Minutes of the 68th Meeting of the Forum of Regulators Held on 20.6.2019 at 10.30 hrs. at New Delhi

Venue	**:**	**Conference Hall, Upper Ground Floor Central Electricity Regulatory Commission New Delhi-110001**
Time/Day/Date	**:**	**10.30 Hrs. on Thursday, the 20th June, 2019**
List of Participants	**:**	**Enclosed as Appendix-I**

The meeting was chaired by Shri P.K.Pujari, Chairperson, Central Electricity Regulatory Commission (CERC) and Forum of Regulators (FoR). The Chairperson, CERC/ FOR welcomed all the Members of the Forum to its 68th Meeting. He specifically welcomed Chairperson, Jammu & Kashmir Electricity Regulatory Commission and officiating Chairperson of Uttarakhand Electricity Regulatory Commission who were attending the meeting for the first time after they took over charge in their respective offices. Thereafter, the Forum took up the agenda items for consideration.

Business Session – I

Agenda Item No.1 : Confirmation of Minutes of the 67th FoR Meeting held on 12 April, 2019 at CERC, New Delhi

The Forum considered and endorsed the minutes of the 67th Meeting of Forum of Regulators held on 12 April, 2019 at New Delhi.

Further, Joint Chief (Regulatory Affairs), CERC informed the Forum that in pursuance to the decision taken in the 66th Meeting of the Forum, the standing Technical Committee of FoR has been re-constituted comprising two groups under the Chairmanship of Shri I.S. Jha, Member, CERC,

- On the subject of "Renewable Energy (RE) Integration and Related Matters" with Chairperson / Member of GERC, MERC, TNERC, KERC, RERC, APERC, HPERC, CMD – POSOCO, Head of RA Division, CERC as its Members

and

- On the subject of "Implementation of ABT Framework at State Level" with Chairperson / Member of PSERC, UPERC, BERC, WBERC, KSERC, AERC, CMD – POSOCO, Head of RA Division, CERC as its Members.

Agenda Item No.2 : Reference received from BERC on,

a) Relevance of Consumer Grievance Redressal Forum

b) Consumer Advocacy

a) Relevance of Consumer Grievance Redressal Forum

The Forum considered the issue of relevance of CGRF, in the context of law enacted in Bihar for disposal of grievances of various departments. The Forum observed that as per Section 42(5) of the Electricity Act, 2003, each SERC has a separate set of regulations customized to the needs of the State. The Forum has also brought out model regulations on CGRF for facilitating the SERCs/ JERCs. The Forum felt that an Act notified by the State Government for grievance redressal is in the interest of the consumers and, therefore, a welcome move. However, such Act brought by the State Government and the State CGRF framework may continue to co-exist as both the frameworks are aimed at facilitating the consumers. However, efforts should be made by appropriate agencies to further strengthen the CGRF mechanism by making it simpler, approachable and effective.

b) Consumer Advocacy

The Forum considered the issue of facilitating the consumers to make their views heard during appropriate proceeding. The Forum was informed that CERC has notified consumer representative organizations, which submit their views on draft Regulations. Several other consumer organizations, as part of Central Advisory Committee, also interact with CERC from time to time. The Forum further noted that SERCs/ JERCs have also established appropriate channels for consumer representative organizations to provide their comments/ views on Regulations, Orders etc. The Forum felt that SERCs/ JERCs are free to take further measures, if

any, to encourage consumers/ consumer organizations to approach the ERCs and submit their views.

The Forum was informed that as approved, process for commissioning a study on "Consumer Protection in Electricity Sector" has been initiated.

Agenda Item No.3 : Reference received from JERC (M&M) on non-adherence of tripartite agreement for transfer of funds by the State Governments of Manipur and Mizoram.

The Joint Electricity Regulatory Commission (Manipur & Mizoram) brought to the notice of the Forum that from February 2013 onwards, the State Governments of Manipur and Mizoram have not been equally sharing the expenditure of JERC. This has resulted in curtailing the expenditure to the lowest minimum causing difficulty in managing the affairs of the Commission. The Forum noted that in addition to JERC (M&M), NERC is also facing the issue of non-availability of funds. The Forum felt that this issue may be flagged by the concerned ERC to the Ministry of Power.

Agenda Item No.4 : Report on Review of Status of Open Access in Distribution Sector

The Forum has commissioned a study on "Review of Status of Open Access in Distribution". M/s Deloitte was appointed as consultant for the study to assist the Forum. The study is aimed at reviewing/ analyzing the status of Open Access in electricity distribution sector (limited to ten States) and identifying the challenges impacting Open Access and way forward. A presentation (**Annexure–I**) on the study was made by the consultant.

The study found increased Open Access activity in the States of Maharashtra, Tamil Nadu and Andhra Pradesh and that this could possibly be due to increased availability of cheaper RE sources coupled with availability of incentives facilitating Open Access. The study also found reduction in short term open access (STOA) in the States of Haryana and Gujarat. Such reduction in STOA could be attributable to significant increase in prices in power exchanges as STOA transactions of consumers in these States depend on power exchanges for STOA.

The study observed that Open Access was viable for captive consumers using conventional power in all States under study, whereas in respect of non-captive consumers, it was found viable in the States of Andhra Pradesh, Tamil Nadu and Maharashtra only. However, OA was found viable in respect of captive as well as non-captive consumers using RE-Solar power in all State except West Bengal.

The study suggested several measures for effective implementation of Open Access, which *inter alia* include streamlining measures in respect of frequent shifting of consumers, progressive tariff rationalization, uniform methodology for determination of OA charges, long term certainty of OA charges, removal of delays in grant of NoC for Open Access etc.

Members were requested to send their views on the report within 15 days of issuance of the minutes, so that the same could be finalized and brought to the Forum in its next meeting.

Agenda Item No.5 : Security Constrained Economic Dispatch and sharing of experience.

In pursuance to the CERC Order dated 31.1.2019 (Petition No. 02/SM/2019), POSOCO operationalized "Security Constrained Economic Dispatch (SCED) of Electricity for the Inter-State Generating Stations" on pilot basis with effect from 1.4.2019. The SCED is aimed at minimizing pan-India ISGS variable cost, subject to the constraints which *inter alia* include, meeting total requisition by States, transmission constraints, technical minimum of plants, maximum generation (DC on bar), ramp-up/ ramp-down rates etc.

A presentation **(Annexure–II)** was made before the Forum by POSOCO on implementation of SCED in Inter-State Generating Stations (pan India) and their experience. The pilot operation of SCED during the months of April and May, 2019, encompassing 150 ISGS plants, amounting to half a million contracts per day across 36 States have resulted in increase in cheaper generation, decrease in costly generation and reduced the average variable cost of generation from 210 paise/ unit to 207 paise/ unit. During these two months of pilot operation, a reduction of Rs. 196 Cr. in fuel cost (without considering heat-rate compensation) has been noted. It was also brought out that SCED has resulted in 42% reduction in number of schedule changes and 32% reduction in schedule GW changes and finally resulted in increased PLF of cheaper stations.

Operationalization of SCED brought out certain challenges which include, further streamlining the scheduling process at all levels, need for Gate Closure, need for Robust and seamless communication etc.

The Forum appreciated the presentation.

Agenda Item No.6 : Presentation on "Indian Accounting Standards (Ind AS) & Its Impact on Capital Cost in Tariff".

