailam RB	770	3	94	44	51
Upper Sileru	240	3	93	66	69
Lower Sileru	460	5	86	56	53

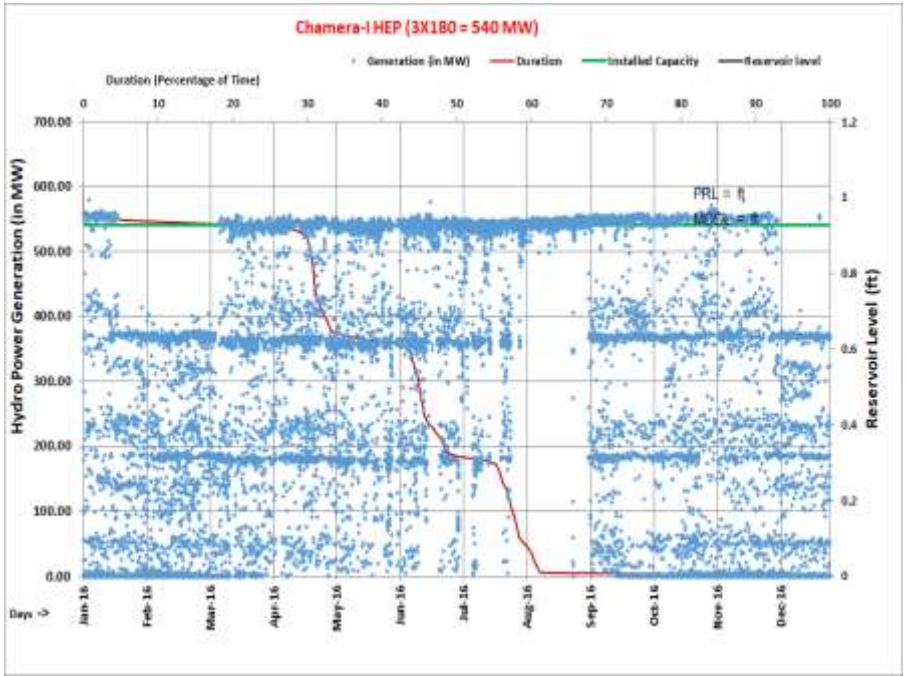
- Flexibility of hydro - overload capability, fast ramping & peaking support
- Immense value for reliable, secure and economic grid operation.
- **Tariff design needs to reflect "Value of Water"**
  - Multi-part tariff to incentivize flexible characteristics
  - Regulatory Framework for Incentivization of Pumped Storage Plants (PSP)

Sample Illustration - Peaking Support from Hydro Power Stations

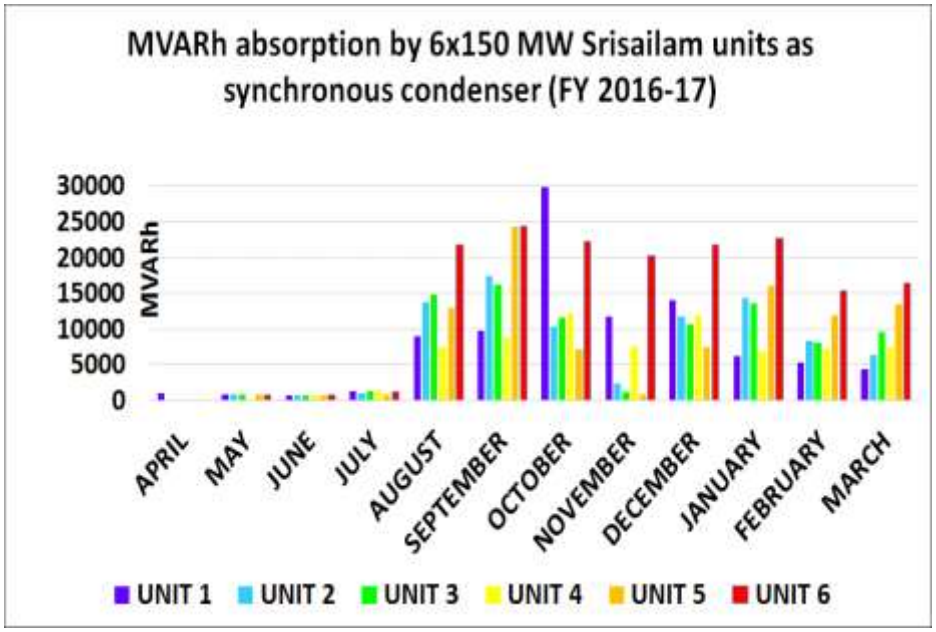


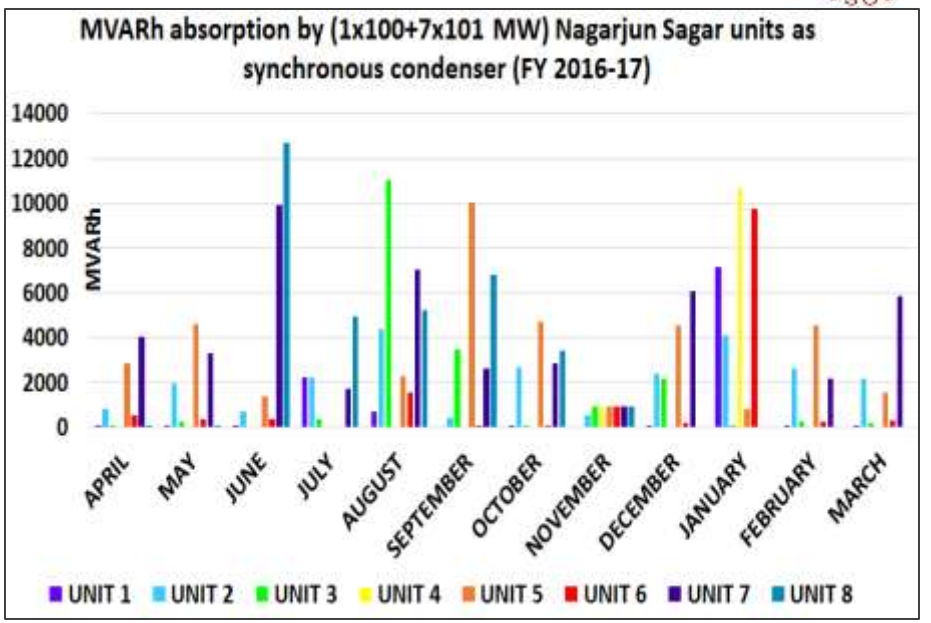






Synchronous Condenser Operation





- **Increased variability of the load pattern leads to voltage variations**
- **Hydro stations in synchronous condenser mode provide reactive power support**
- **Limitations for Hydropower stations**
  - Tariff dependent on only real power output.
  - Additional cost - Drawing energy from grid to meet friction & windage losses
  - Auxiliary Consumption - Power drawn by air compressors etc. as system loss
- **Regulatory Mechanism needed for Reactive Support Ancillary Services**
  - Suitable compensation and incentives for hydropower stations

Model Regulation for Tariff Determination & other related matters for Intra-State Hydro Generating stations 2017

Tariff Recovery (AFC) – 2 Part

(i) Capacity Charge (50%) – Linked to 85-90% annual availability(NAPAF) & 3 hrs Peaking in a day (PAFM)

(ii) Energy charge (50%) – ECR linked to Design Energy(DE)

(iii) ECR capping (beyond DE)

ABT & DSM for Hydro: Ex-ante schedule to be sacrosanct

PSP Hydro – Capacity charge & Energy charge; Prorated reduction in AFC for m/c outage by > 15%; Plant DC to include Gen/Pumping hours & MWh in each mode

RoE linked to Flexibility features:

- Peaking/FGMO/PSS/AVR/Communication/Black-start/Synchronous Condenser facility wherever applicable
- Higher RoE for Storage/Pondage type to promote flexibility
- Incentive for timely completion

Incentivising Black Start Service based on capability demonstration & certification

Incentivising Synchronous Condenser operation

Trial Operation Norms : Compliance to CEA Standards viz. peaking(110%) ,12 hrs at MCR, FGMO, PSS/AVR, Fast ramp, part load operation , islanded operation etc.

Model Regulation endorsed - 61st FOR Meeting (22 Sep 2017)

Need for expeditious implementation at intra-state level

Other Points for Consideration

- Evacuation constraints in Sileru Hydro Complex in Andhra Pradesh

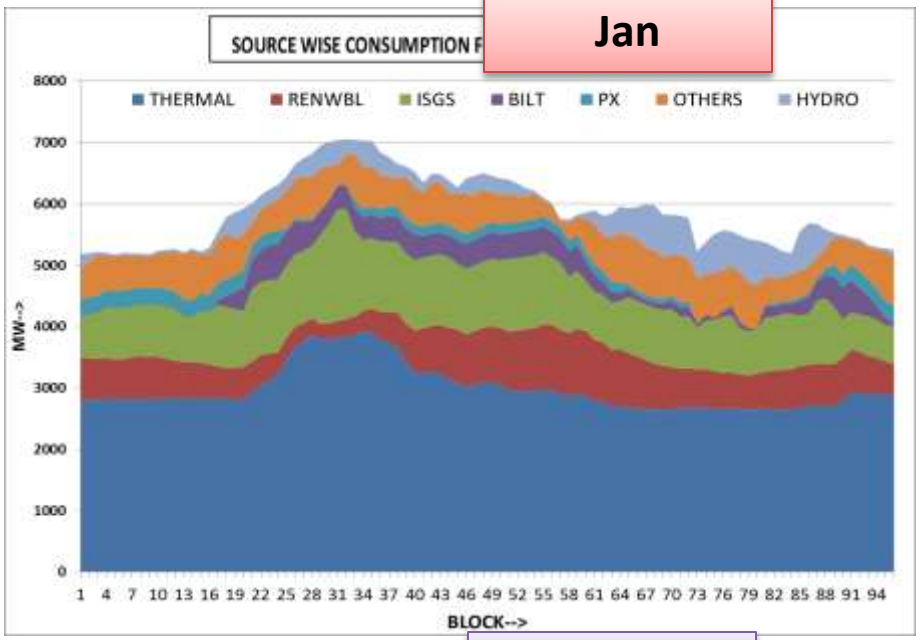
- Rejuvenation of 220kV Balimela-Upper Sileru line

- Synchronous pumping loads - Lift Irrigation Schemes - Useful for power system through their flexibility and demand side management

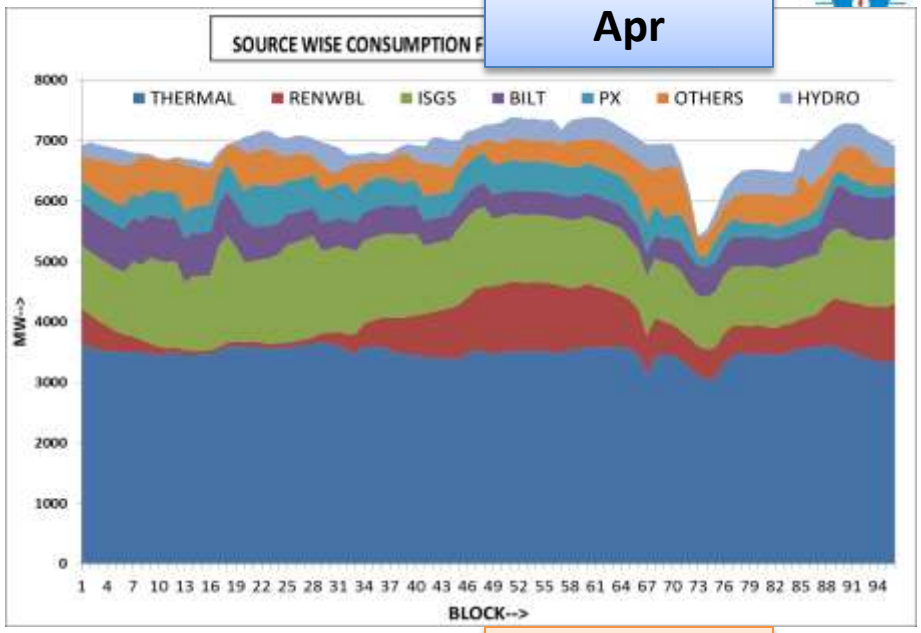
Demand Pattern Analysis of Andhra Pradesh and Telangana

AP Energy Mix Pattern

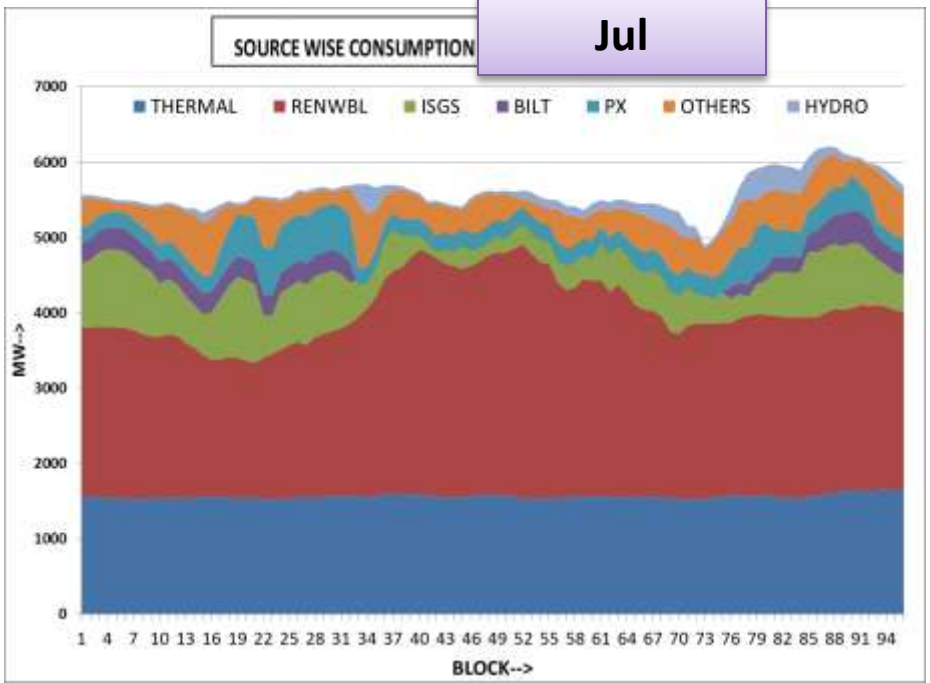
Jan



Apr



Jul



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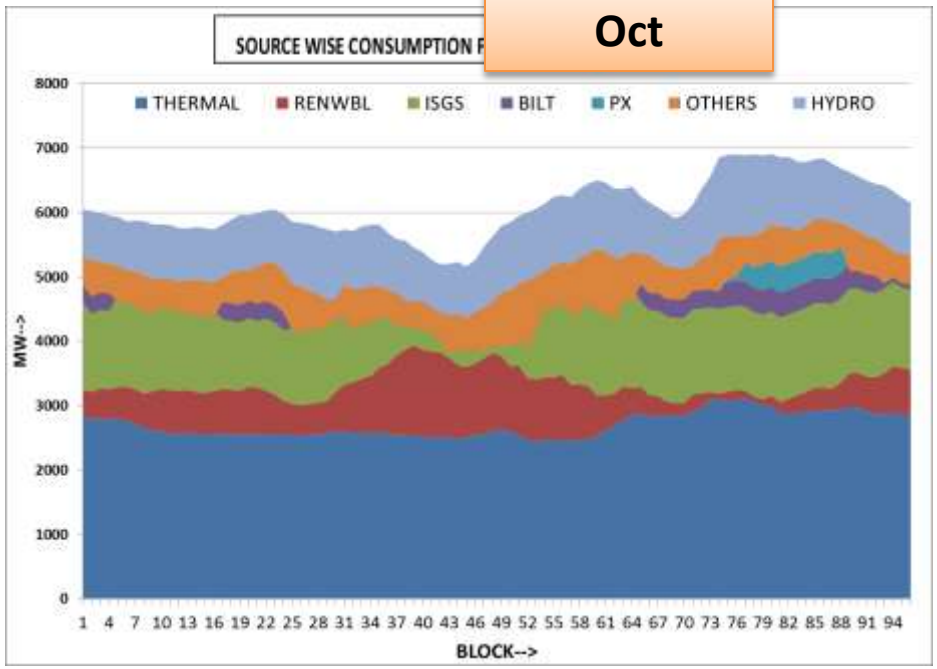

Telangana Energy Mix Pattern

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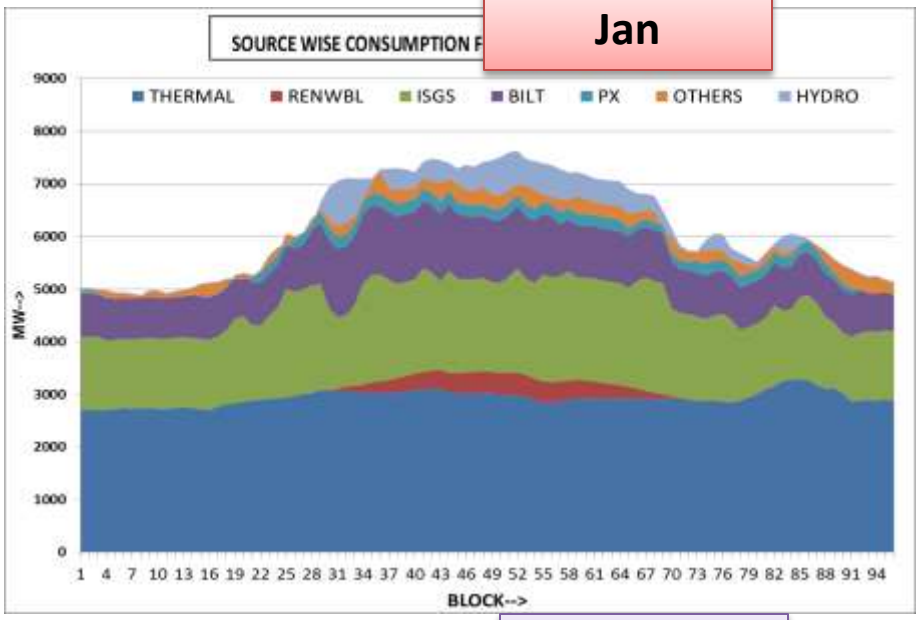

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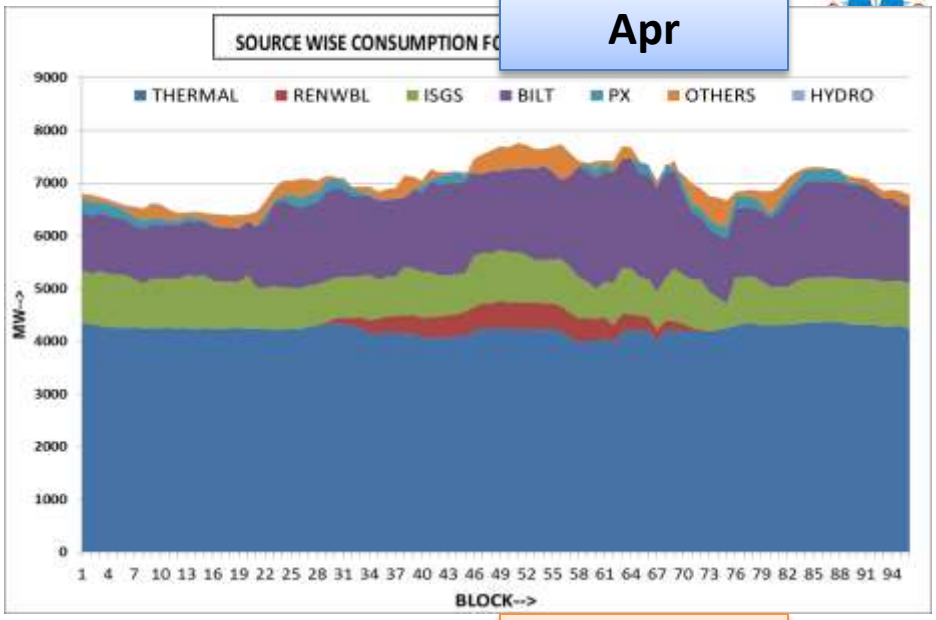

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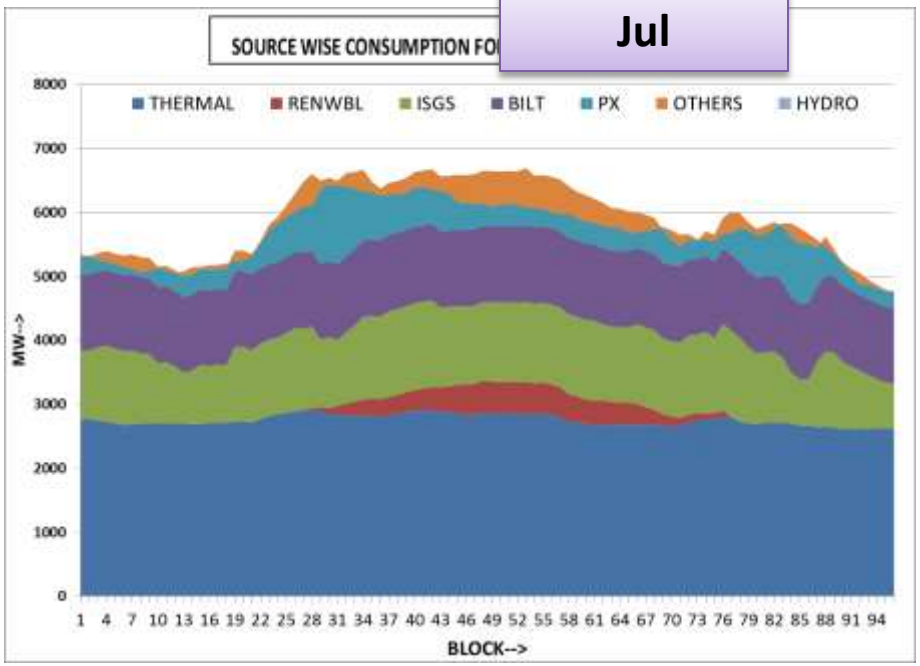

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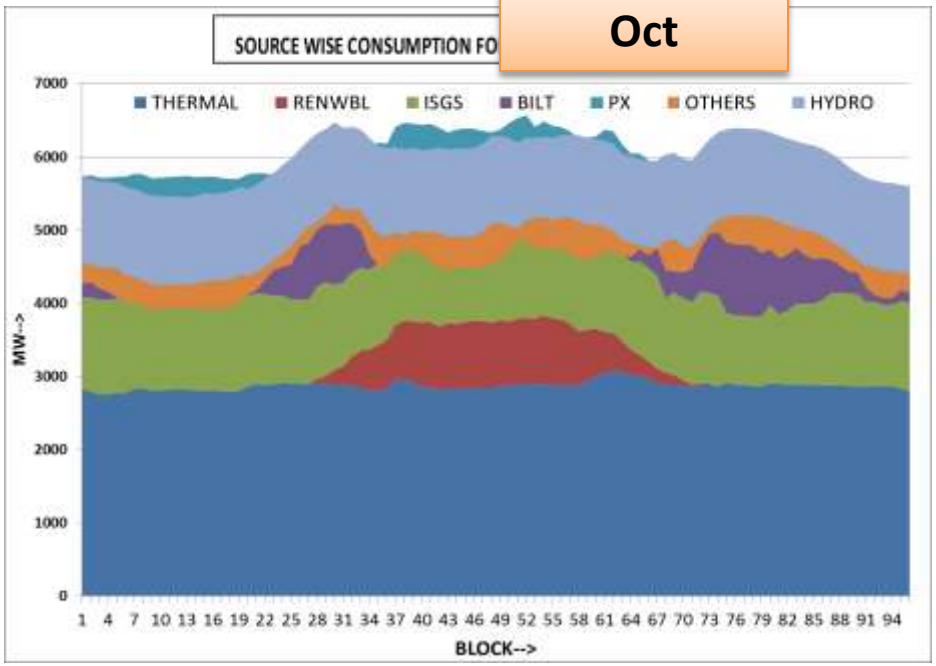
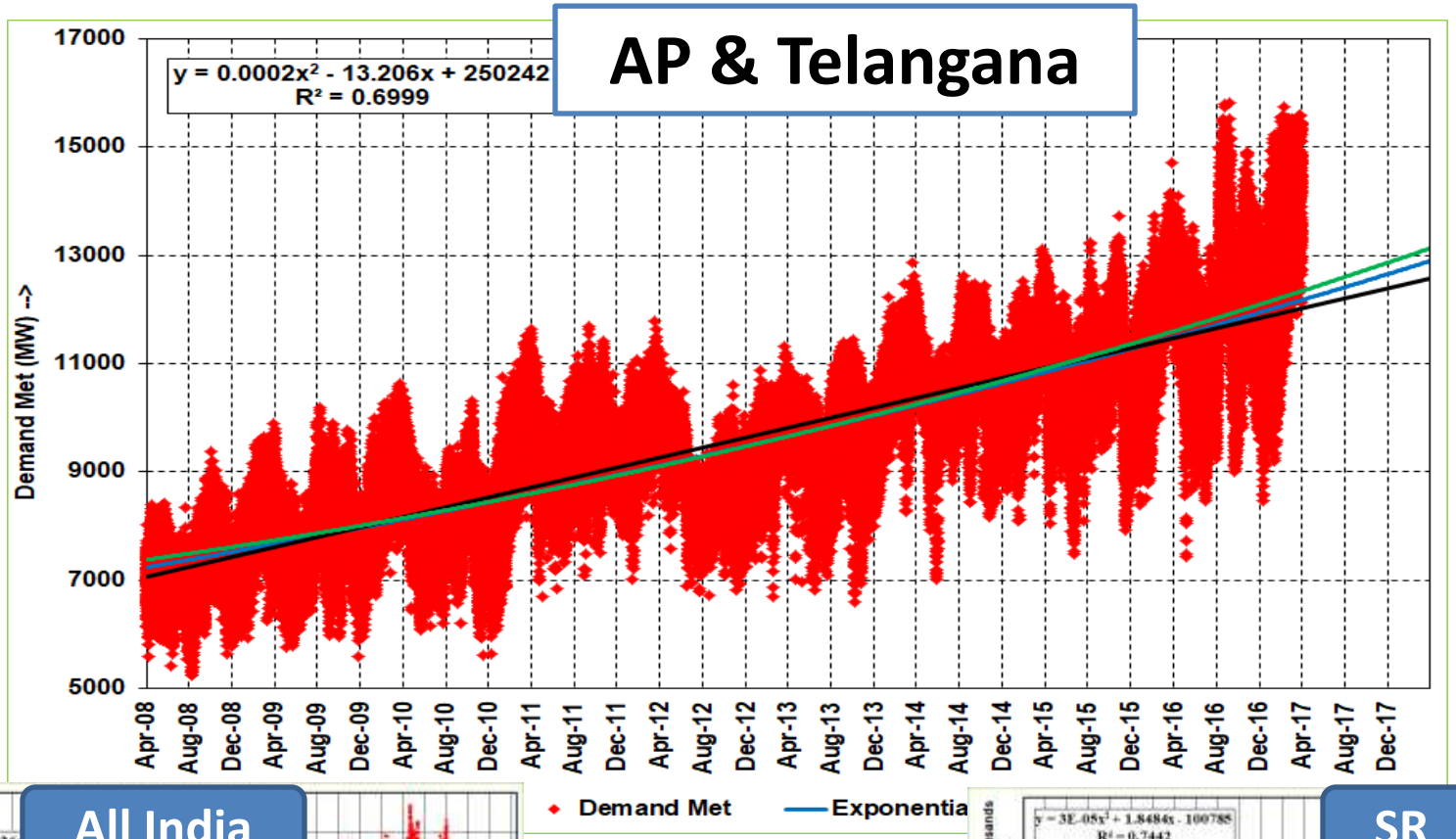
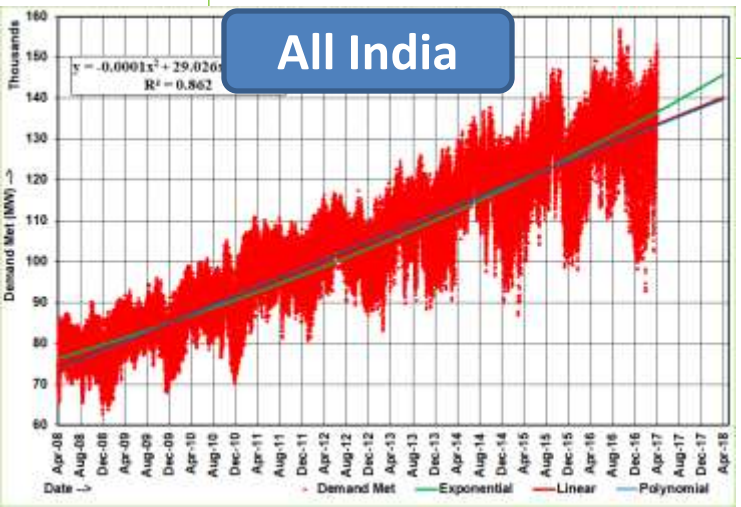