A presentation **(Annexure –III)** on recently notified Indian Accounting Standards (Ind AS) & its impact on Capital Cost in Tariff was made by representatives of NTPC.

The salient features of the new Indian Accounting Standards (which replaced IGAAP) *inter alia* include, importance to concept of 'Substance Over Form' i.e. economic reality of a transaction, 'Fair Valuation Approach', measurements based on "Time value of Money', more disclosures of relevant information and assumptions etc. The Ind-AS will have an impact of capital cost as it affects asset accounting, borrowings (accounting of transaction costs), exchange rate variations, measurement of employee loans, discounting of non-current vendor liabilities, accounting of rebate to customers, fair valuation of investments in Equity Instruments and Mutual Funds (Non DDR), proposed dividend and DDT, actuarial gains/ losses – employee benefits, prior period items, related party disclosures etc.

It was also brought out that there is a marked change in calculations under Ind AS vis-à-vis IGAAP (previous accounting standard). Accordingly, the revised accounting standards have a direct bearing on the capital cost component in the context of electricity tariff.

The Forum noted the presentation.

Agenda Item No.7 : Additional Item with the permission of Chairperson.

Issues brought by Secretary, MNRE for consideration of Forum

Secretary, MNRE joined the proceedings of the Forum. In his initial remarks, he said that interaction with the Forum has always benefited the Government in framing its policy interventions. He requested the Forum for its continued support with regard to the policy initiatives taken by MNRE for development of RE generation. Subsequently, he brought the following issues to the notice of the Forum.

i. As regards progress made in achievement of RPO, he requested SERCs to align RPO trajectory with that notified by Ministry of Power till the year 2021-22; and ensure compliance of RPO targets by State obligated entities. Further, RPO may not be taken as the cap for RE installations, and encourage such installation even beyond RPO level.

ii. In order to mitigate delays in adoption of tariff discovered through competitive bidding, it was suggested that SERCs may adopt tariff arrived at through competitive bidding process within forty five days from the date of request.

iii. As regards issues relating to Curtailment and Forecasting & Scheduling, it was suggested that curtailment should be resorted to only for grid security reasons, through transparent process; and intimation must be given in writing. He urged that final F&S regulations be notified at the earliest and, if needed, amendments in State Grid Code may be made for facilitating F&S, real time generation data acquisition and energy accounting.

iv. As regards Open Access and Banking, he suggested that Regulatory interventions may be explored to ensure a facilitative Open Access and banking norms that do not put renewable energy generators at a disadvantageous position.

v. In order to promote rooftop solar/ grid connected solar pump projects, it is important to create a framework that is fair to project developers/ owners as well as the distribution companies.

vi. Feed in Tariff (FiT) for 5 MW Solar & 25 MW Wind Power Projects may be fixed by the SERCs considering average of tariff discovered during last year.

vii. A system may be mandated facilitating payment governed by the principle of First in First out (FIFO) so that earlier dues are paid first and no preferential treatment is given to anyone, while imposing penalty on DISCOMs on delay in payment beyond a prescribed period.

viii. SERC may not allow any DISCOM to modify the PPA after it has been signed and implementation started.

The Forum observed that appropriate measures are taken by respective SERCs/ JERCs for promoting RE generation, while taking care of availability of RE sources in the States, financial health of discoms, interests of all stakeholders as well as impact on tariff for the end consumers.

Session – II

Shri R.K. Singh, Hon'ble Minister of State (I/C) for Power, New & Renewable Energy, Skill Development and Entrepreneurship joined the proceedings.

Interaction of Hon'ble Minister with the Forum:

Chairperson, CERC/ FoR formally welcomed the Shri R.K. Singh, Hon'ble Minister of State (I/C) for Power, New & Renewable Energy, Skill Development and Entrepreneurship.

The Hon'ble Minister, during his initial remarks stated that Regulators play a very critical role in development of the power sector by facilitating effective implementation of the policies of the Government. He further observed that regulatory function is ever evolving considering the experience gained so far. Unbundling of the electricity sector was carried out with the objective of making the sector sustainable, bringing in accountability etc. However, over the period, the discoms have not significantly improved their financial health, necessitating financial support on a periodical basis through schemes such as DDGY, IPDS, UDAY etc. Regulators should have a vision for future, while learning from the past, and facilitate the sector to provide reliable and sustainable service for the consumers.

He said that given the present condition of the distribution utilities, the Government is seriously considering several policy interventions for the benefit of the sector.

Generation:

1. Policy interventions should be provided to ensure each segment in value chain of the sector stays financially healthy. Presently, payment security for the generating companies is not adequately ensured, which is causing great difficultly for them to operate. The generating companies have to pay in advance for fuel, fuel transport, besides meeting other working capital requirements. However, the receivables are not securely guaranteed, thereby making them vulnerable to financial difficulties.
2. He stated that in this context, it is necessary to bring in a policy intervention necessitating the distribution licensees to open and maintain adequate letter of credit as payment security mechanism with the generating companies under the power purchase

agreements. He stated that Ministry of Power will be issuing an Order on this matter in a short period.

3. In the context of generation, he further stated that the issue of allowable fuel mix needs to be examined and appropriate measures should be taken to economize the fuel cost of generating companies.

4. He noted that unutilized cheaper generation capacities should be effectively utilized by restructuring the scheduling process.

Distribution:

5. He stated that in the best interest of the consumers, it is necessary to sensitize them to understand economic value of subsidy being given to them. Therefore, Government is considering the possibility of providing subsidy through "Direct Benefit Transfer", which is aimed at facilitating the consumers understand the economic value of subsidy. Once "Direct Benefit Transfer" is in place, the consumers will be able to understand the economic value and optimize their power consumption effectively.

6. He observed that "Open Access" should be made attractive to the large consumers by making structure of Open Access charges simple and transparent and establishing non-cumbersome channels for seeking permissions to get Open Access.

7. In the context of billing, he stated that pre-paid metering can be a very effective solution. Therefore, efforts should be made to take up for installation of pre-paid smart meters by the distribution utilities to prevent leakages at billing and metering end.

8. He stated that the draft tariff policy has proposed that technical and commercial losses in distribution, in excess of 15%, need to be borne by the distribution licensee. In addition, load shedding without any valid technical difficulty will be unacceptable. Therefore, in this context, proactive measures in the area of metering, billing, installation of pre-paid smart meters assumes significance.

9. Franchisee model in distribution sector reportedly achieved significant success in loss reduction. Therefore, efforts should be made to encourage franchisee model in distribution sector.

10. He stated that the Government is committed to achieving the target of 175 GW of RE generation by 2022. In order to facilitate demand for RE generation, Ministry of Power has also determined RPO trajectory which is required to be adhered to by the obligated entities. SERCs should take appropriate measures to ensure RPO target are met by the entities.

11. He noted that internal governance of distribution utilities is also an important issue to be observed as certain States are yet to unbundle the sector at the State level.

Transmission:

12. Transmission price structure for RE generation is currently attractive and beneficial for the sector to grow. However, free transmission for RE generation needs to be reviewed in the context of changing cost economics of RE generation.

The Hon'ble Minister, in his closing remarks urged the Regulators to take initiatives in the best interest of the power sector.

The Chairperson, CERC/ FoR thanked the Hon'ble Minister of State (I/C) for Power, New & Renewable Energy, Skill Development and Entrepreneurship for sparing his valuable time to join the proceedings and share his thoughts with the Forum.