Hourly Demand Met Pattern

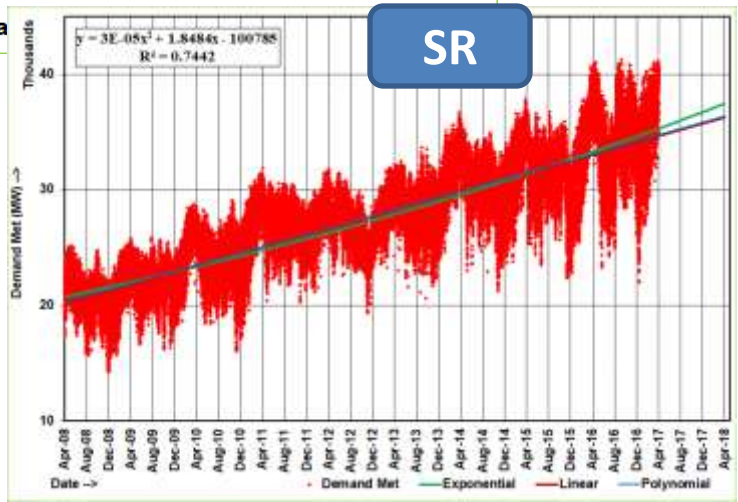
AP & Telangana



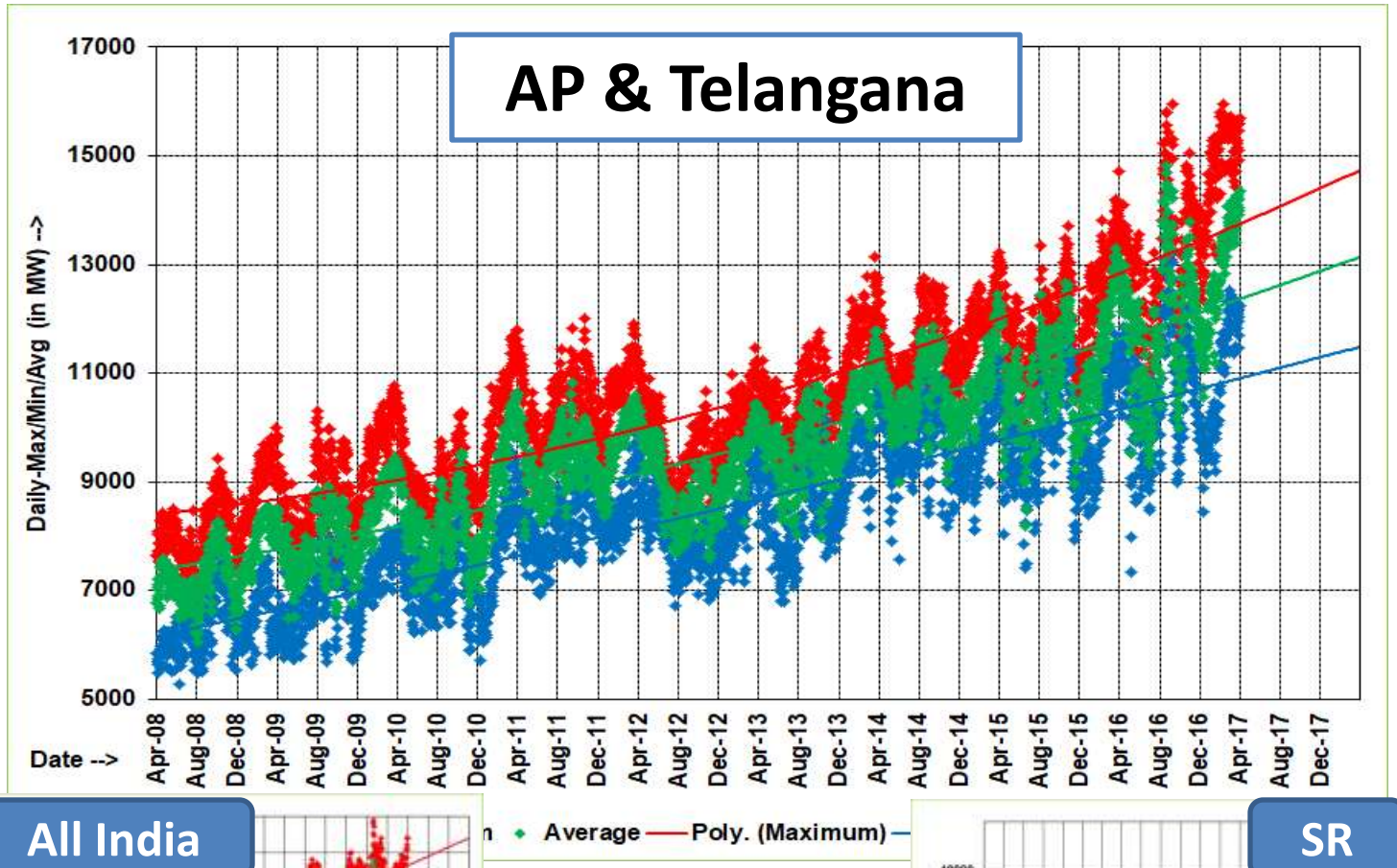
All India

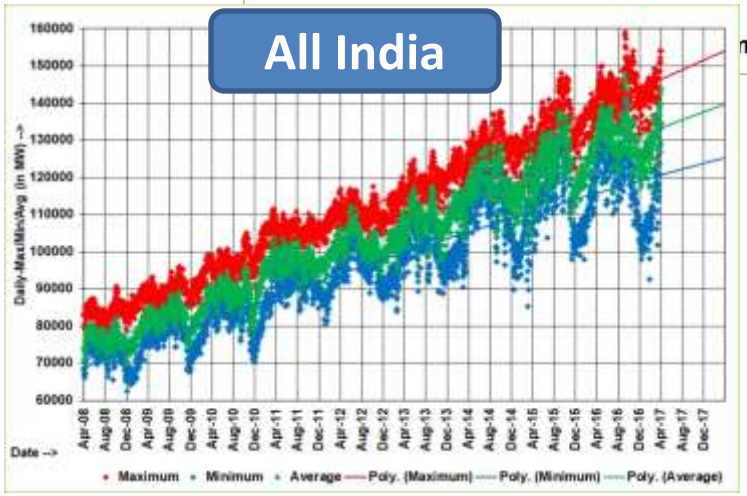


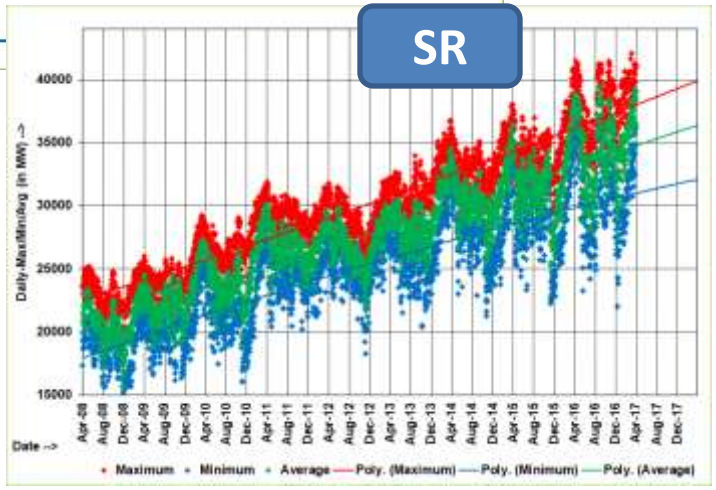
SR



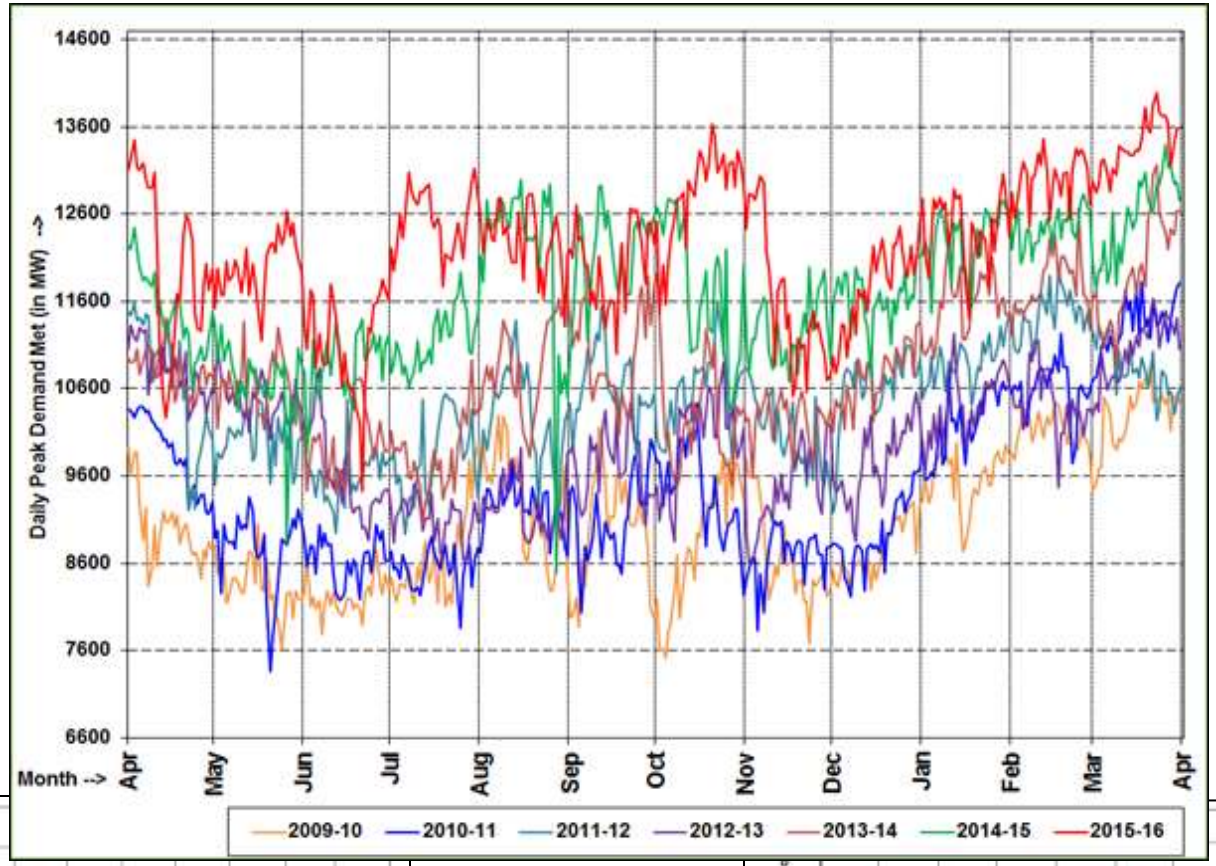
Daily Max., Min. and Avg. Demand Met Pattern (2)



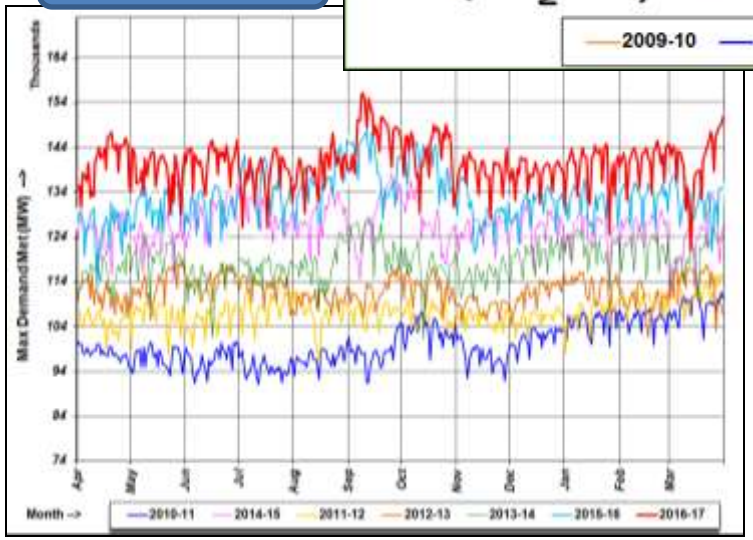




Daily Peak Demand Met Pattern: **AP & Telangana**



All India



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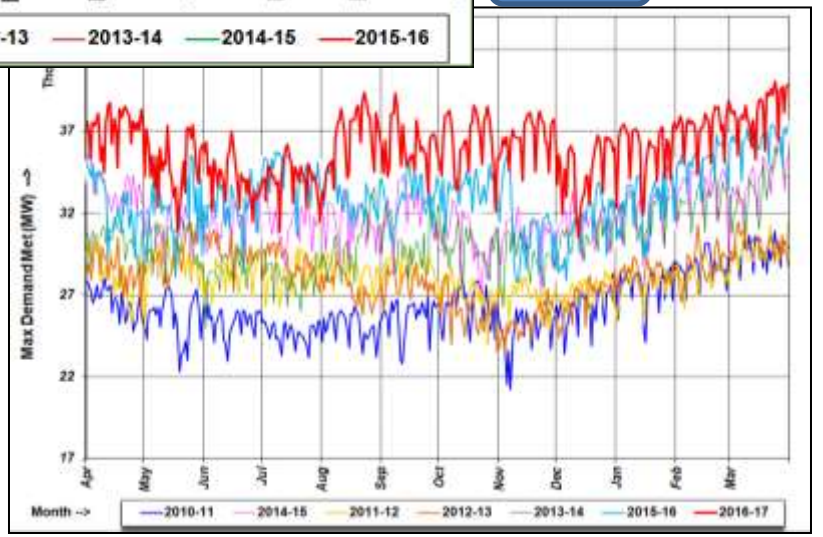
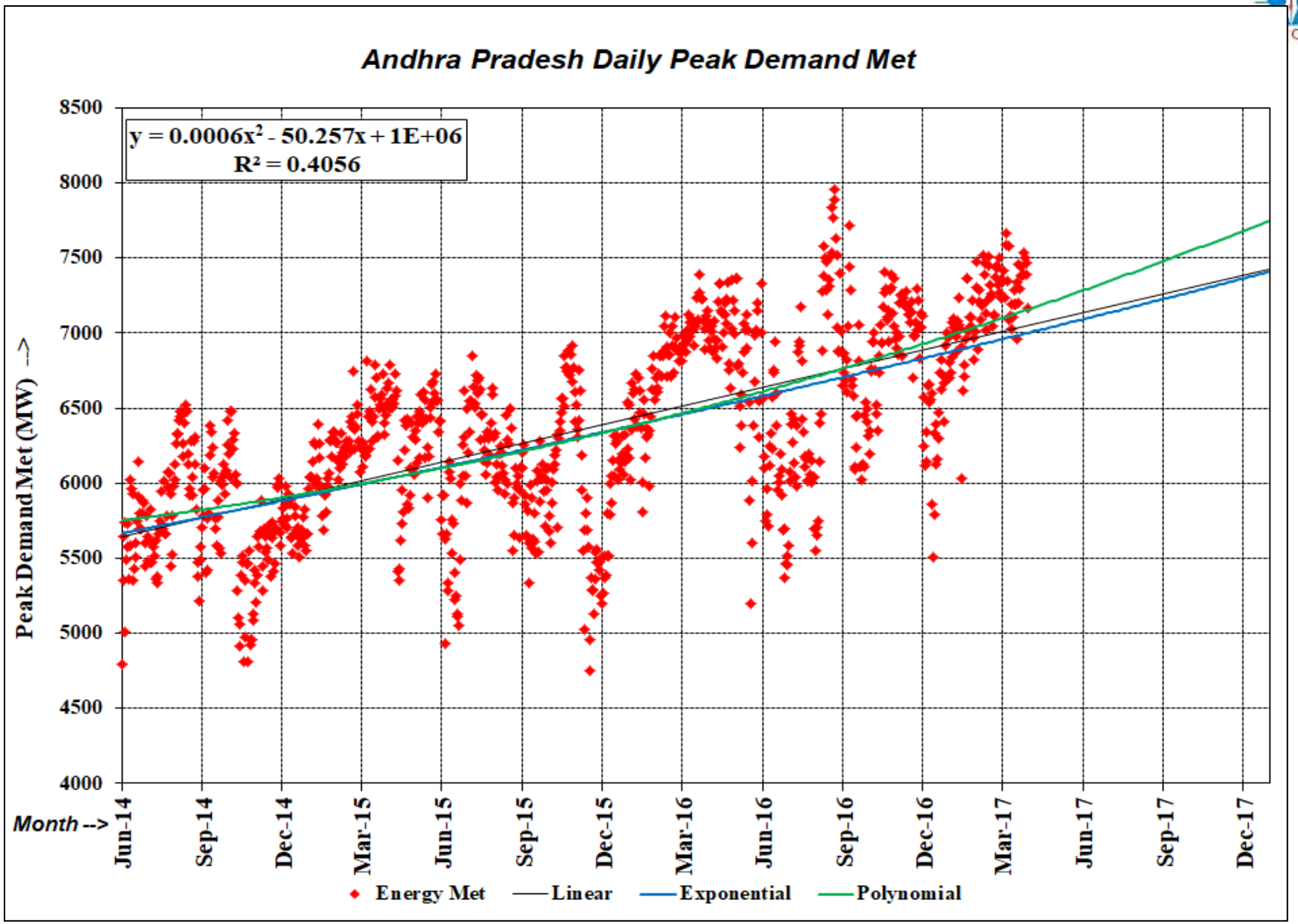
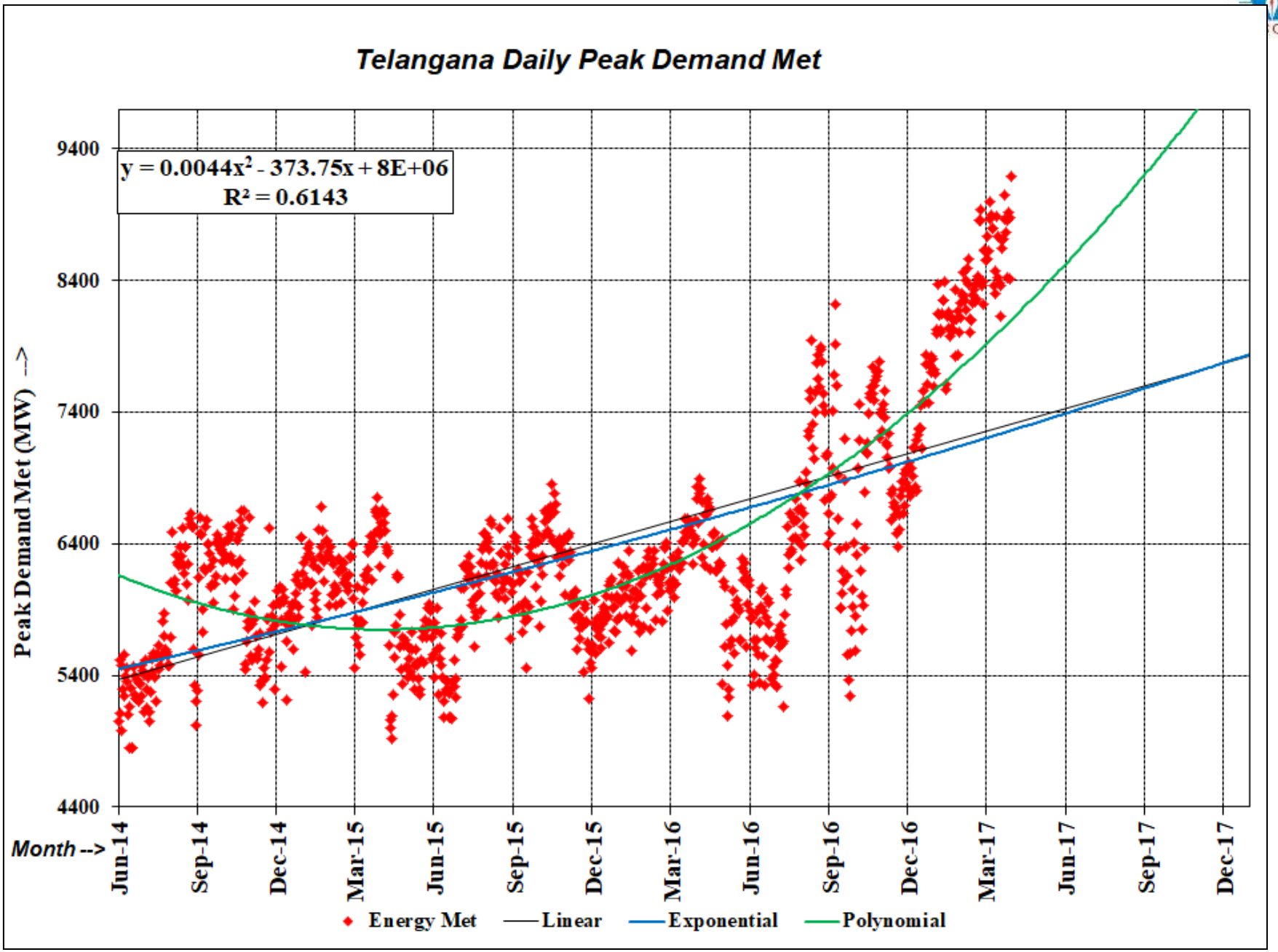


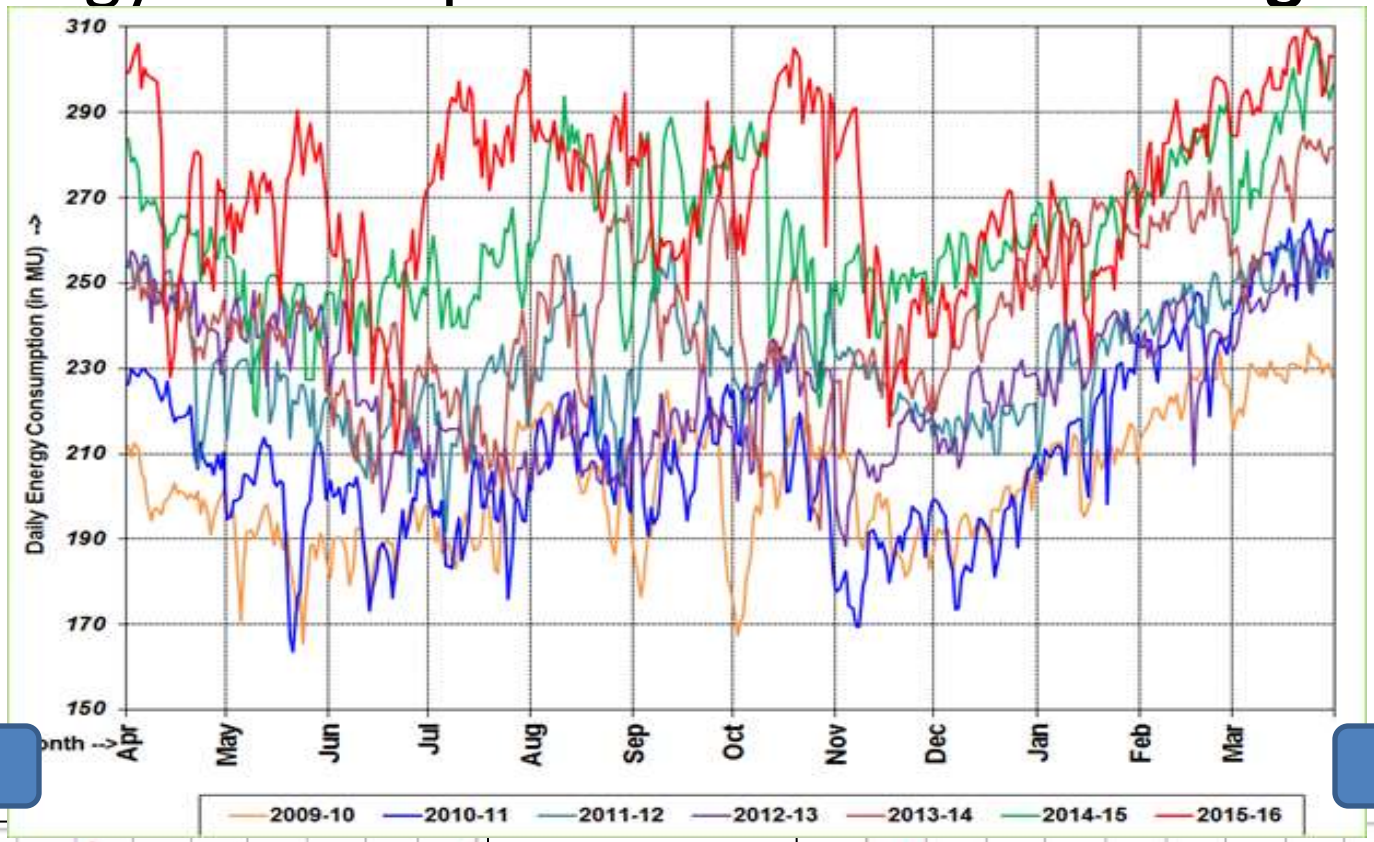
Daily Peak Demand Met Pattern: **AP (2014-17)**



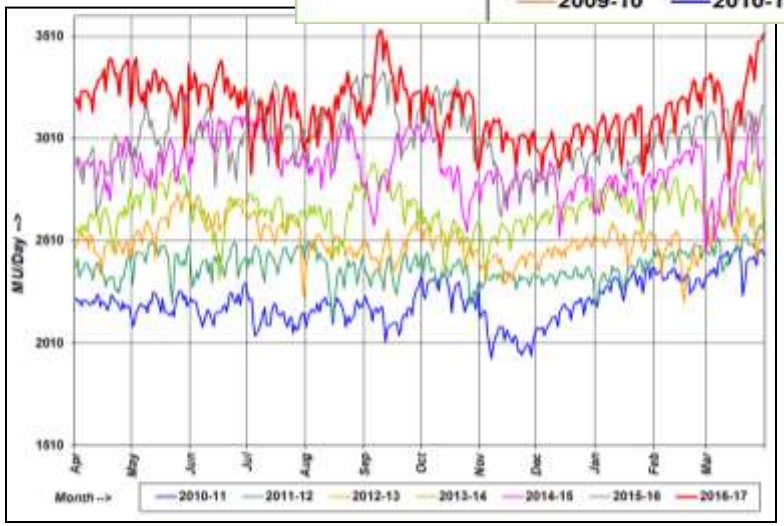
Daily Peak Demand Met Pattern: **Telangana (2014-17)**



Daily Energy Consumption Pattern: **AP & Telangana**



All India



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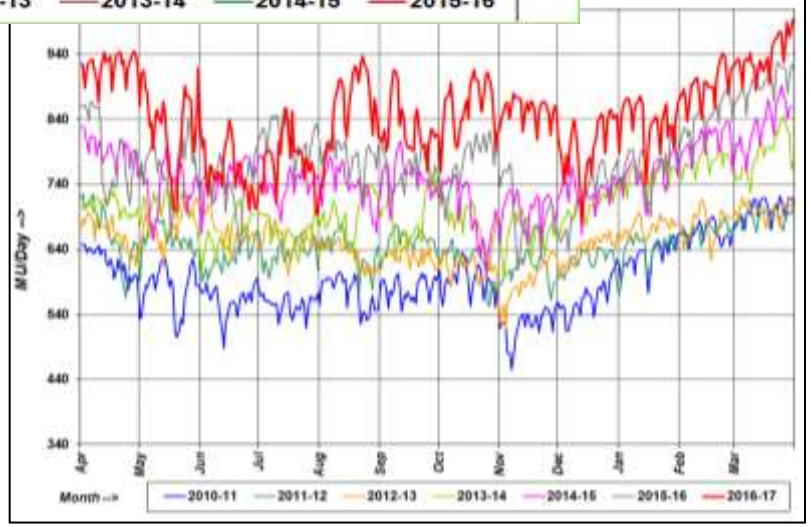
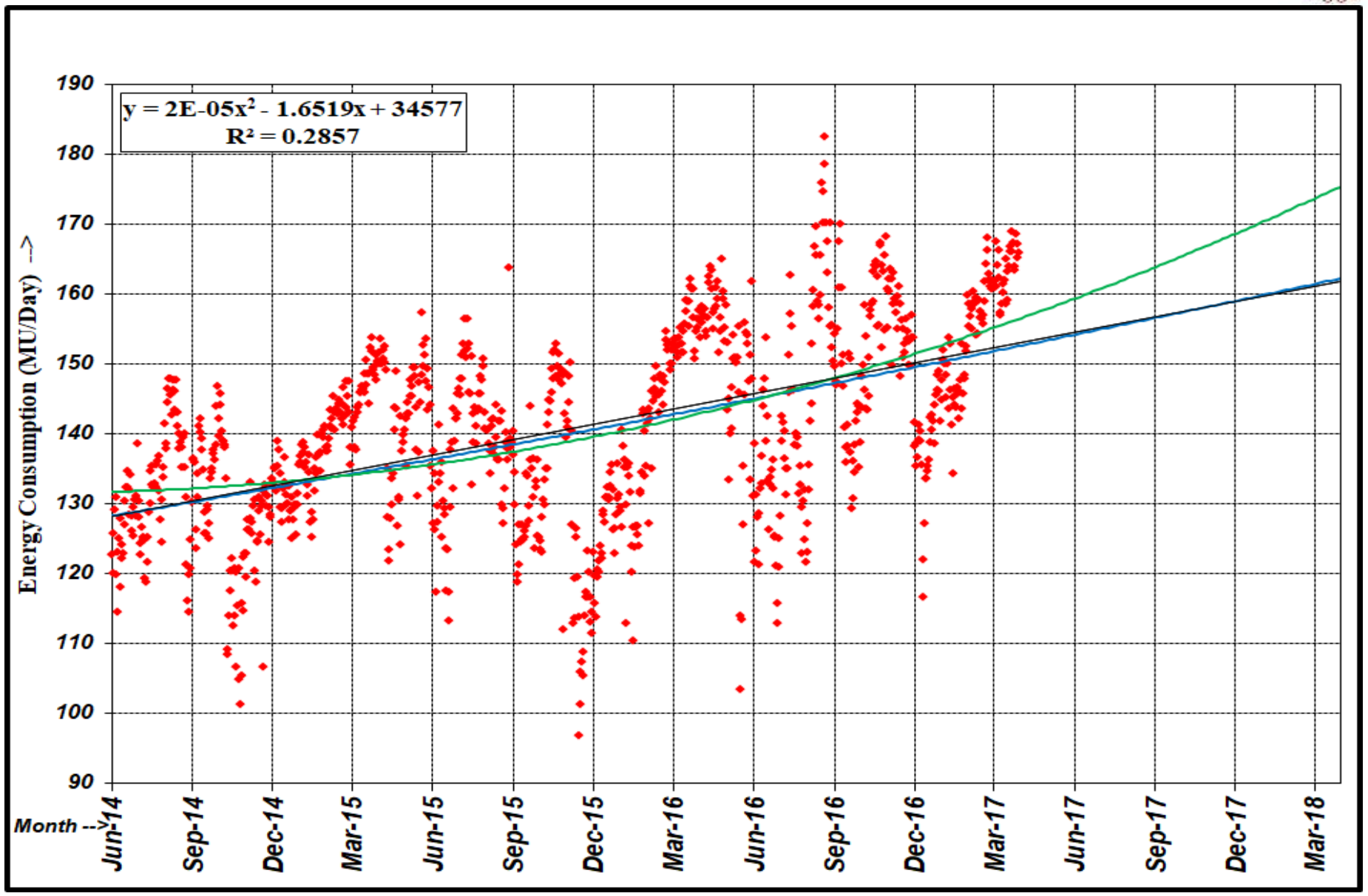
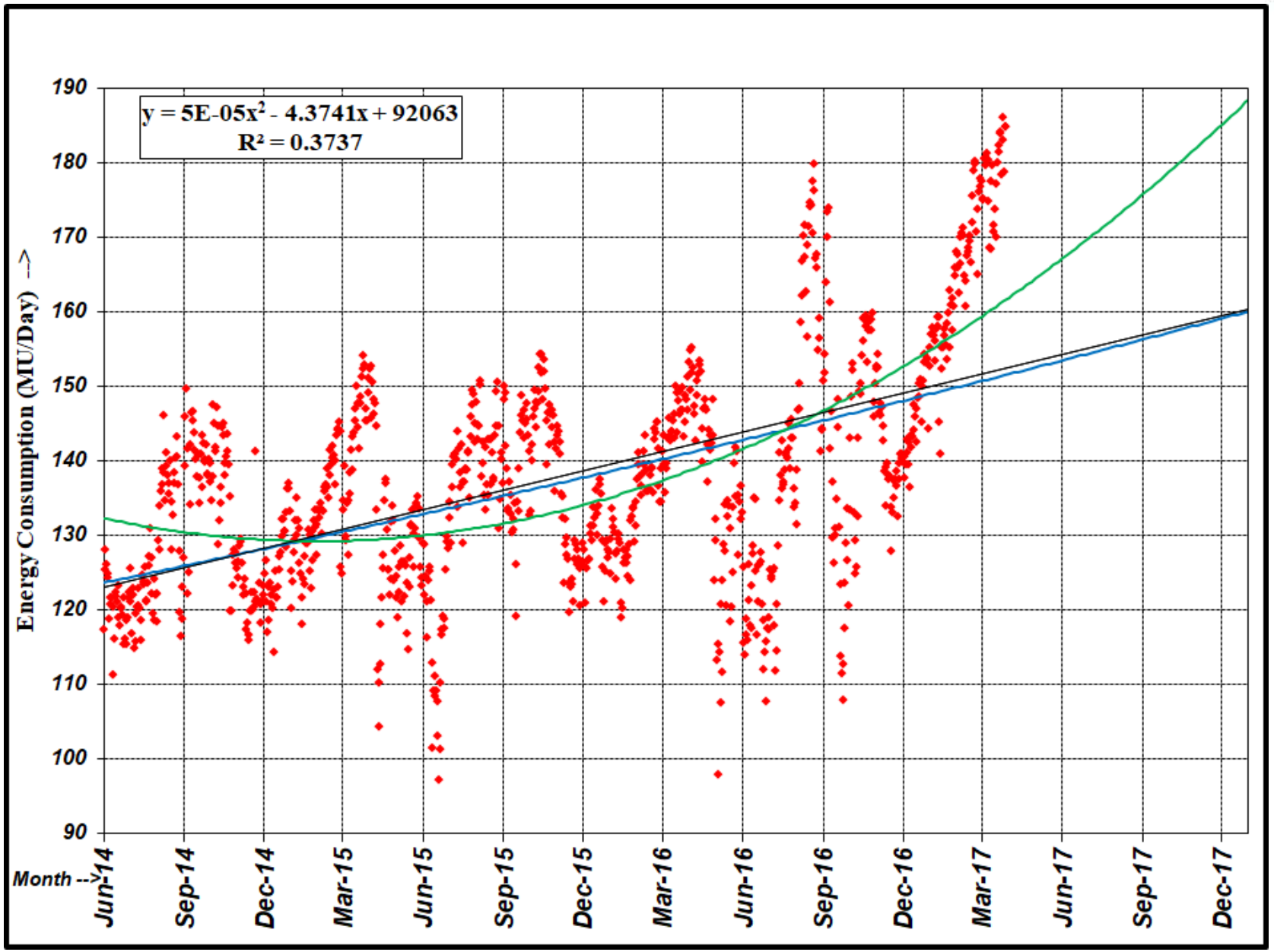


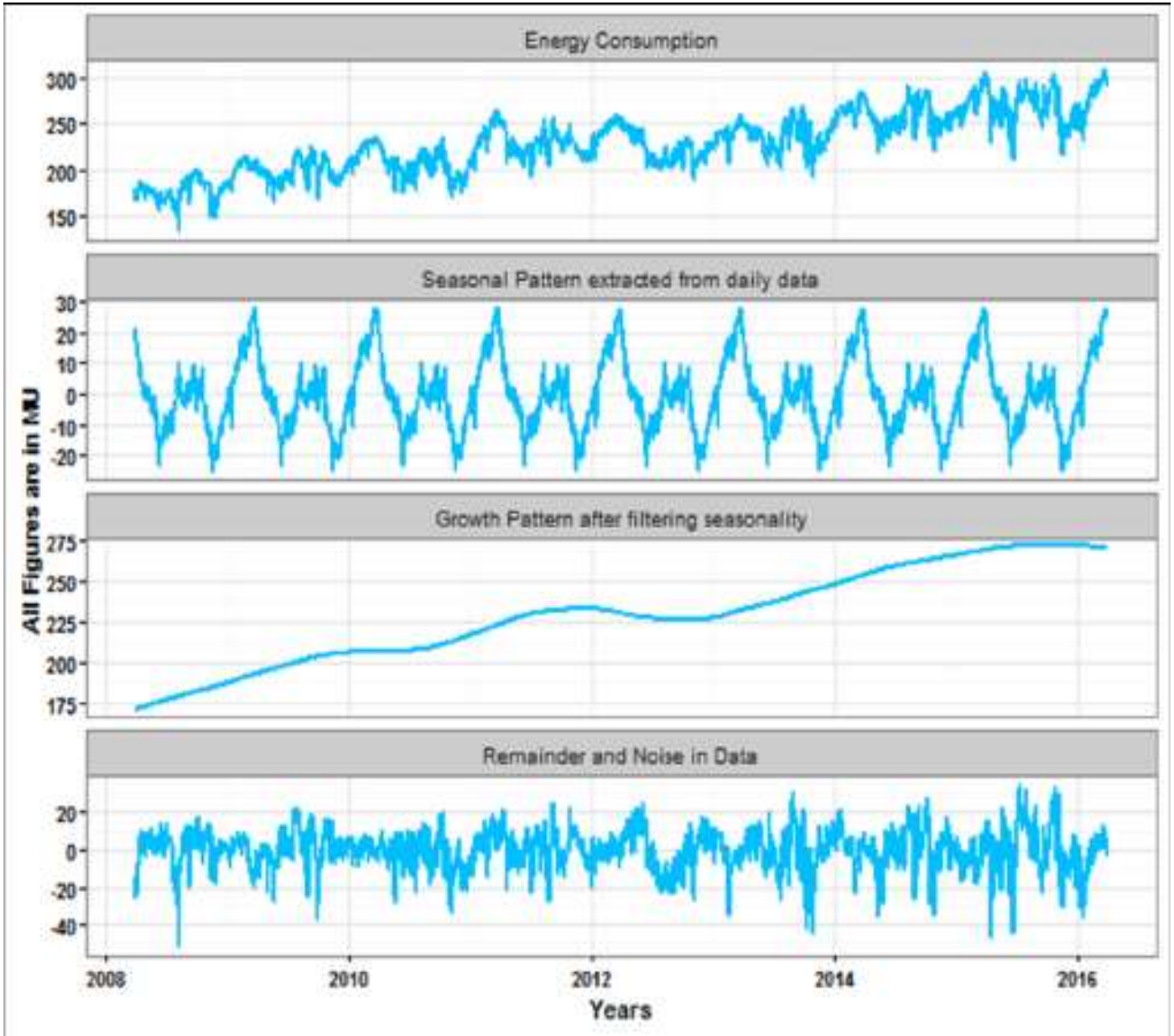
Daily Energy Consumption Pattern: AP **(2014-17)**



Daily Energy Consumption Pattern: Telangana **(2014-17)**

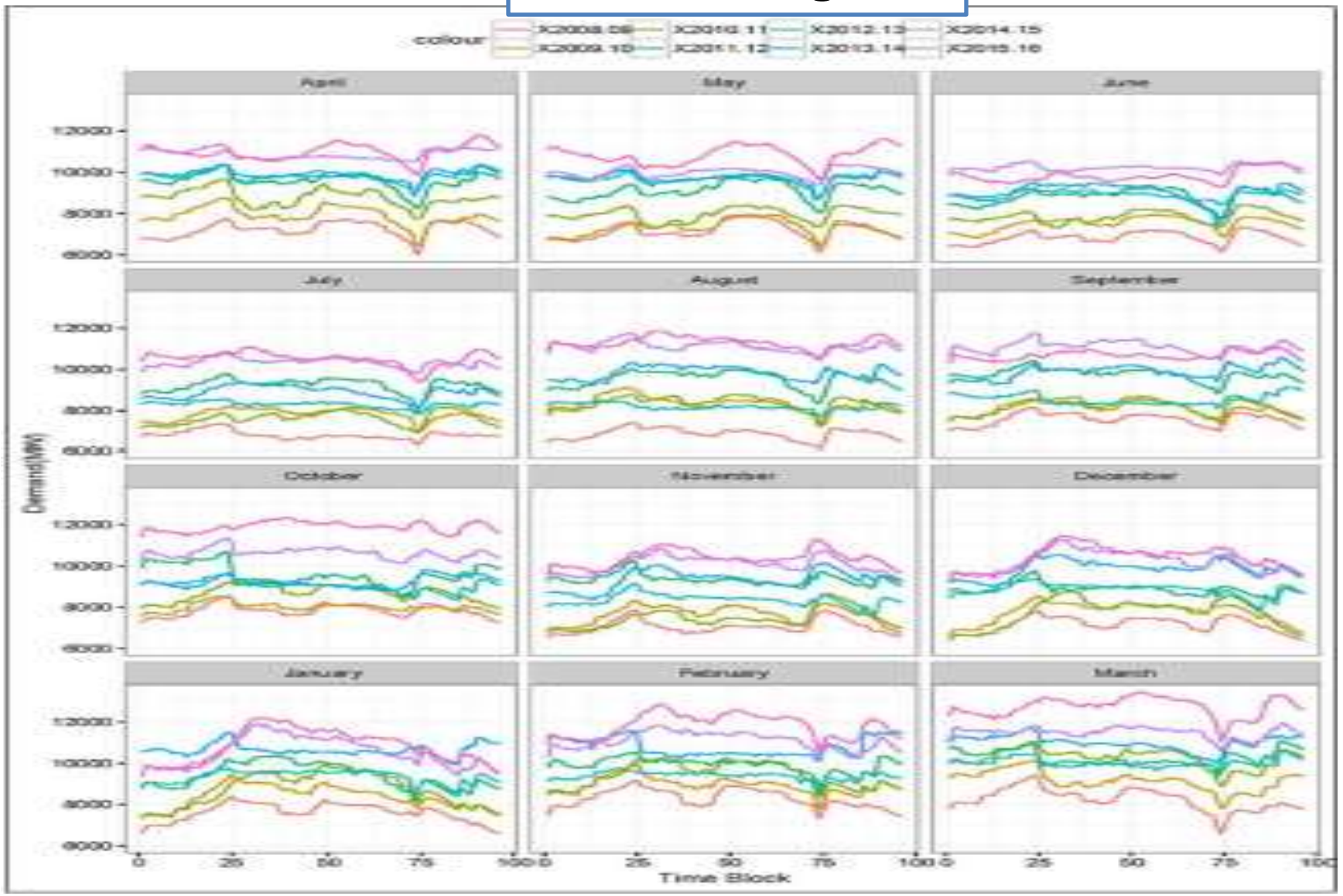


Decomposition of Daily Energy Met:
AP & Telangana

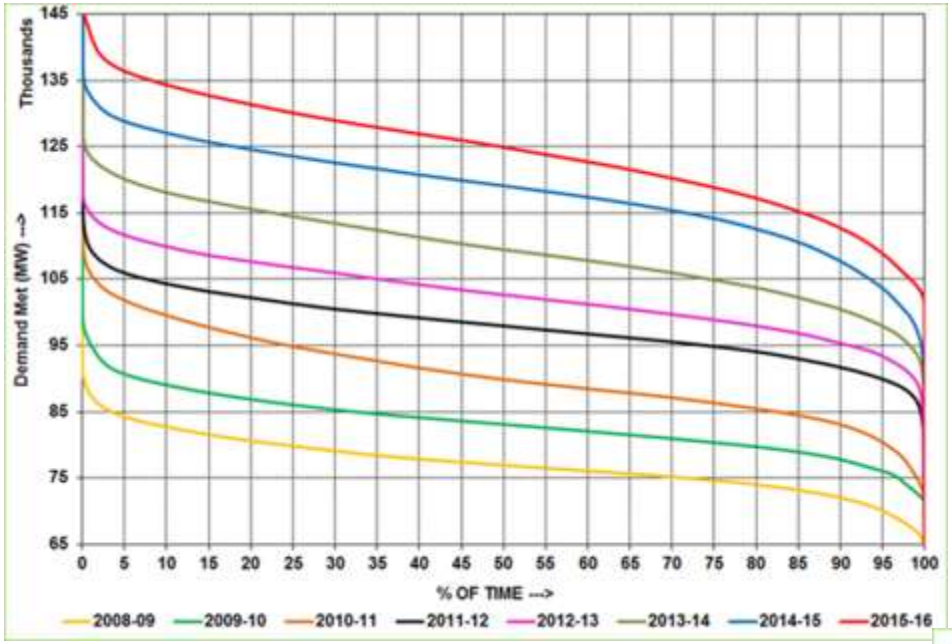


Monthly Demand Met Pattern (2)