The Chairperson, CERC/ FOR thanked the Members of Forum and informed them that next meeting of the Forum will be held on 20th September, 2019 at Amritsar. Secretary, CERC thanked the staff of "FOR" Secretariat for their arduous efforts in organizing the meeting.

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

/ Appendix – I /

LIST OF PARTICIPANTS ATTENDED THE 68TH MEETING

OF

FORUM OF REGULATORS (FOR)

HELD ON 20TH JUNE, 2019 AT NEW DELHI.

S. No.	NAME	ERC
01.	Shri P.K. Pujari Chairperson	CERC / FOR – in Chair
02.	Shri R.P. Singh Chairperson	APSERC
03.	Shri Subhash Chandra Das Chairperson	AERC
04.	Shri S.K. Negi Chairperson	BERC
05.	Shri Anand Kumar Chairperson	GERC
06.	Shri Jageet Singh Chairperson	HERC
07.	Shri S.K.B.S. Negi Chairperson	HPERC
08.	Shri Lokesh Dutt Jha Chairperson	J&KSERC
09.	Dr. Arbind Prasad Chairperson	JSERC
10.	Shri M.K. Goel Chairperson	JERC (State of Goa & UTs)
11.	Shri Lalchharliana Pachuau Chairperson	JERC for M & M
12.	Shri Shambhu Dayal Meena Chairperson	KERC
13.	Shri Preman Dinaraj Chairperson	KSERC

14.	Dr. Dev Raj Birdi Chairperson	MPERC
15.	Er. Imlikumzuk Ao Chairperson-cum-Member	NERC
16.	Shri U.N. Behera Chairperson	OERC
17.	Ms. Kusumjit Sidhu Chairperson	PSERC
18.	Shri Shreemat Pandey Chairperson	RERC
19.	Shri Nanda Ram Bhattarai Chairperson	SSERC
20.	Shri Raj Pratap Singh Chairperson	UPERC
21.	Shri D.P. Gairola Officiating Chairperson/Member (Law)	UERC
22.	Shri Sutirtha Bhattacharya Chairperson	WBERC
23.	Shri P. Rama Mohan Member	APERC
24.	Shri Mukesh Khullar Member	MERC
25.	Shri Sanoj Kumar Jha Secretary	CERC
26.	Dr. Sushanta K. Chatterjee Joint Chief (RA)	CERC
	MINISTRY OF POWER	
27.	Shri Sanjiv Nandan Sahai Additional Secretary	MOP
28.	Shri Sandeep Nayak Director	MOP
MNRE		
29.	Shri Anand Kumar Secretary	MNRE

30.	Shri Praveen Kumar Additional Secretary	MNRE
31.	Dr. K. Balaraman Director General	NIWE
SPECIAL INVITEES		
	CERC	
32.	Dr. M.K. Iyer Member	CERC
33.	Shri M.K. Anand Chief (Fin.)	CERC
34.	Ms. Geetu Joshi Chief (Eco.)	CERC
35.	Shri S.C. Shrivastava Chief (Engg.)	CERC
	POSOCO / NTPC & OTHERS	
36.	Shri K.V.S. Baba CMD	POSOCO
37.	Shri S.R. Narasimhan Director (System Operation)	POSOCO
38.	Shri A.K. Gautam	NTPC
39.	Ms. Sangeeta Bhatia	NTPC
40.	Shri Amit Goenka Senior Manager	DELOITTE
41.	Shri Rajat Goel Senior Consultant	DELOITTE

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Deloitte.

Annexure-I

Review of Status of Open Access in Distribution

Forum of Regulators (FOR)
Final Presentation

Overall Approach

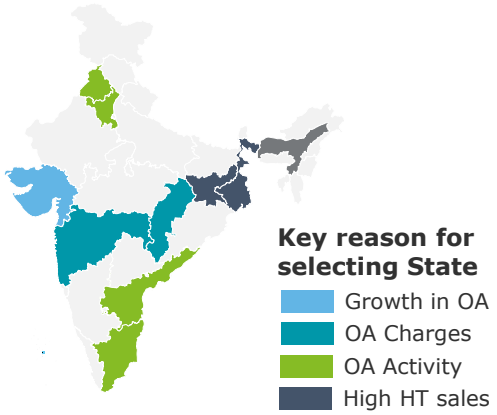
Key modules executed in the assignment

Shortlisting of States

10 States shortlisted based on:

- *Potential of OA*
- *Level of OA activity & Charges*

Final Shortlisted States



Detailed Analysis of Status of Open Access

Comparative analysis of shortlisted States on following areas:

- **Regulatory Review**
- **OA Activity Review**
- **Commercial Review**
- **Tariff & OA Charges Review**

Impact Assessment of Open Access

Impact on Consumers

(Viability of open access)

- *Break even power purchase cost*

Impact on Discoms

(Revenue loss due to OA migration)

- *Per unit revenue loss*
- *Aggregate impact on Discom*

+ Scenario/ Sensitivity Analysis

Measures for Effective OA Implementation

1. **Standardization of Regulations**

   To enable wider adoption of open access

2. **Balancing Interests of Consumers and Discoms**

   Through rationalization of tariff and open access charges

3. **Improvement in operational procedures**

   Improving ease of operating under open access

Detailed Analysis of Status of Open Access

- Regulatory review
  - *Open access eligibility conditions*
  - *Open access application process*
  - *Open access charges*

Open Access Eligibility Conditions

Few States have conditions with respect feeder and voltage level for availing OA

OA Eligibility

	Min Load	Feeder Conditions	Voltage Conditions	Other Conditions
CG	1 MW	• Only dedicated feeder	• 33 kV and above	-
AS	1 MW	• Only dedicated feeder	• Wheeling charges only for 33 kV	-
PB	1 MW	• Not allowed on urban pattern supply feeders, AP feeders & category 1 - mixed load feeders • Category 2 mixed load feeders subject to load shedding	• 11 kV and above	• RPO compliance in previous period
JH	1 MW	• Subject to load shedding on mixed feeders or on feeders at 33 kV or below	-	• Consumer taking bulk supply from Discom and supplying to multiple users, cannot take OA
TN	1 MW*	• Subject to SERC restrictions on mixed feeder	-	-
AP	1 MW	-	-	-
WB	1 MW	-	-	-
GJ	1 MW	-	-	-
HR	0.5 MW	• Subject to load shedding on mixed feeder	• 11 kV and above	-
MH	1 MW	-	-	-

OA Period

	LTOA	MTOA	STOA
CG	12-25yr	1yr – 7yr	<= 1m
AS	> 7 yr	3m – 5yr	<= 1m
PB	12-25yr	3m – 3yr	<= 1m
JH	12-25yr	3m – 3yr	<= 1m
TN	12-25yr	3m – 3yr	<= 1m
AP	>= 2 yr		<= 1yr
WB	>=15 yr		<= 4m
GJ	12-25yr	3m – 3yr	<= 1m
HR	12-25yr	3m – 3yr	<= 1m
MH	12-25yr	3m – 3yr	<= 1m

- In JH and GJ, exception for min load requirement of 1MW for captive consumers

**as informed by stakeholders, OA approvals are being granted for 1 MW and above only. Only in cases of Wind Power, OA approvals are being given for less than 1 MW also*