AP & Telangana

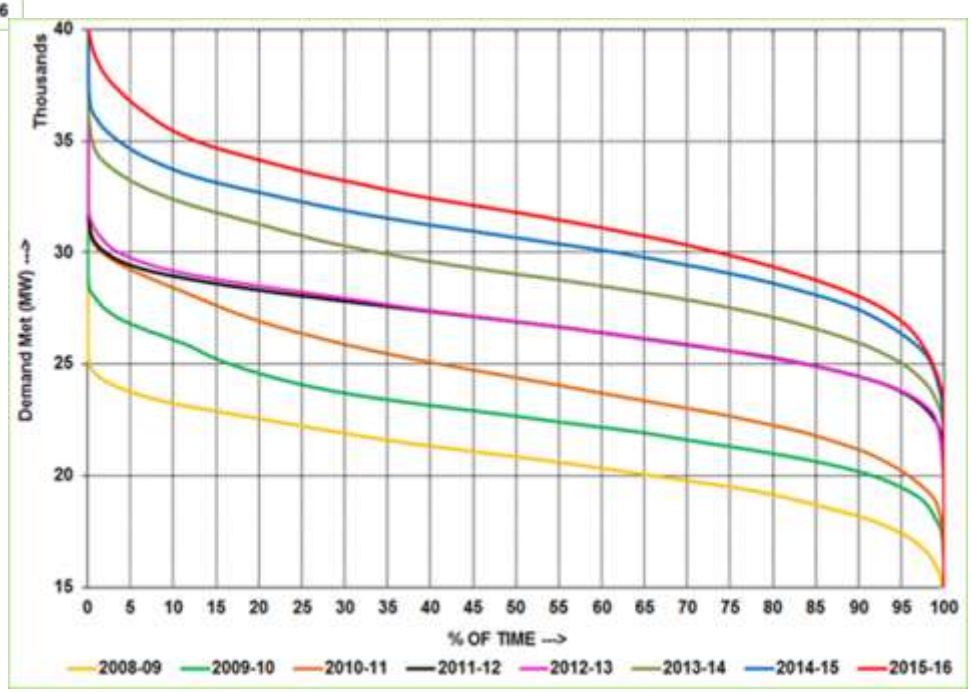


Annual Demand Duration Curve (1)

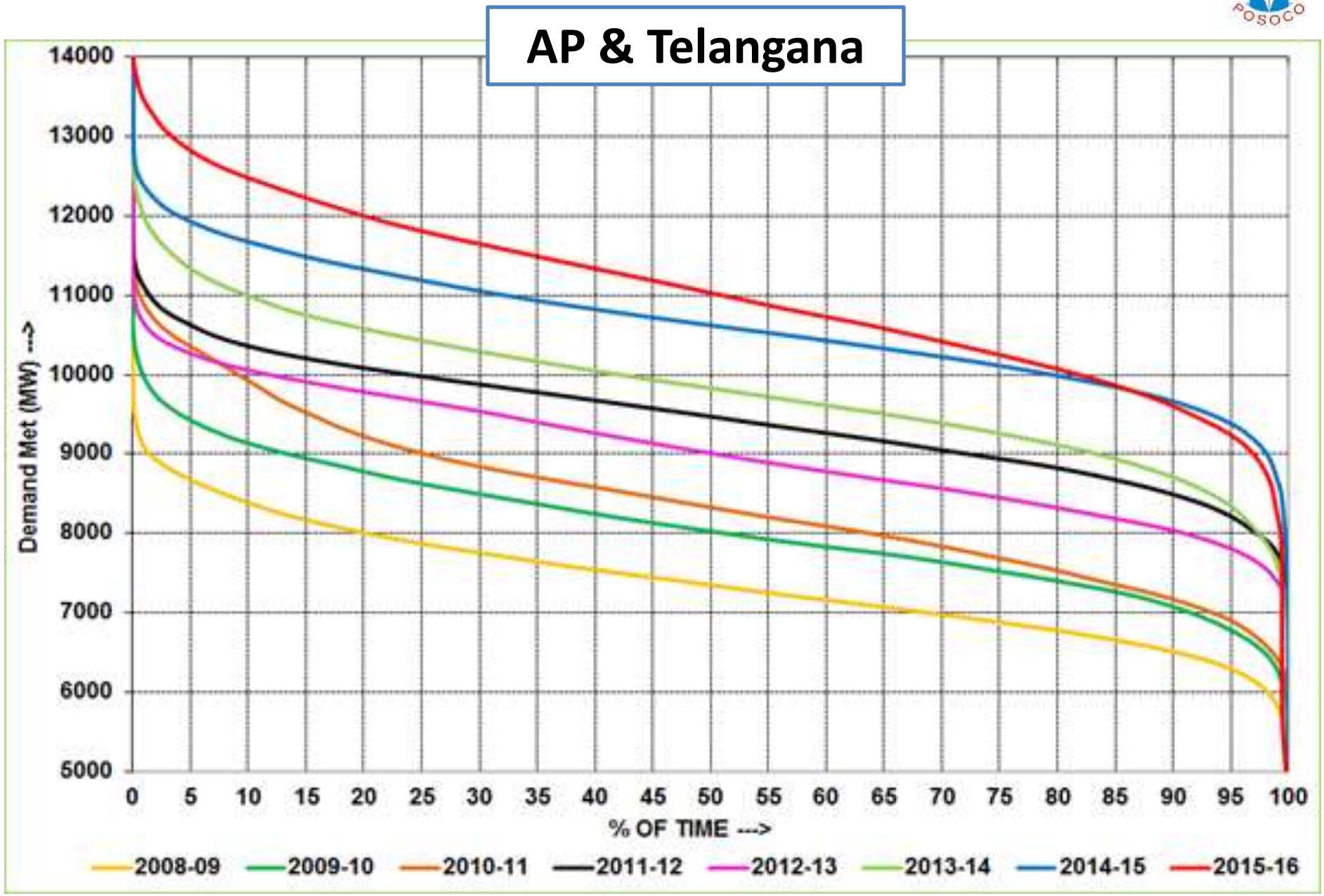


All India

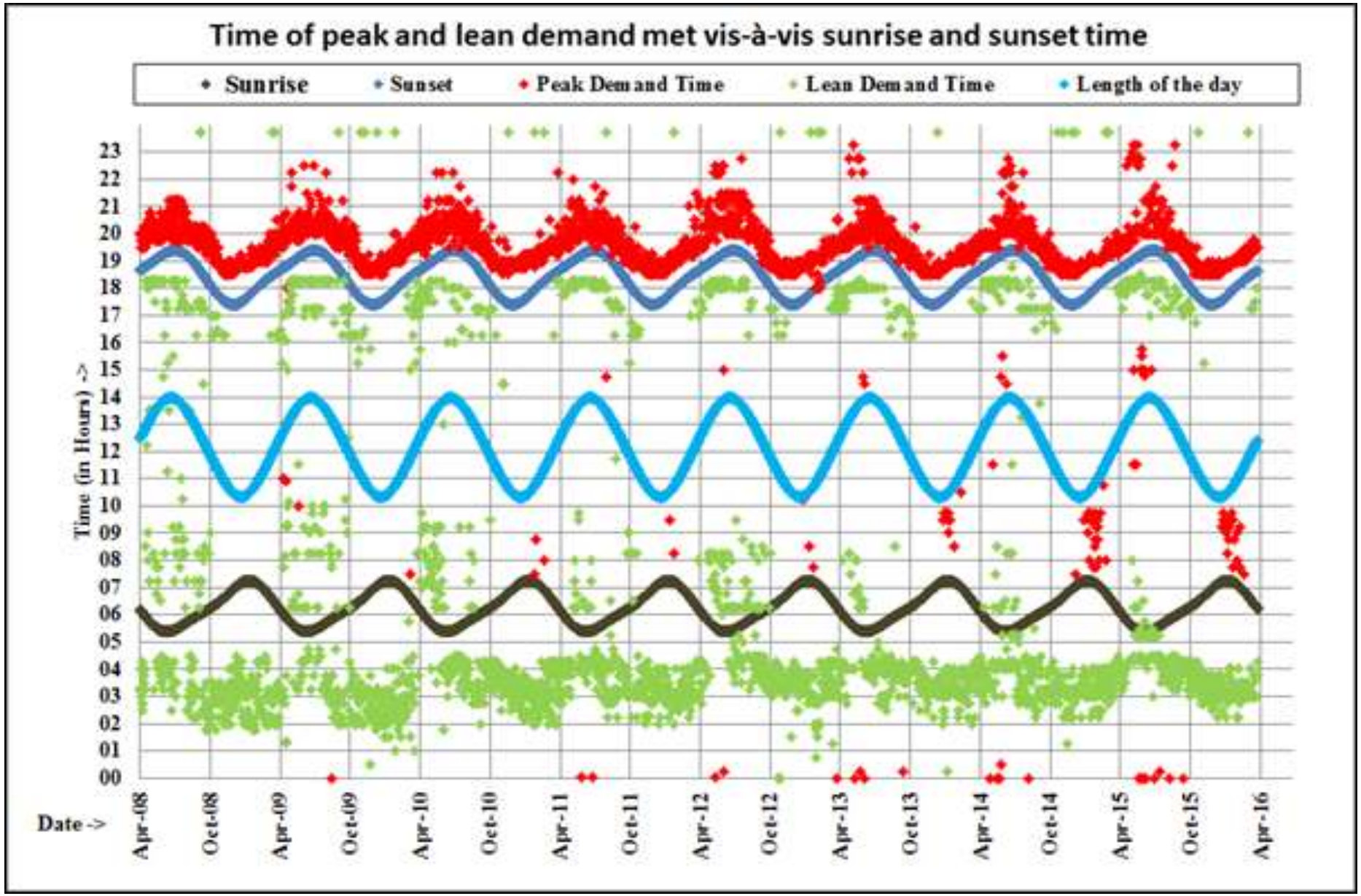
Southern Region



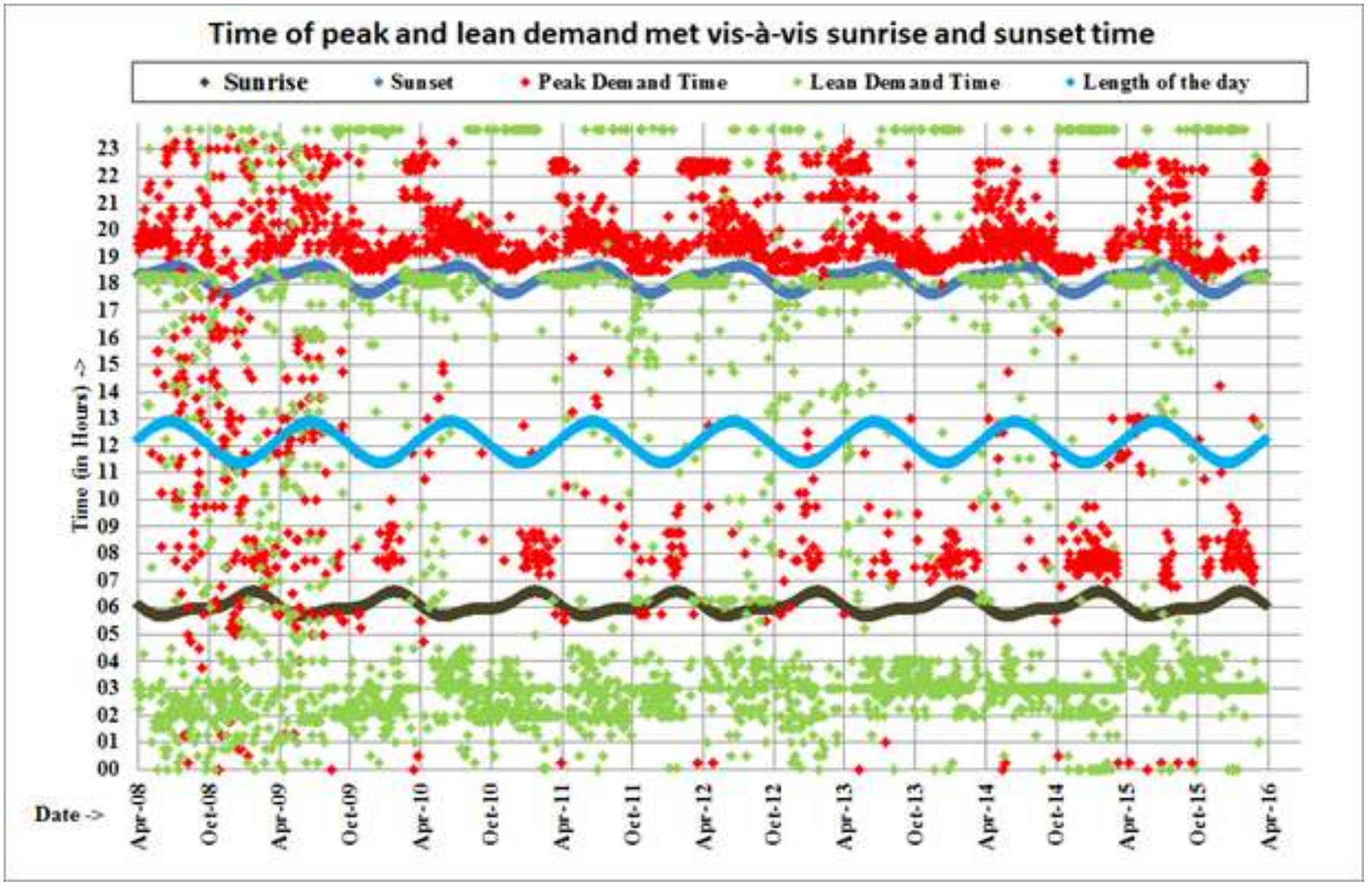
Annual Demand Duration Curve (2)



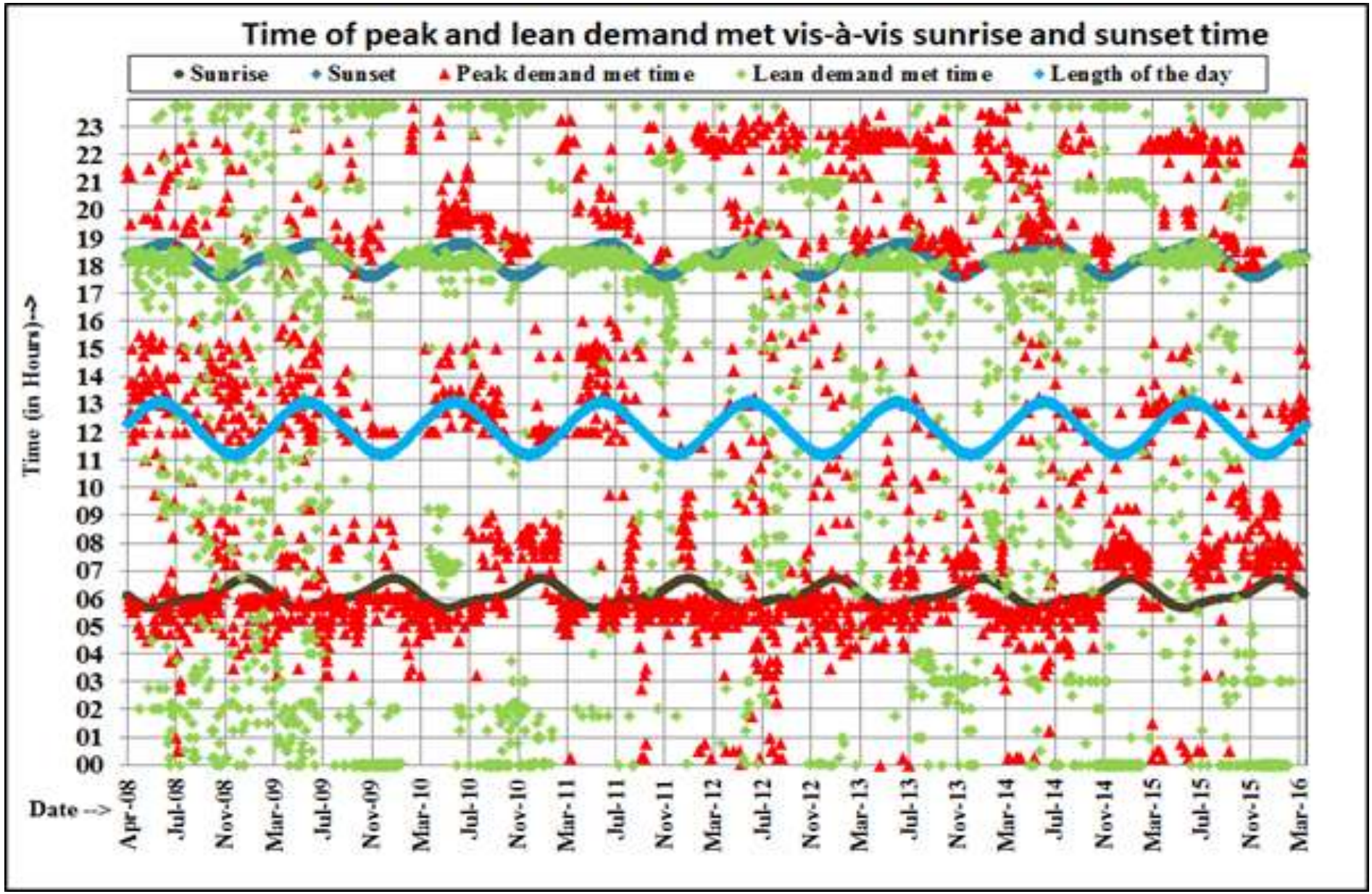
Time of daily sunset, sunrise with occurrences of peak and lean demand met – **All India**



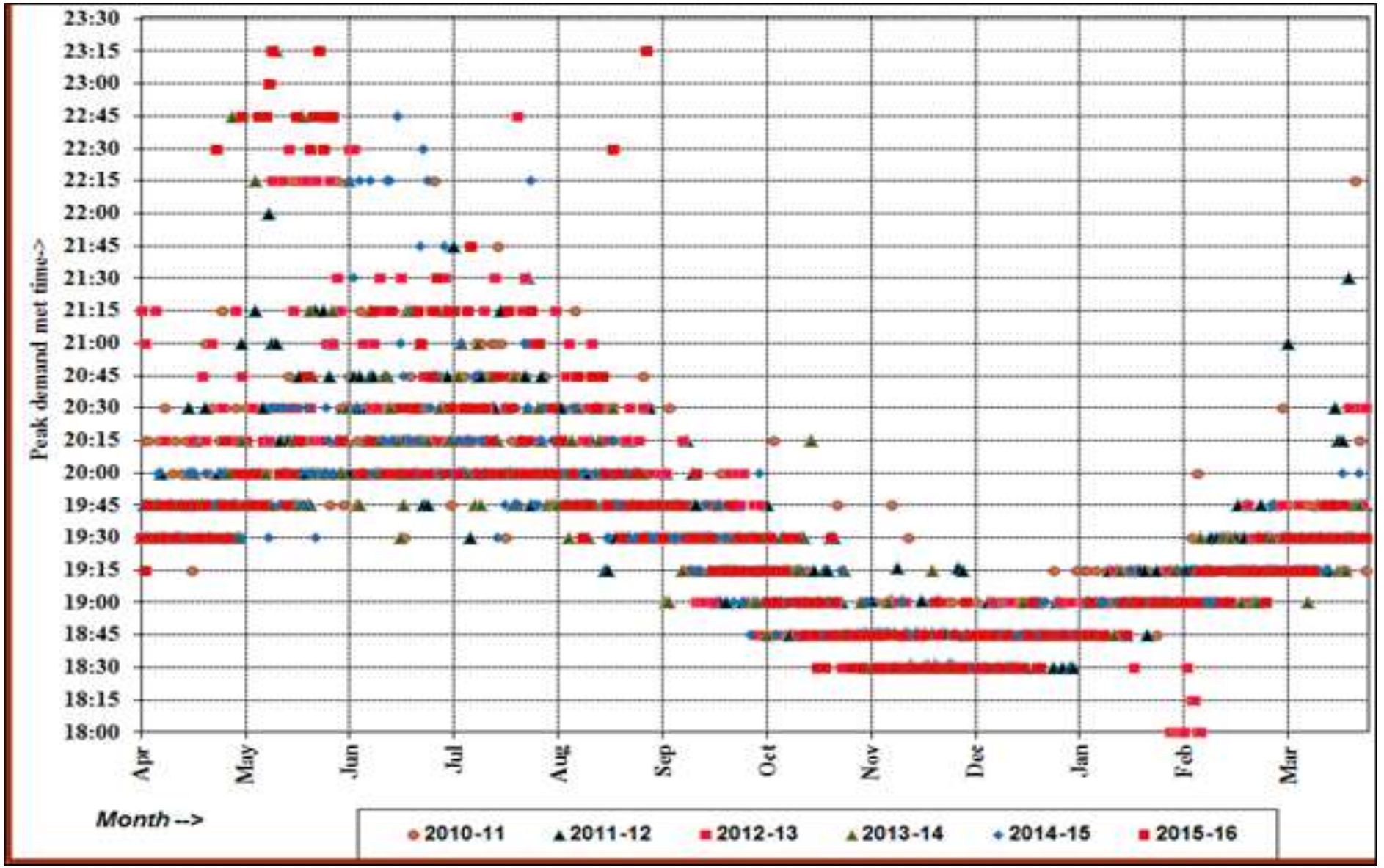
Time of daily sunset, sunrise with occurrences of peak and lean demand met – **Southern Region**



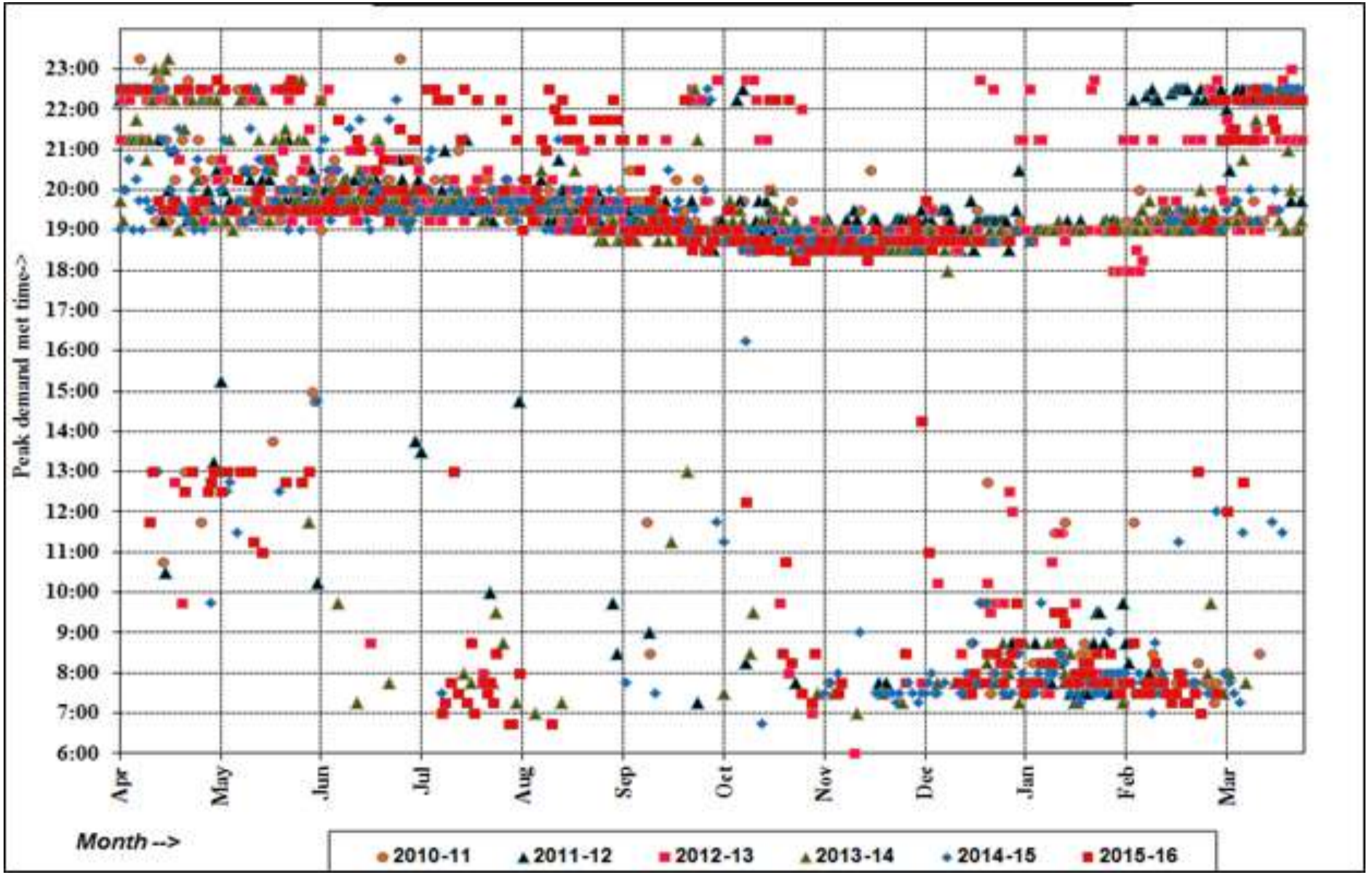
Time of daily sunset, sunrise with occurrences of peak and lean demand met – **AP & Telangana**



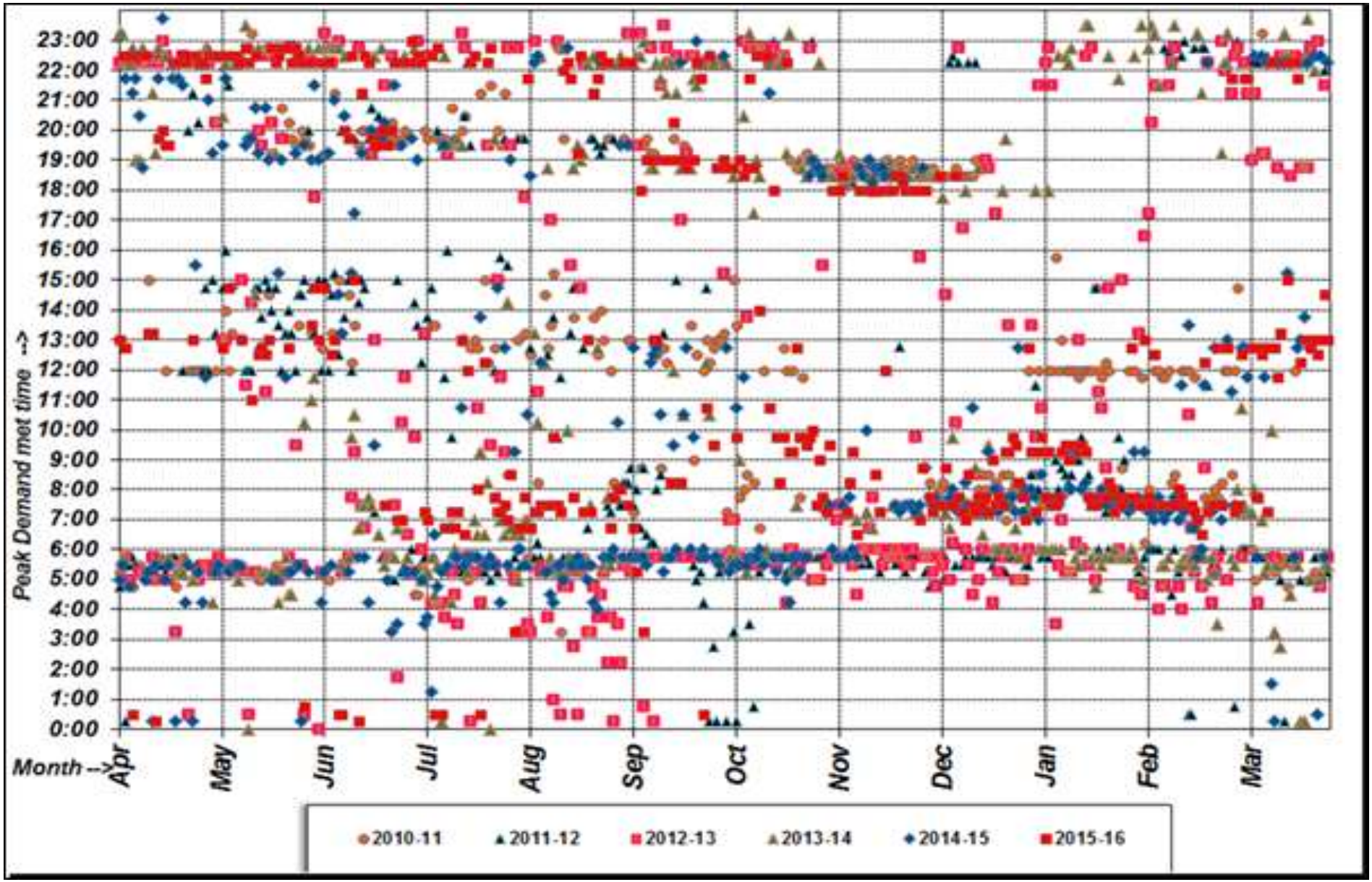
Maximum Daily Demand Met occurrences: Year-On-Year pattern – **All India**



Maximum Daily Demand Met occurrences: Year-On-Year pattern – **Southern Region**



Maximum Daily Demand Met occurrences: Year-On-Year pattern – **AP & Telangana**



Discussion

Thank You !!

Presentation on Proposed Implementation plan for roll out of Smart Meter

Background

- Interaction of Hon'ble Minister of Power on 22.7.2017 with Central & State Electricity Regulators.
- Issue of rolling out of Smart meters and its installation for all consumers to be deliberated at technical committee of FOR.
- **Major Concern**:
  - Whether the remote connection and disconnection feature is necessary
  - If it is possible to bring down the cost of smart meters.
- Meeting with meter manufacturers, ISGF, DISCOMs, industry experts on 19.7.2017 and 31.7.2017.

Clause 8.4 of tariff Policy dated 28.1.2016 provides as under

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

Appropriate Commission shall, therefore, mandate smart meters for:

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

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

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

Features of Smart Meters

- **Measurement of Electrical parameters**
- **Two way communication**
- **Remote Connect disconnect / load limiting features**

Electrical Parameters

- Voltage, phase current, neutral current, power factor, real time clock, frequency, apparent power (KVA), active power (KW), cumulative energy (KVArh and KW (import and export)), maximum demand (KW and KVA), cumulative tamper count, cumulative billing count.
- instantaneous values as well as cumulative values for the specified period.
- Utility can make use of instantaneous values for determining fault location or maximum demand
  - extensive control centre at remote location along with data management software to manage the quantum of data and logical/effective use of data.

Two way communication

- Remote metering- do away with meter readers
- Set dynamic ToU tariff
- Technology of communication
  - Radio Frequency
  - GPS/GPRS
  - Need for parallel network and skilled manpower
  - Choice to Utility!
  - EESL Auctions

Beneficial use of two way communication

- Notification of Time of use (ToU) tariff or Time of day tariff (ToD) or dynamic pricing
- Installation of control centre with backbone communication system, SCADA, IT
- Training of manpower for advanced IT, communication system handling and data management
- Customer sensitisation on benefits of smart meter to make the scheme acceptable and successful.

Concerns

- Privacy of data
- Data mishandling or hacking
- Cyber security

Remote connect-disconnect/ load limiting feature

- Load limit value (KW)
- Utility when
  - Prepaid metering
  - ToU/ToD/Dynamic pricing framework is in place
    - Agreement with utility to pay extra
    - Supply capacity control
      - Two switches (essential load / non-essential load)
    - emergency supply capacity control
    - Temporary disconnection for relief from MD charges
- Whether it should be there?
  - Customer elasticity..non esssential load
  - Industrial customers.
  - Cost-10% of meter cost..as per manufacturer
  - Can be disabled-factory or remote

Features available in existing electronic meter

- Basic Electrical parameter measurement
- 30 minutes block for 60 days
- Option of 4 registers for ToU
- AMR results-communication channel required
- Whether retrofitting possible?

Estimates

- ISGF:
  - 5 crore for consumers>200 units/month
  - 25 Crore: all consumers
- Manufacturing capability for normal meter: 2.5 Crore /year
- Time required: 3 to 10 years ..including communication

Utility benefit of Smart meters

- Remote metering and billing facilitating reduction in AT&C losses
- Increased consumer interface and sharing of information on usage of a consumer bring much needed transparency
- Providing net metering facility for injection from roof top solar of consumer
- Facilitate ToU/ToD/Dynamic pricing.
- Flexibility in managing load and Demand side management by utilities
- Early fault detection and faster recovery of system
- Improved supply and Reduced retail tariffs of the consumers
- Reduction in forced outages and Reduction in O&M cost etc.
- Expert manpower for network management and IT infrastructure management will be required.
- Utility will get real time information of all points and get information of outage automatically.
- Cut down corruption in the billing process.
- No manual intervention.

Cost Implications

- Total awarded cost of smart meter is around Rs.5200 to 6700 per meter and now Rs 2500/meter in recent EESL reverse auction
- Massive reduction in cost is not possible even with large scale roll out .
- The total cost of metering includes associated communication infrastructure cost, IT cost, development of manpower skills to manage and make use of data available, security set up etc.
- 25% meter cost considering entire expenditure on metering
- Total cost for the comprehensive installation of meter may vary from Rs. 8000- 10000 per meter including cost of smart meters
- If 5 Crore meters are installed the total cost shall be of the order of Rs.45000 Crore considering average metering cost of Rs. 9000/meter.
- This amount has to be paid by consumers either directly as meter rent or through retail tariffs.
- Meter manufacturers informed that the guarantee period for a smart meter is 5 years although the meter may function for a period of 10-15 years.

Tackling of Electricity Theft

- Types of theft
  - Tampering
  - Direct connection from overhead line
- Will smart meters reduce theft?

Financing of Smart meters

- capital expenditure -grant from MoP
- Subsidised loan
- include in ARR of Utility or
- illed directly to consumers at monthly EMI of approximately Rs 70/month for 6 years. (only meter cost).
- + infrastructure cost + Operational expenditure
- The benefits to the consumer are required to be clearly shown to avoid resistance which is likely to come from consumer end on such cost of meters.

Conclusion and Recommendations

- Dynamic pricing by way of Time of Use or Time of Day tariffs may be introduced
- Initially few pilots may be conducted to establish cost benefits before taking up large scale roll out. Such pilots could be initiated in selected States supported by Govt grant or soft loans.
- Remote connect/disconnect and load management may be disabled /dispensed
  - Small consumers consuming less than 500 units.
  - Large consumers
- EESL has already bidded for 50 lakh smart meters (40 lakhs for UP and 10 Lakhs for Haryana). After assessing the cost of meters and performance of these meters over 1-2 years further investment may be planned

Thank You

Provisions under Tariff Policy dated 28.1.2016

The clause 8.2.1 (b) of the Tariff Policy in the context of AT&C losses in distribution system provides as follows:

"The SERC shall undertake independent assessment of baseline data for various parameters for every distribution circle of the licensee. The SERC shall also institute a system of independent scrutiny of financial and technical data submitted by the licensees.