Open Access Application Process

Key aspects of application process impacting consumers

1 Nodal Agency

	LTOA	MTOA	STOA
CG[1]	STU / Discom	STU / Discom	SLDC/ Discom
AS	STU	STU	SLDC
PB	STU	STU	SLDC
JH	STU	SLDC	SLDC
TN	STU/ SLDC	STU/ SLDC	SLDC
AP	STU		SLDC
WB	STU		SLDC
GJ*	STU/ SLDC	STU/ SLDC	SLDC
HR	STU	STU	STU
MH	Discom	Discom	Discom

- Independence of SLDC/ Nodal Agency is a key concern

2 Documentation Required

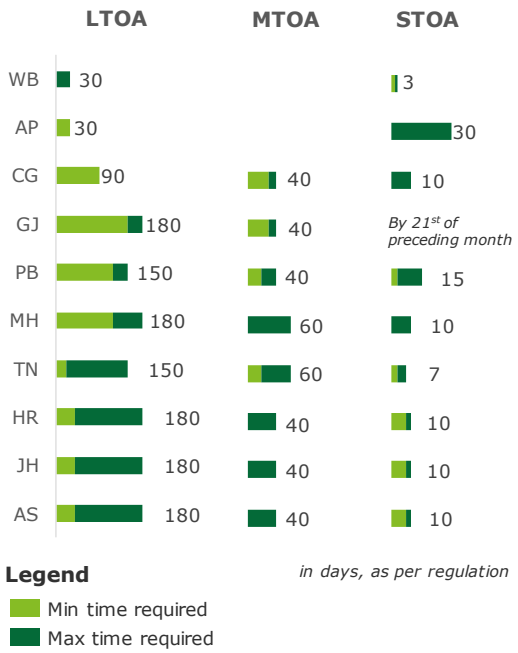
- NOC required along with OA application in CG, JH, TN and GJ
- Conditions for NOC, subjective and non verifiable
  - Existence of necessary infra
  - Availability of surplus capacity

Only few States provide some information on network availability

CG	• Weekly SLDC reports on transmission constraints
GJ	• Report on available OA capacity issued by SLDC
AS	• Monthly reports on Transmission System Availability, by SLDC
MH	• Feeder Outage Data

- PB[2], AP, MH, HR[3] and TN[4] have online NOC/ application process
- In HR and PB, feasibility clearance from STU/ Discom required. In MH a Techno Commercial Report required

3 Time period



- Deemed approval for LTOA at the end of 30 days in AP
- In CG, GJ, PB, TN, HR, JH and AS deemed timelines for NOC approval

4 Cost of application

Application charges based on	LTOA/ MTOA / STOA	Load	Point of Connec-tion	Sourc e of Power
WB	✓			✓
AP	✓			
CG	✓		✓	
GJ		✓	✓	
PB	✓		✓	
MH		✓		
TN	✓	✓	✓	
HR	✓			
JH	✓			
AS	✓			

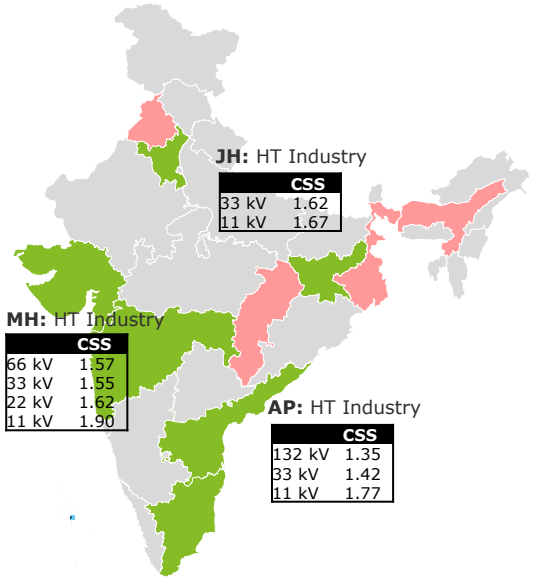
- Cost of OA application insignificant as compared to overall open access charges

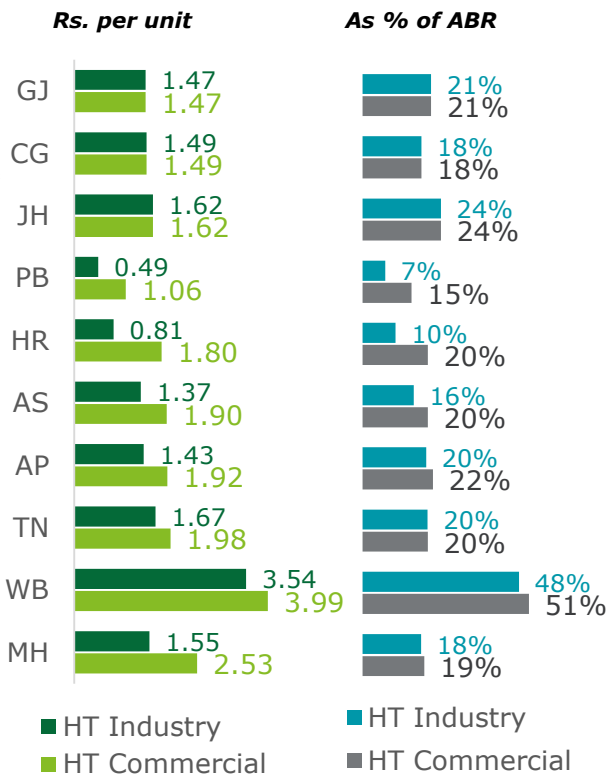
1.based on injection/ drawl point
2.on trial basis for IEX consumers
3.for STOA, online form submission
4.online process for captive consumers

Open Access Charges

Different methodologies and charge structure for CSS and T&D charges

Cross Subsidy Surcharge





- Most States are following the revised methodology for CSS

Assumptions: 33 kV voltage level; Non-captive, conventional consumer; Average CSS taken for AP (E) and AP (S); CSS for WB calculated as per regulations; ABR as per Tariff Orders or Variable Tariff plus Fixed Tariff converted to per unit charge assuming 60% load factor; Numbers for FY2018-19

Transmission and Wheeling Charges

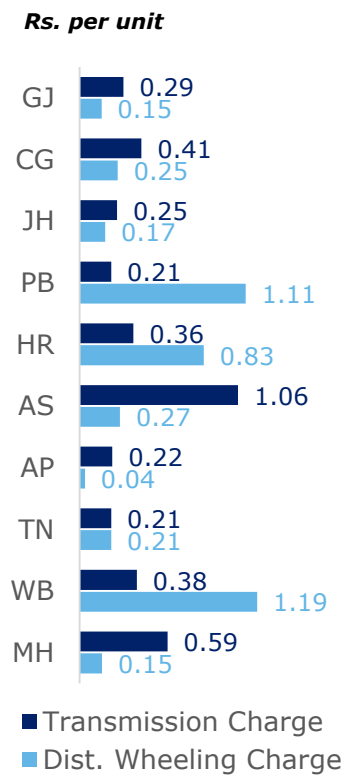
Distribution Wheeling Charge

	LT	MT	ST	Voltage Wise
GJ				✓
CG				
JH				✓
PB	■	■		
HR	■	■		
AS				
AP	■	■	■	✓
TN				
WB				
MH				✓