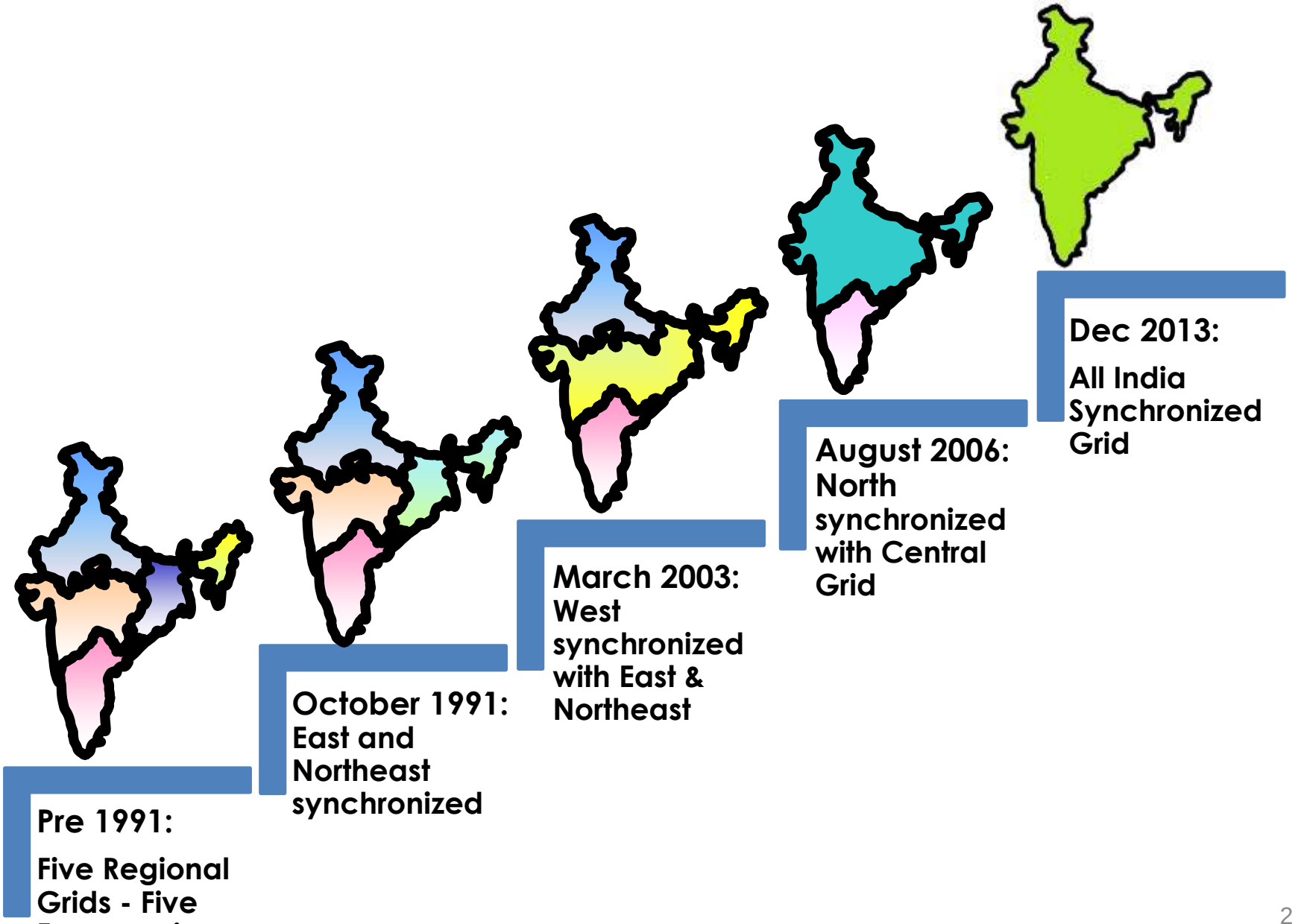
As the metering is completed up to appropriate level in the distribution network, it should be possible to segregate technical losses. Accordingly technical loss reduction under MYT framework should then be treated as distinct from commercial loss reduction which requires a different approach."

The Clause 8.3 of tariff Policy dated 28.1.2016 provides further that

"5. Metering of supply to agricultural/rural consumers can be achieved in a consumer friendly way and in effective manner by management of local distribution in rural areas through commercial arrangement with franchisees with involvement of panchayat institutions, user associations, cooperative societies etc. ***Use of smart meters may be encouraged as a cost effective option for metering in cases of "limited use consumers" who are eligible for subsidized electricity."***

Presentation on
CERC (Communication System for Inter-State Transmission of Electricity) Regulations, 2017

One Nation – One Grid – One Frequency



Maps not to scale

Information Flow hierarchy

National Level

NLDC

Region Level

RLDC- 5

RTU-
Regional Generating Station
and Substations

State HQ Level

SLDC- 36

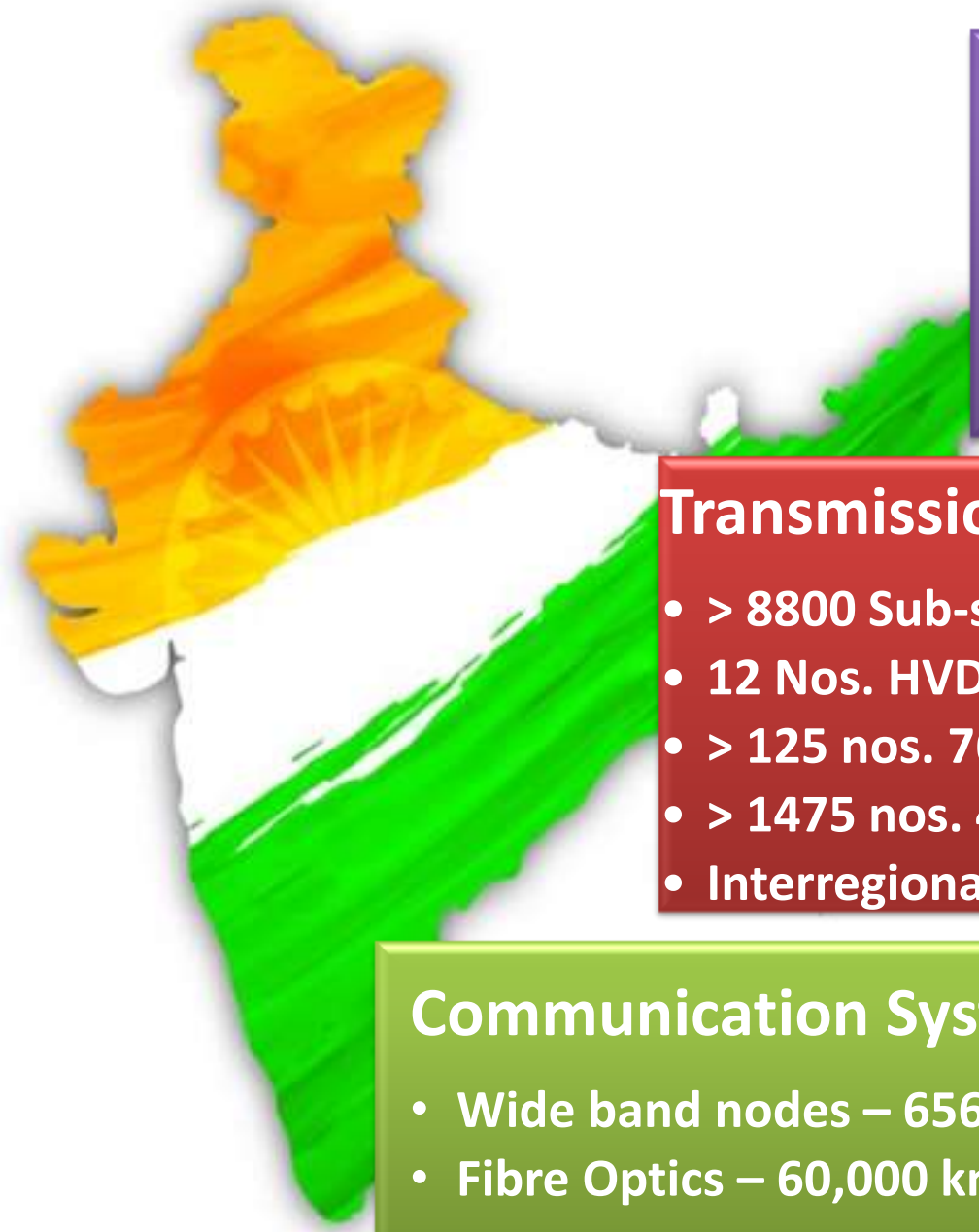
Group of District Level

SUB LDC- 20

RTU

State Generating Station/Sub Station Level

Indian Grid



Power Supply Position

- Peak Demand ~ 160 GW
- Energy Met ~ 3.5 BUs/day
- Installed capacity: 330 GW

Transmission System

- > 8800 Sub-stations
- 12 Nos. HVDC
- > 125 nos. 765 kV lines: 33,000 ckm
- > 1475 nos. 400 kV lines: 165,000 ckm
- Interregional Capacity- ~77 GW

Communication System

- Wide band nodes – 656
- Fibre Optics – 60,000 km by PGCIL

Background & Context

Robust Communication system is

- **Prerequisite for Integrated Grid Operation in safe and reliable manner**
  - **Necessary to ensure adequate telemetry and communication protocols - Generating stations, Load despatch centers, sub-stations of Transmission licensees and distribution companies etc.**

- **Facilitate safety, security, stability and reliability of Grid (large size and complexity)**
  - **Operation of protection system**
  - **Rescheduling required in case of outage**
  - **Fault Analysis**

- **System Automation**

Background & Context

Upcoming Requirements

- **New developments**
  - **Integration of Renewable Energy sources for proper forecasting, scheduling, operation and control.**
  - **Smart Grid**
  - **Smart Metering**
- **Ensure economic operation of grid**
- **Ancillary Services for grid balancing**
  - **Automatic Generation Control**
  - **Reactive power management**
  - **Black start**
- **Optimal use of resources and power market development**
- **Cyber Security**

Legal Framework

Electricity Act, 2003 – Relevant provisions for CERC

- Power to regulate inter-State transmission of electricity [79(1)(c)]
- Power to specify Grid Code having regard to Grid Standards [79(1)(h)]
- Power to make regulations [Section 178]

Need to frame Regulations

- **Lack of Communication System availability at some of the interstate System and State Systems**
  - **Power System Operation Corporation Limited (POSOCO), the System Operator filed Petitions in CERC**
- **Need for clear definition of roles and responsibilities of various organisations**
- **Need to establish uniform standards for communication**
- **Upcoming Requirements**

Objective

- **To facilitate planning, implementation, operation and maintenance and up-gradation of reliable communication system for all communication requirements including exchange of data for integrated operation of National Grid**

Scope

- **Applicable to communication infrastructure for power system at National, Regional and inter-State level**

- **Includes power system at State level till appropriate Regulations made by SERCs**

- **Applicable to all users & stakeholders**

Procedure for Regulation

Notification of Regulations - Timeline

22 Apr 2015	• Constitution of Task Force- CEA, PGCIL, POSOCO, STUs, NTPC,NHPC
12 Feb 2016	• Submission of Report by Task Force
7 Sep 2016	• Draft Regulations published seeking comments from Stakeholders
7 Nov 2016	• Last date for receipt of Comments
17 Nov 2016	• Public Hearing Held
15 May 2017	• Notification of Regulations (came into effect from 1.7.2017)

Salient Features

- **Provides for preparation of Guidelines and Standards for continuous availability of data**
- **Provides for planning, implementation, operation, maintenance and up-gradation of communication system**
- **Specified roles & responsibilities of Central Transmission Utility / State Transmission Utilities / Central Electricity Authority / National Power Committee / Regional Power Committee / Load Despatch Centres etc.**
- **CEA to constitute Standing Committee for Communication System in Power Sector and carry out planning & coordination**
- **Central Transmission Utility – Nodal Agency at inter-State level**
- **State Transmission Utility – Nodal Agency at intra-State level**
- **All users of CTU. STUs and LDCs to maintain availability of communication channel at 99.9%. Total availability should be 100% with backup communication system**
- **The affected parties may approach CERC in case of any dispute**

Roles of Organisations

- **Role of CEA**
  - Constitute Standing Committee for Communication System in Power Sector and carry out planning & coordination - plan , review and monitor
  - formulate communication planning criterion and Technical Standards for development of reliable Communication system duly considering requisite route redundancy ,capacity, as well as requirements of smart grid and cyber security.

- **Role of CTU**
  - Planning of communication system
  - Procedure on “Centralized supervision for quick fault detection and restoration“ and on “Maintenance and testing of communication system”.

- **Role of Regional Power Committee**
  - Outage planning for communication system in their region
  - conduct performance audit of communication system annually.
  - third party cyber security audits shall be conducted periodically.
  - Non-compliance reporting to Commission
  - Certify Availability

Roles of Organisations

- **Role of National Power Committee**
  - Guidelines on “Availability of Communication System”

- **Role of NLDC**
  - Guidelines on “Interfacing Requirements”
  - Monitor case of cyber security incidences and discuss them at RPC level and take necessary action

- **Role of user**
  - Make available Compatible equipment for uninterrupted communication with the concerned control

Thank you

Existing Regulatory provisions

Indian Electricity Grid Code – Relevant provisions [4.6.2]

- Establishment of communication system for facilitate data flow

CEA Technical Standards Regulations – Relevant provisions [6(3)]

- Provisioning of necessary facilities for voice and data communication and transfer of online operational data

CERC Order in Petition No. 168/MP/2011, Dated 26.9.2012 [para 45]

- Clear directions for establishment of communication system

All India Summary

Sl. No.	User Name	Total Nos of Stations		No. of wide band communication nodes under ULDC scheme
		Generating Station	Sub-station	
1	**NR**	142	745	259
2	**WR**	123	616	97
3	**SR**	246	487	139
4	**ER**	85	386	143
5	**NER**	25	146	18
	TOTAL	**621**	**2380**	
	Total (over all)	**3001**		656

Northern Region summary sheet and details of current status of implementation of telemetry system

										Updated Till:		30.09.2017	
Sl. No.	User Name	Total Nos of Stations		Telemetry not Provided				Telemetry Intemittent				Total non-availability of data in % (Telemetry not provided plus Telemetry intermittency)	
				Total nos of station		Non-availability of data in % (wrt total nos of stations)		Total nos of station		Non-availability of data due to intermittency in % (wrt total nos of stations)			
		GS	SS	GS	SS	GS	SS	GS	SS	GS	SS	GS	SS
1	Punjab	17	173	-	92	-	53%	3	26	18%	15%	18%	68%
2	Haryana	5	65	-	3	-	5%	-	1	-	2%	-	6%
3	Rajasthan	19	153	-	33	-	22%	6	18	32%	12%	32%	33%
4	Delhi	6	39	-	-	-	-	1	1	17%	3%	17%	3%
5	UP	21	150	-	-	-	-	-	22	-	15%	-	15%
6	Uttarakhand	10	36	1	20	10%	56%	-	-	-	-	10%	56%
7	HP	12	23	-	-	-	-	1	-	8%	-	8%	-
8	JK	4	16	-	-	-	-	3	9	75%	56%	75%	56%
9	POWERGRID	-	73	-	-	-	-	-	8	-	11%	-	11%
10	NTPC	13	-	-	-	-	-	1	-	8%	-	8%	-
11	NHPC	13	-	-	-	-	-	4	-	31%	-	31%	-
12	NPCIL	5	-	-	-	-	-	1	-	20%	-	20%	-
13	NJPC	2	-	-	-	-	-	-	-	-	-	-	-
14	THDC	2	-	-	-	-	-	-	-	-	-	-	-
15	BBMB	6	16	-	-	-	-	-	-	-	-	-	-
16	IPP/JV/Patran	7	1	-	-	-	-	4	-	57%	-	57%	-
	TOTAL	142	745	1	148	1%	20%	24	85	17%	11%	18%	31%
	Total (over all)	887		149		17%		109		12%		29%	

Note:

1. Constituentswise details is as furnished by SLDC's / as available at RLDC.

2. Status considered above are grid substation and upto 132 KV voltage level. In case of UP it is upto 220 kV.

3. 'GS' Generating Stations and 'SS' subStations

Western Region summary sheet and details of current status of implementation of telemetry system

Status as on : 01.10.17

Sl. No.	User Name	Total Nos of Stations		Telemetry not Provided				Telemetry Intemittent				Total non-availability of data in % (Telemetry not provided plus Telemetry intermittency)	
				Total nos of station		Non-availability of data in % (wrt total nos of stations)		Total nos of station		Non-availability of data due to intermittency in % (wrt total nos of stations)			
		GS	SS	GS	SS	GS	SS	GS	SS	GS	SS	GS	SS
1	Maharastra	32	195	0	2	0.0%	1%	1	39	3%	20%	3%	21%
2	Chattisgarh	7	97	0	16	0.0%	16%	1	44	14%	45%	14%	62%
3	Madhya Prdesh	19	146	0	0	0.0%	0%	2	2	11%	1%	11%	1%
4	Gujarat	25	121	-	1	-	1%	-	-	-	-	-	1%
5	Goa	-	7	-	-	-	-	-	-	-	-	-	-
6	DD	-	1	-	-	-	-	-	-	-	-	-	-
7	DNH	-	4	-	2	-	50%	-	2	-	50%	-	100%
8	ISGS	16	-	-	-	-	-	0	-	0%	-	0%	-
9	ISTS	-	45	-	0	-	0%	-	-	-	-	-	0%
10	IPP	24	-	-	-	-	-	1	-	4%	-	4%	-
	TOTAL	123	616	0	21	0%	3%	5	87	4%	14%	4%	18%
	Total (over all)	739		21		3%		92		12%		15%	

Southern Region summary sheet and details of current status of implementation of telemetry system