Transmission Charge

	LT	MT	ST	Voltage Wise
GJ^	■	■	■	
CG	■	■		
JH				
PB	■	■		
HR*				
AS	■	■		
AP	■	■	■	
TN	■	■		
WB	■	■	■	
MH	■	■		

Legend
Per month
Per unit



- Voltage wise and Per month wheeling charges not determined in most States
- In AP, significant difference between 11kV and 33kV wheeling charge

Note:
^Transmission wheeling charge for STOA collective transactions is per unit and for bilateral transactions per MW/Day;
** While regulations provide for per month trans. charge in LTOA/ MTOA, only per unit charge for STOA is determined*

Open Access Charges

Variations in methodology and applicability of other open access charges across States

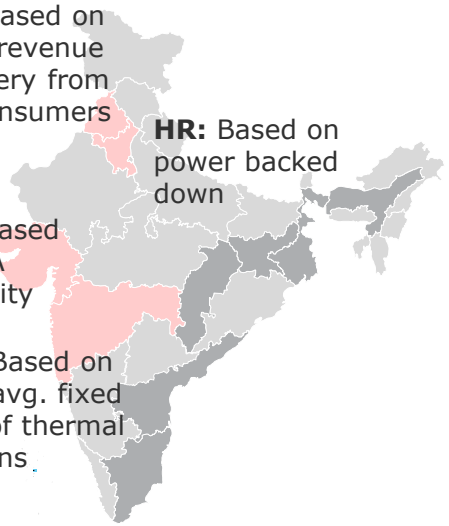
Additional Surcharge

PB: Based on fixed revenue recovery from HT consumers

HR: Based on power backed down

GJ: Based on OA capacity

MH: Based on wtd. avg. fixed cost of thermal stations



	Rs./Kwh
PG	0.86
HR	1.13
GJ	0.57
MH	1.25

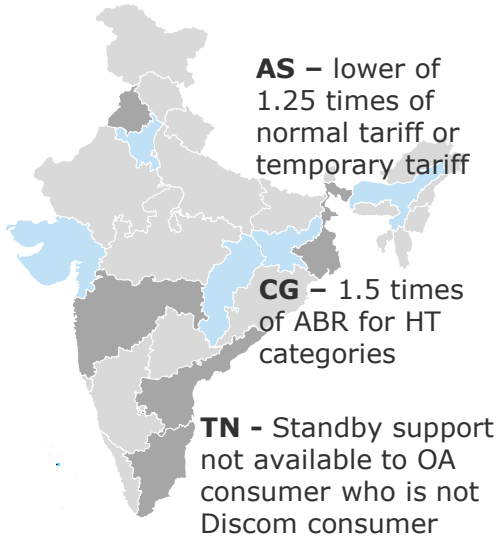
- Methodology suggested by MoP/ FOR is still to be adopted

SLDC Charges

	LT	MT	ST
CG	-	-	Rs. 2,000/ day
AS	Rs. 46.87/ MW/ Day		
PB	Rs. 1,321/ MW/ Month		Rs. 2,000/ day
JH	-		
TN	Scheduling – Rs. 160/ day Rs. 33.74/ MW/ day		Rs. 1.41/ MW/ Hr
AP	Annual Fee – Rs. 4,214/MW/Year Operating – Rs. 2,343/MW/Month		
WB	Rs. 0.05/ Kwh + 0.5% of T&D charge		
GJ	Rs. 300/ MW/ Month		Rs. 2,000/ day
HR	-	-	Rs. 1,000/ day
MH	Rs. 658/ MW/ Month		

- Per MW/ Per Day SLDC charges for STOA consumers could be higher in case of lower load factor

Stand-by charge



AS – lower of 1.25 times of normal tariff or temporary tariff

CG – 1.5 times of ABR for HT categories

TN - Standby support not available to OA consumer who is not Discom consumer

Legend

- Temporary Tariff
- N/A or no mention in regulations

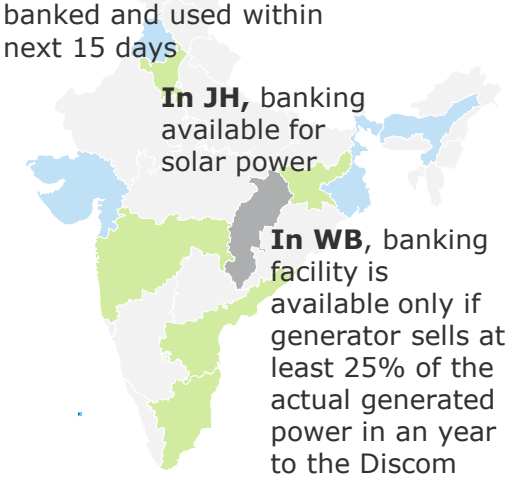
- Requirement for provision on standby charges in open access regulations across states

Banking of Power

In PB, any underdrawl due to unscheduled power cut can be banked and used within next 15 days

In JH, banking available for solar power

In WB, banking facility is available only if generator sells at least 25% of the actual generated power in an year to the Discom



Legend

- Available for third party RE OA consumer
- Available for captive RE consumers
- Banking not available

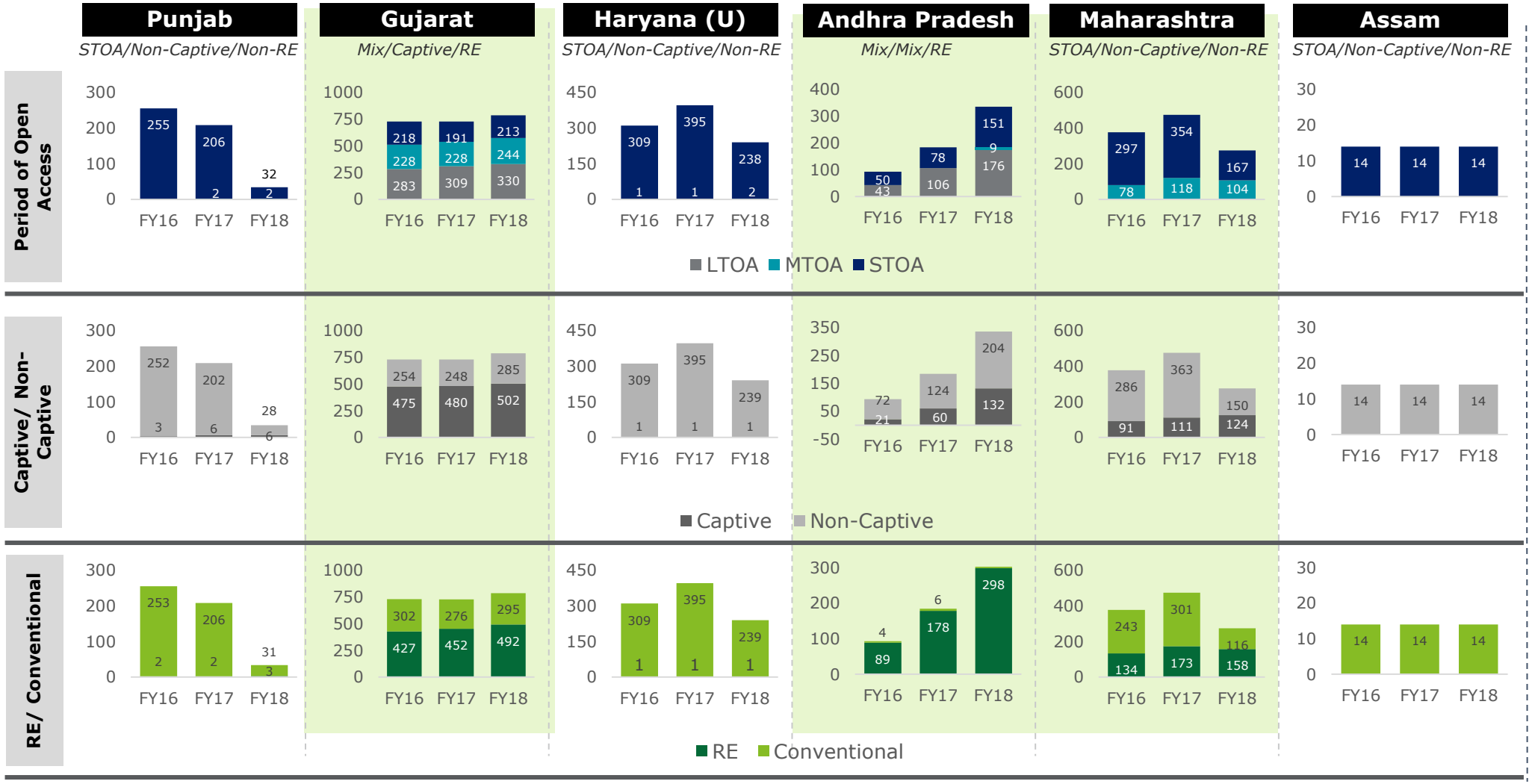
- In HR, GJ, PB and TN Under-drawl of OA due to network outage or unscheduled load shedding, is banked or compensated for

Detailed Analysis of Status of Open Access

- Open Access Activity review
  - *Type of open access activity*
  - *Open access consumers and sales*
  - *Open access applications*

Type of open access activity

OA consumers are predominantly utilizing STOA in most states instead of LTOA/MTOA



Key Observations

- AP & GJ have high proportion of LTOA/ MTOA consumers, while other states have STOA
- AP & GJ are also RE rich states and the proportion of RE power in OA quantum is considerably high as compared to the other states
- Limited captive open access is observed in northern states of Punjab, Haryana and NER state of Assam

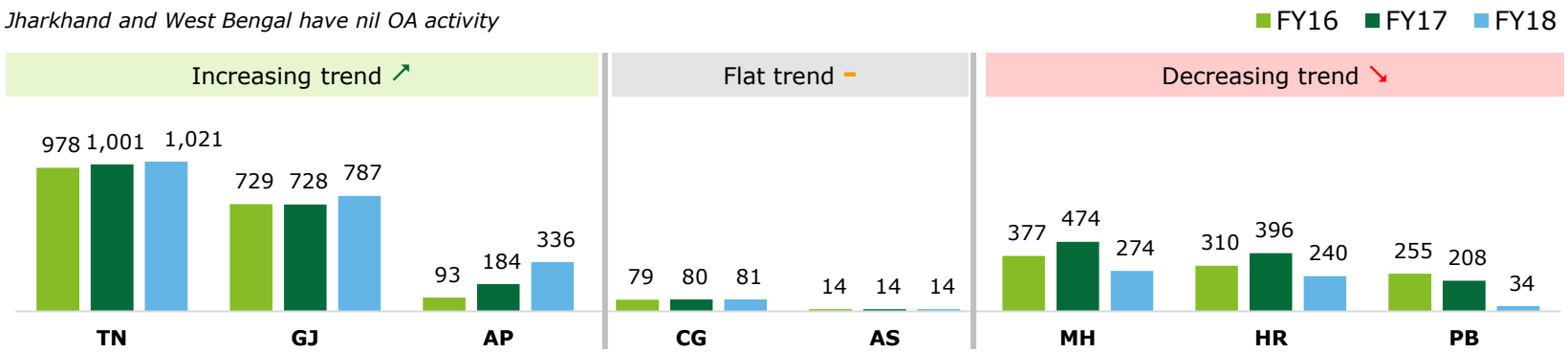
Based on number of consumers

Open access consumers and sales

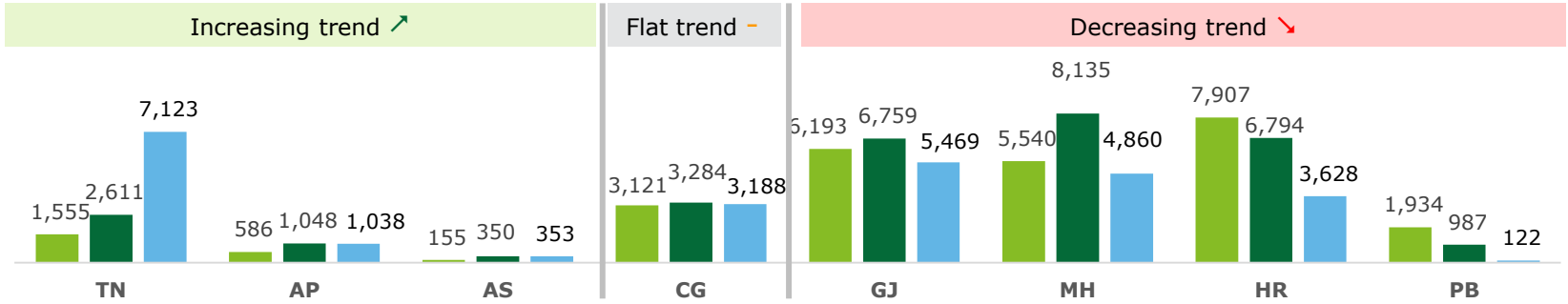
Considerable variations are observed in OA activity in the last three years across States

Open Access Consumers (Numbers)

Jharkhand and West Bengal have nil OA activity



Open Access Sales (Gwh)



Source: CERC Market Monitoring Reports for TN, CG and MH; Data provides by respective SERCs for other states
Units purchased from bilateral sources and power exchange is taken from CERC market monitoring reports

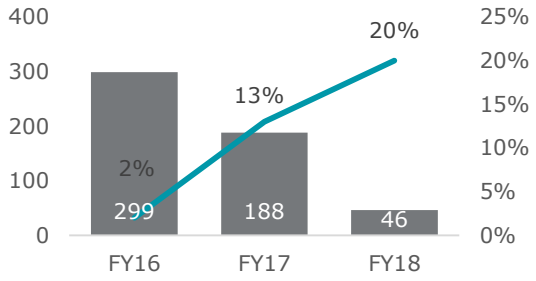
Key Observations

- Increased RE capacity and incentives lead to higher Open Access activity. One of the reason for increased open access sales across Maharashtra, Tamil Nadu and Andhra Pradesh is the increased RE capacity and incentives in form of discounted OA charges
- STOA activity is largely dependent on the prices in power exchanges. Due to increase in short-term prices during FY18, the STOA activity has reduced in states like Haryana and Gujarat where industrial consumers were buying only in case of significant difference in tariff and short-term prices
- Significant increase in OA sales is seen in Tamil Nadu as CSS has reduced significantly post Tariff Policy 2016

Open access applications

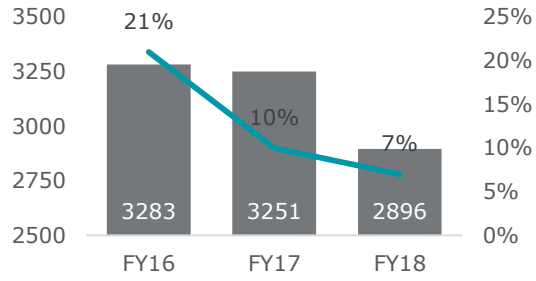
Decreasing trend of applications across states; rising rejection rate except for Gujarat

Punjab



- Non-compliance with RPO is cited as reason for all rejections

Gujarat

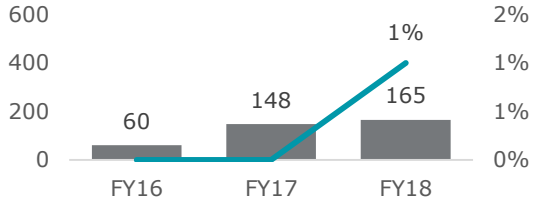


- Upstream network constraint and Denial by Discom are the biggest reasons for rejection
- Reasons given by Discom for denial are ABT meter issues, load above contract demand, undertaking not submitted etc.