										Updated Till:		30-09-2017	
Sl. No.	User Name	Total Nos of Stations		Telemetry not Provided				Telemetry Intemittent				Total non-availability of data in % (Telemetry not provided plus Telemetry intermittency)	
				Total nos of station		Non-availability of data in % (wrt total nos of stations)		Total nos of station		Non-availability of data due to intermittency in % (wrt total nos of stations)			
		GS	SS	GS	SS	GS	SS	GS	SS	GS	SS	GS	SS
1	Andhrapradesh	88	115	13	3	15%	3%	1	0	1%	0%	16%	3%
2	Telangana*	54	84	9	10	17%	12%	3	2	6%	2%	22%	14%
3	Karnataka	23	106	0	0	0%	0%	0	2	0%	2%	0%	2%
4	Kerala	13	20	0	0	0%	0%	0	2	0%	10%	0%	10%
5	Tamilnadu	**47**	**107**	**2**	**1**	4%	1%	**5**	**0**	11%	0%	15%	1%
6	Pondicherry	-	4	-	-	-	-	-	1	-	25%	-	25%
7	POWERGRID	-	51	-	-	-	-	-	1	-	2%	-	2%
8	NTPC	5	-	1	-	20%	-	-	-	-	-	20%	-
9	NLC	3	-	-	-	-	-	0	-	0%	-	0%	-
10	NPCIL	3	-	-	-	-	-	0	-	0%	-	0%	-
11	IPP/JV/Others	10	0	-	-	-	-	2	-	20%	-	20%	-
	TOTAL	**246**	**487**	**25**	**14**	**10%**	**3%**	**11**	**8**	**4%**	**2%**	**15%**	**5%**
	Total (over all)	**733**		**39**		**5%**		**19**		**3%**		**8%**	

Eastern Region summary sheet and details of current status of implementation of telemetry system

									Status as on :		03.10.2017	
Sl. No.	User Name	Total Nos of Stations		Telemetry not Provided			Telemetry Intemittent				Total non-availability of data in % (Telemetry not provided plus Telemetry intermittency)	
				Total nos of station		Non-availability of data in % (wrt total nos of stations)	Total nos of station		Non-availability of data due to intermittency in % (wrt total nos of stations)			
		GS	SS	GS	SS	GS	GS	SS	GS	SS	GS	SS
1	OPTCL	36	108	-	2	-	-	2	-	2%	-	4%
2	BSPTCL	3	110	-	-	-	-	21	-	19%	-	19%
3	WBSETCL	15	50	-	1	-	3	8	20%	16%	20%	18%
4	DVC	12	32	-	0	-	0	2	0%	6%	0%	6%
5	JUSNL	3	37	-	3	-	2	7	67%	19%	67%	27%
6	PGCIL		46	-	1	-	-	7	-	15%	-	17%
7	SIKKIM		2	-		-	-		-	0%	-	0%
8	NTPC	6	1	-	-	-	-	-	-	-	-	-
9	NHPC	2		-	-	-	0	-	0%	-	0%	-
10	IPP	8		-	-	-	1	-	13%	-	13%	-
	TOTAL	85	386	0	7	0%	6	47	7%	12%	7%	14%
	Total (over all)	471		7		1%	53		11%		13%	

North Eastern Region summary sheet and details of current status of implementation of telemetry system

Status as on : 05.10.2017

Sl. No.	User Name	Total Nos of Stations		Telemetry not Provided				Telemetry Intemittent				Total non-availability of data in % (Telemetry not provided plus Telemetry intermittency)	
				Total nos of station		Non-availability of data in % (wrt total nos of stations)		Total nos of station		Non-availability of data due to intermittency in % (wrt total nos of stations)			
		GS	SS	GS	SS	GS	SS	GS	SS	GS	SS	GS	SS
1	AEGCL	3	59	-	-	-	-	2	58	67%	98%	67%	98%
2	MeECL/MePTCL	7	16	-	-	-	-	1	13	14%	81%	14%	81%
3	TSECL	3	22	-	10	-	45%	3	9	100%	41%	100%	86%
4	POWERGRID	-	22	-	-	-		-	4	-	18%	-	18%
5	NEEPCO	6	-	-	-	-	-	2	-	33%	-	33%	-
6	NHPC	1	-	-	-	-	-	-	-	-	-	-	-
7	OTPC	1	-	-	-	-	-	-	-	-	-	-	-
8	NTPC	1	-	-	-	-	-	-	-	-	-	-	-
9	NAGALAND	1	3	1	3	100%	100%	-	-	-	-	100%	100%
10	MIZORAM	2	4	2	3	100%	75%	-	1	-	25%	100%	100%
11	MANIPUR	-	11	-	6	-	55%	-	-	-	-	-	55%
12	Ar.Pradesh	-	9	-	9	-	100%	-	-	-	-	-	100%
	TOTAL	**25**	**146**	**3**	**31**	**12%**	**21%**	**8**	**85**	**32%**	**58%**	**44%**	**79%**
	Total (over all)	**171**		**34**		**20%**		**93**		**54%**		**74%**	

Smart Meters in Telangana:
Rollout Plan, Challenges and Way Forward

30th October 2017

Presentation by TS Discoms

Contents

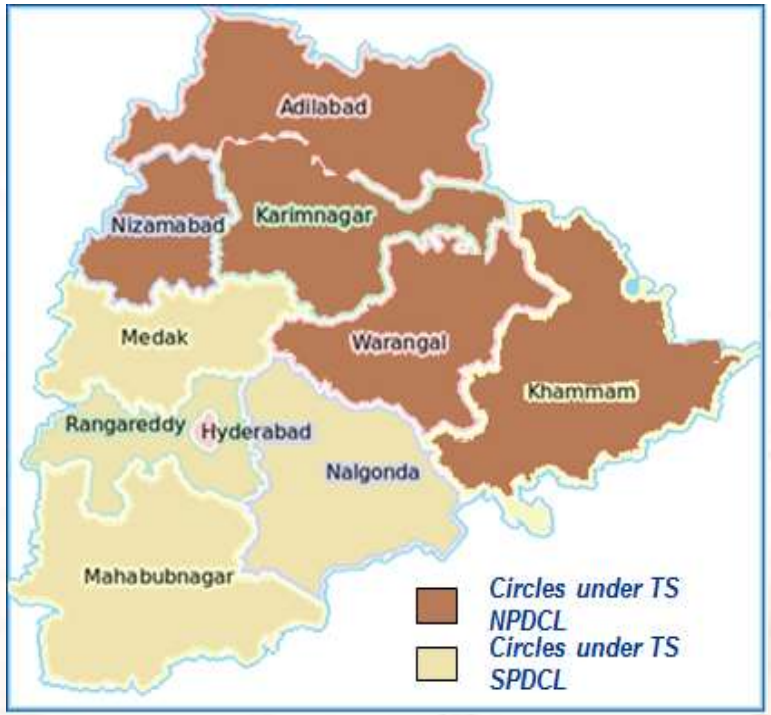
- Overview of TS Discoms
- Smart Metering Target : UDAY Scheme
- Current Status
- SMART Grid Pilot Project in Telangana
- International Examples
- Challenges in Implementation
- Possible Models for Smart Meter Roll-out

Overview of TS Discoms

TSSPDCL

Brief Overview (As on Sept 2017)	
Details	**Nos.**
33/11 kV SUBSTATIONS	1,453
33 kV FEEDERS	1039
11 kV FEEDERS	6,177
Power Transformers	2,759
Distribution Transformers	365,691
No. of Consumers	8,141,108
LT Consumers	8,132,733
HT Consumers	8,375

Peak Demand met in TSSPDCL –
***6,262 MW** recorded on 13th Sept 2017*
Peak Demand met in GHMC area –
***2,796 MW** recorded on 26th May 2017*



Peak Demand met in the State –
***9,500 MW** recorded on 13th Sept 2017*

TSNPDCL

Brief Overview (As on Sept 2017)	
Details	**Nos.**
33/11 kV SUBSTATIONS	1,243
33 kV FEEDERS	487
11 kV FEEDERS	4,780
Power Transformers	2,119
Distribution Transformers	260,110
No. of Consumers	5,347,666
LT Consumers	5,345,265
HT Consumers	2,401

Peak Demand met in TSNPDCL –
***3,070 MW** recorded on 13th Sept 2017*

Smart Meters: UDAY Targets as per MoU

As per UDAY MOU, Discoms to install smart meters for consumers consuming

TSSPDCL

Activity	Specifications	Units	FY 2017-18	FY 2018-19	Total
Installation of Smart Meters (other than Agri)	For Consumer Units > 500 Units/month	Nos	4,10,000		4,10,000
	For Consumer Units 200-500 Units/month	Nos	2,00,000	4,96,000	6,96,000
	Total	Nos	6,10,000	4,96,000	**11,06,000**

TSNPDCL

Activity	Specifications	Units	FY 2017-18	FY 2018-19	FY 2019-20	Total
Installation of Smart Meters (other than Agri)	For Consumer Units > 500 Units/ month	Nos	5,054	3,212	8,030	16,296
	For Consumer Units 200-500 Units/ month	Nos	54,340	32,554	89,531	1,76,425
	Total	Nos	59,394	35,766	97,561	**1,92,721**

- TS DISCOMs signed UDAY MoU on 4th January 2017 under which both the Discoms have committed to Smart Metering targets as tabulated
- UDAY MOU envisages installation of about **13 lakhs** smart meters across TS Discoms over a period **2017-18 to 2019-20**
- As of now 855 Smart Meters have been installed under pilot projects and for the remaining meters Discoms require funding

Smart Meters: Current Status in Telangana

- A total 855 smart meters have been installed in the state till date. (TSSPDCL -450, TS NPDCL- 405)
- Financial support of approx. **INR 1,948 Crs** is required to procure the smart meters to achieve the target under UDAY Scheme.
- TS Discoms have installed IRDA Meters for 60,13,074 consumers which is 63% of the total metered consumers.
- With installation of IRDA port meters, TS Discoms have realized substantial benefits with improvement in the billing efficiency. This has greatly reduced cases of reading suppression.

Smart Meters provide an additional advantage of real time data and reduced man-hours with 10 times higher investment than that of IRDA Meters with challenges of compatibility with existing communication system.

Smart Metering Project in Telangana:
An Overview

Smart Energy

- Post Paid – Prepaid Metering System
- Energy Audit
- Renewable Energy Integration

Smart Measurement

- Remote Meter Reading
- Load Profile based measurement (ToU / ToD)
- Interval Metering
- Import – Export (Net) Measurement

Smart Management

- Outage Management
- Peak Load Management
- Demand Side Management (incl. DR)
- Power Quality Management

Smart Integration of Services & Operations

Smart Operations

- Remote Connect / Disconnect
- Remote Alerts (Tamper) & Notifications
- Remote Meter Upgrades
- Remote Health Check

Smart Metering Project in Telangana:
Pilot Project in Hyderabad

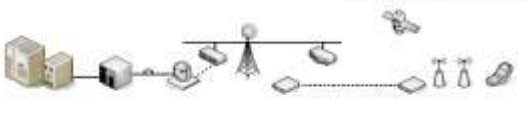
Project scope

- Smart metering infrastructure covering 12,000 consumers in Hyderabad
- Enable understanding & streamlining of smart grid implementation for DISCOM to enable a wider rollout
- Improve key Operation KPIs like billing efficiency, T&D loss etc

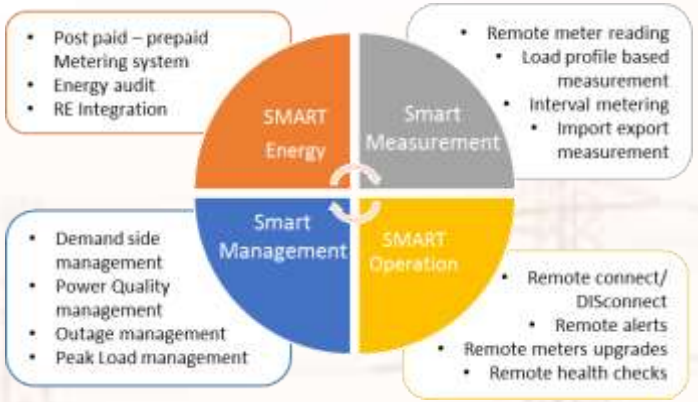
Philosophy

Electrical Infrastructure

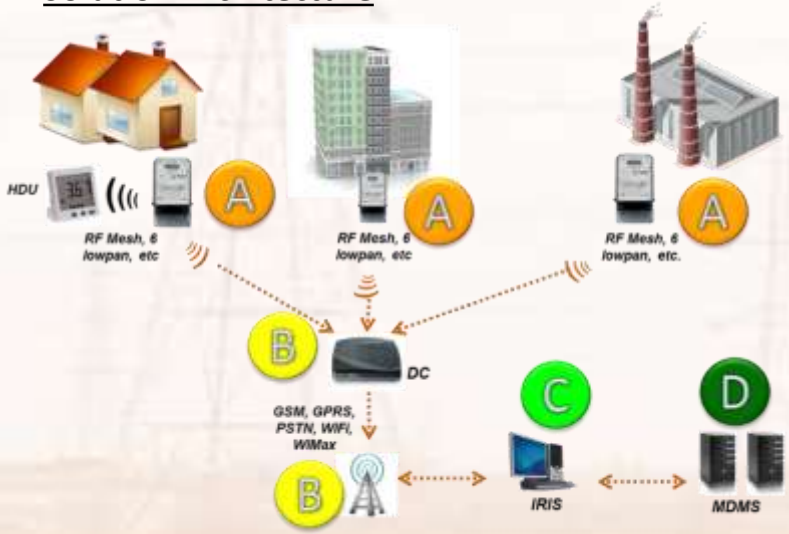
Information Infrastructure



ENABLES SMART GRID



Solution Architecture



A: Smart Energy Meter (1$^{\phi}$,3$^{\phi}$WC, 3$^{\phi}$LTCT)
B: Advanced Metering Infrastructure (AMI)
C: Meter Data Acquisition System (MDAS)
D: Meter Data Management System (MDMS)

Key Technologies

EC-smart meter:
- Core component to collect relevant data

ZigBEE network
- Communication between meter and field data concentrators

GPRS
- Send data & receive instruction from remote servers

Application servers & BI
- Analyze data
- Automate key functions like
  - Billing
  - Remote on/off etc

Potential benefits

- **Stream lined billing process & Improve Billing Efficiency**
- **Cloud implementation reduces maintenance costs by 50%**
- **Reduced Commercial losses**
- **Bring in consumer discipline**
- **Validation of concept –wider roll-out across state in pipe line**

International Examples – Smart Meter Roll Out

Some of the examples of International Roll-out* of Smart-metering are as follows-

Sl No	Name of Country	Key Particulars	Drivers of Roll-out
1	California	2007/08 deployment to cover 12 million electricity and 5 million gas meters	Management of peak consumption of electricity
2	Italy	2005-07: Distribution network operator –ENEL installs over 32 million smart meters	Reduction of non-technical losses and to control contracted power more effectively
3	Canada (Ontario)	Target of 4.5 million installations by 2010	Management of peak consumption to reduce investment in new generating capacity
4	Northern Ireland	2009: 2.22 lakh smart meters installed	To minimize the high costs of pre-payment meters compared with credit electricity meters

*Source: OFGEM, metering.com

International Examples – Key Points

Some of the key learnings from smart-metering installations across countries are as follows –

- Technology choice* has differed based on specific drivers –
  - **Italy**: Business case was based on improving operational efficiencies. As such Demand Response (DR) was not the key priority
  - **Great Britain**: Key objectives-
    - Energy Security & carbon reduction
    - Helping consumers to reduce their consumption and improve energy efficiency
    - Functionality that improves the responsiveness of consumers to information and prices is important

- Open and interoperable system is a key for integration of variety of solutions. This enables utilities to avoid locking in to one specific technology.

- Choice of communication technologies*
  - Rural and remote areas with lower customer density, Power line Carries (PLC) seemed to effective
  - Mesh radio communication is more suitable & cost effective in areas of high customer density.

- In addition to operational benefits, combining **smart meters** with **smart pricing schemes** has the potential to considerably augment benefits of smart metering roll-out

Smart meters roll-out have been a complex and lengthy process, trade-offs between functionalities of smart meters is required to deliver desired benefits to consumers

*Source: Smart metering, Pollit et all

Smart Metering Project in Telangana: Challenges Faced During Implementation

Consumer Acceptance	■ Misinformation regarding features like real-time load monitoring, detection of tampering, remote disconnection facility were **viewed as tools of policing by the consumers** ■ Real time displays to consumers could be offered as tool for promoting energy efficiency
Topological constraints	■ Selected area had large concentration of **tin metal Structures leading to Signal interference** ■ Due to uneven landscape & location of meters – **Line of sight problems** arose for communication between smart meter and Data Concentrator Units (DCUs), **Difficulty in Arranging Power supply for field DCUs**
Network limitation	■ During peak hours due to higher demand for voice services, the mobile service providers used to convert the available data channels to voice channels to meet demand for voice services. Hence during this time there was **loss of communication between the DCU & HES impacting efficiency** of the systems.
Integration of Multiple Technologies	■ Since the system involved various technologies across platforms **initial teething problems** were faced for integration of various systems

Other Challenges

- Lack of adequate and compatible communication infrastructure for synchronizing the new technology with the existing ones
- Handling and storing of data collected by the smart meters would require huge data center infrastructure for storage which is an additional cost burden
- India has limited number of Smart Meter manufacturers, importing from other countries is time consuming and only makes sense if economies of scale is realized

Smart Meters:
Possible Model for Roll-out

AMI Implementation and Maintenance on Services Model

- Appointment of an integrated agency for providing variety of functions related to AMI & its maintenance on a competitive basis.
- Agency will ensure
  - Testing and certification of the meter and communication devices
  - Establishing and maintaining the last mile communication connectivity
  - Integrating, testing and commissioning of the entire AMI system
  - Integration of MDMS with other systems such as billing, collection, connection/disconnection, OMS etc
  - Ensuring availability of complete AMI system at mutually agreed Service Level Agreements (SLAs)

Innovative Models for Smart Meter Rollout can be thought of to make the transition process more smooth and burden free for Discoms

Way Forward

- Distribution losses in TS Discoms is amongst the lowest levels in country (9.94%). Business case of smart meters may not be fully justified from a perspective of commercial loss reduction only.
  - Measures for improving customer service features such as real time displays could nudge consumers towards energy efficiency
  - Benefits could also accrue due to consumers willing to participate in demand response programs. However this could be over a longer time horizon.
  - Greater clarity on the desired functionalities in smart meters could hasten the roll out process.

- AMI at Distribution Transformer (DTR) level could give rise to streamlined energy audit process at a DTR level. Enabling targeted loss reduction initiatives.

- Model for roll-out should be designed keeping in view the funding requirements of TS Discoms.

Thank You