Key Observation

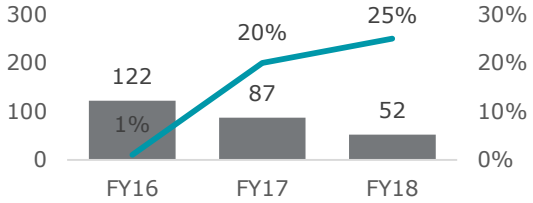
- The type of applications being received in a state are of similar nature i.e. either short term, medium term or long term

Assam



- Very few open access applications rejected

Chhattisgarh



- Majority of the applications with status 'Not Approved' are mentioned to be as per request of consumer

OA Applications

% of OA applications rejected

Detailed Analysis of Status of Open Access

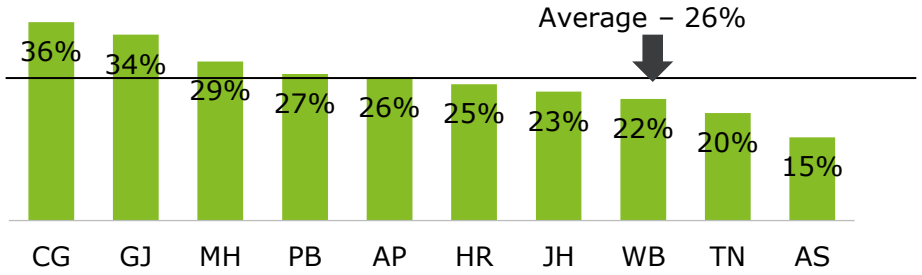
- Commercial review
  - *Share of HT Industrial and HT Commercial sales*
  - *Load Profile of HT consumers*

Share of HT sales and Load Profile of consumers

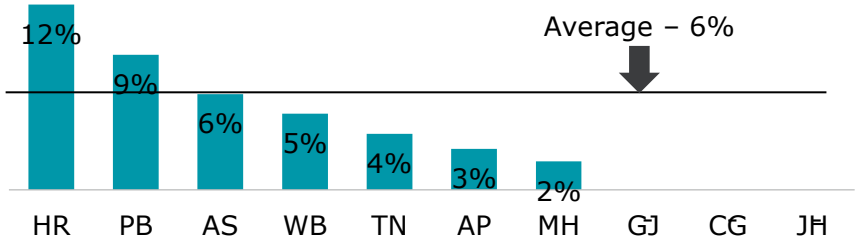
CG, GJ, MH and PB have a larger HT consumer base that may potentially shift to OA

Share of HT sales

HT Industrial Category



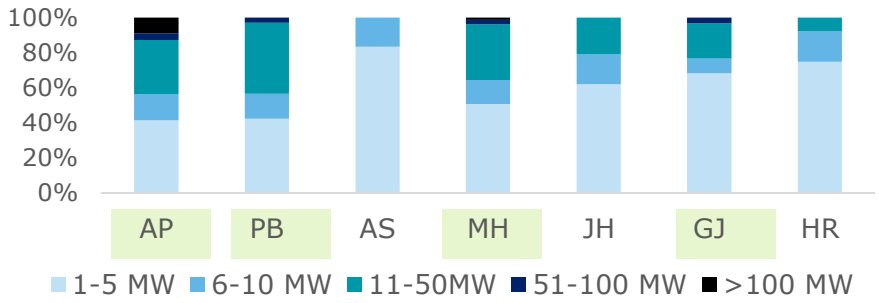
HT Commercial Category



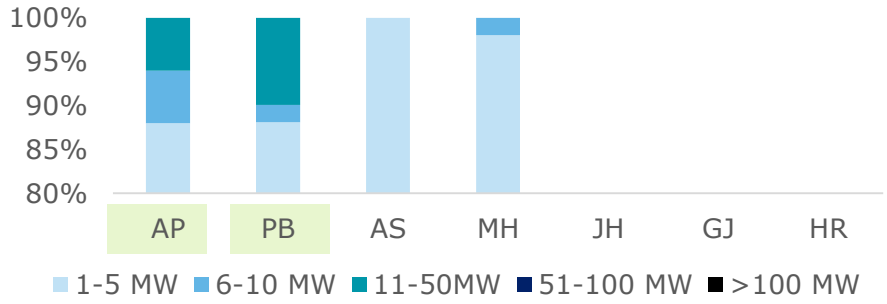
- Potential of OA migration would be higher in States with higher share of HT industrial and commercial sales
- MH, CG and GJ have the highest share and could have high OA migration

Load Profile of HT Consumers in the State

HT Industrial Category *% of sales in each category of load*



HT Commercial Category



States with consumers present in higher load slabs

- AP, PB, GJ and MH have more than 20% of HT Industrial consumers in the 11-50 MW load block, and thus consumers in the states have higher potential of migrating to open access

Detailed Analysis of Status of Open Access

- Tariff and OA charges review
  - *Review of retail tariffs applicable on HT consumers*
  - *Review of OA charges for various types of consumers*

Review of retail tariffs applicable for HT consumers

Tariff rationalisation is required to reduce negative impact on Discoms

Cost Coverage

ACOS Coverage	HT Ind.	HT Comm.
PB	103%	108%
WB	106%	113%
MH	134%	208%
AS	119%	129%
TN	143%	170%
AP	124%	144%
HR	104%	117%
CG	132%	132%
JH	113%	113%
GJ	120%	120%

- In case of MH, TN and CG the HT retail tariffs have ACOS coverage beyond 120%, because of which recovery from CSS could be lower due to provisions of NTP which restrict CSS at 20% of ABR

Fixed and Variable Charges

	Fixed ACoS %	HT Ind. (Fixed ABR)	HT Comm. (Fixed ABR)
PB	63%	7%	4%
WB	52%	12%	11%
MH	56%	10%	7%
AS	57%	5%	4%
TN	52%	11%	9%
AP	45%	15%	13%
HR	50%	5%	5%
CG	58%	12%	12%
JH	52%	10%	10%
GJ	48%	16%	16%

- Fixed costs in total ARR of Discoms is ~52% for all the utilities put together however recovery from fixed tariffs of HT consumers is ~10%
- In PB, WB, MH, AS and AP the fixed charges are growing a faster pace than variable charges

Recovery of fixed cost from fixed charges

HT Ind.	Fixed ACoS	Fixed ABR	Conventional Power			Fixed ABR + Fixed OA charge	Fixed Cost Recovery from Fixed Charges
			Dist. Wheel	Trans. Wheel	Add. Sur.		
	A	B	C	D	E	F = B+ C+D+E	F/A
PB	4.11	0.47	1.11	0.21	0.86	2.66	65%
WB	3.55	0.89	1.19	0.38	0.00	2.46	69%
MH	3.60	0.81	0.15	0.59	1.25	2.80	78%
AS	4.17	0.42	0.27	1.06	0.00	1.74	42%
TN	3.01	0.81	0.21	0.21	0.00	1.23	41%
AP	2.65	1.10	0.03	0.22	0.00	1.35	51%
HR	3.85	0.39	0.83	0.36	1.13	2.71	70%
CG	3.59	0.87	0.25	0.41	0.00	1.54	43%
JH	3.08	0.69	0.17	0.25	0.00	1.11	36%
GJ	2.84	1.10	0.15	0.29	0.57	2.10	74%

- In the states of AS, TN, CG and JH the fixed charges cover less than 50% of the fixed costs of Discom
- Further the Distribution Wheeling charge is ‘per unit’ in most of the states except PB, AP and HR

Review of Open Access Charges

CSS and Additional Surcharge are the major contributors to OA charges

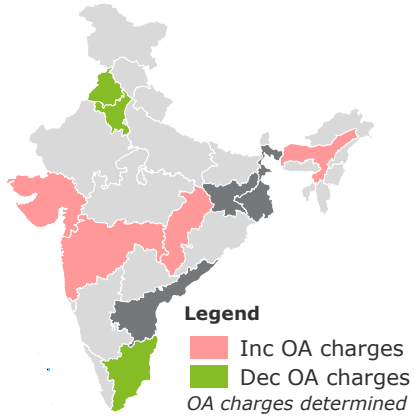
HT Industry Consumer Category (for conventional Power)

Rs./ Unit	CSS	Dist. Wheel.	Trans. Wheel	Add. Sur.	SLDC charge	RPO	Total
CG	1.49	0.25	0.41	-	-	0.11	2.27
AS	1.37	0.27	1.06	-	0.00	0.11	2.81
PB	0.49	1.11	0.21	0.86	0.00	0.07	2.74
JH	1.62	0.17	0.25	-	0.00	0.10	2.14
TN	1.67	0.21	0.21	-	0.01	0.14	2.24
WB	3.54	1.19	0.38	-	0.01	0.06	5.19
AP	1.43	0.03	0.22	-	0.01	0.11	1.80
GJ	1.47	0.15	0.29	0.57	0.00	0.13	2.60
HR	0.81	0.83	0.36	1.13	0.07	0.07	3.27
MH	1.55	0.15	0.59	1.25	0.00	0.14	3.68

HT Commercial Consumer Category (for conventional Power)

Rs./ Unit	CSS	Dist. Wheel.	Trans. Wheel	Add. Sur.	SLDC charge	RPO	Total
CG*	1.49	0.25	0.41	-	-	0.11	2.27
AS	1.90	0.27	1.06	-	0.00	0.11	3.34
PB	1.06	1.11	0.21	0.86	0.00	0.07	3.31
JH*	1.62	0.17	0.25	-	0.00	0.10	2.14
TN	1.98	0.21	0.21	-	0.01	0.14	2.55
WB	3.99	1.19	0.38	-	0.01	0.06	5.64
AP	1.92	0.03	0.22	-	0.01	0.11	2.28
GJ*	1.47	0.15	0.29	0.57	0.00	0.13	2.60
HR	1.80	0.83	0.36	1.13	0.07	0.07	4.26
MH	2.53	0.15	0.59	1.25	0.00	0.14	4.66

Trend of Open Access Charges



OA charges determined in JH in FY19 only; Flat trend in AP

- Variation in CSS and/ or Additional Surcharge is the main contributor to change in overall open access charges across States
- Minimal change is observed in Transmission charges and Distribution Wheeling charges across States except for Haryana and Maharashtra

Discounts for RE Power

	CSS	Dist. Wheel.	Trans. Wheel	Add. Sur.	SLDC charge	T&D Losses
CG	50%	100%	100%	-	100%	6%
AS	-	67%	33%	-	-	-
PB	-	100%	100%	-	-	-
JH	100%	50%	50%	-	-	100%
TN	40%	60%	60%	-	60%	-
WB	-	-	-	-	-	-
AP	100%	100%	100%	-	-	100%
GJ	100%	-	-	-	-	-
HR	100%	100%	100%	100%	-	-
MH	-	-	-	-	-	-

- Complete waiver in AP and HR (as AP has no Add. Surcharge)
- No Discount in WB and MH

Assumptions: 1 MW load; Non-Captive conventional power; 60% load factor; 33 kV voltage; LTOA (Except in case of Haryana, where only short term OA charges are determined); Numbers for FY2018-19

**Since no separate HT commercial category is present in CG, JH and GJ, same charges of HT Industry category are represented for comparison with other states*

Open Access Charges for different types of consumers

OA charges for captive consumers and RE based OA is lower

Long Term Open Access

General OAC Trend

HT Ind.	Total Open Access Charges				HT Industrial Tariff	
Rs/ unit	Non Captive, Conventional Power	Captive, Conventional Power	Non Captive, RE* Power	Captive, RE* Power	ABR	Energy Tariff
CG	2.27	0.78	0.75	0.00	7.50	6.63
AS	2.81	1.44	1.90	0.53	7.62	7.20
PB	2.74	1.39	1.36	0.01	6.63	6.16
JH	2.14	0.52	0.21	0.21	6.75	6.05
TN	2.24	0.57	1.39	0.38	7.16	6.35
WB	5.19	1.64	6.02	2.47	7.33	6.44
AP	1.79	0.37	0.02	0.02	7.28	6.18
GJ	2.60	0.56	1.69	1.12	7.06	5.97
HR	3.27	1.33	0.07	0.07	7.29	6.89
MH	3.68	0.88	3.30	0.50	7.91	7.10

- Generally OA charges are lower for captive consumers due to non-applicability of CSS and additional surcharge
- Lower OA charges for RE based procurement due to discounts offered by various States

Short Term Open Access

(Higher from LTOA/ MTOA)

HT Ind.	Total Open Access Charges				HT Industrial Tariff	
Rs/ unit	Non Captive, Conventional Power	Captive, Conventional Power	Non Captive, RE* Power	Captive, RE* Power	ABR	Energy Tariff
CG	2.34	0.85	0.75	0.00	7.50	6.63
AS	2.40	1.03	1.90	0.53	7.62	7.20
PB	3.09	1.74	1.36	0.01	6.63	6.16
JH	3.77	0.66	0.67	0.67	6.75	6.05
TN	2.24	0.57	1.39	0.38	7.16	6.35
WB	4.66	1.11	4.82	1.28	7.33	6.44
AP	1.79	0.37	0.02	0.02	7.28	6.18
GJ	2.82	0.78	1.54	0.98	7.06	5.97
HR	3.27	1.33	0.07	0.07	7.29	6.89
MH	3.43	0.63	3.30	0.50	7.91	7.10

- It is observed that OA charges for STOA is higher than OA charges for LTOA/ MTOA, except in few cases of AS, WB and MH

**for Solar Power*

Impact Assessment of Open Access

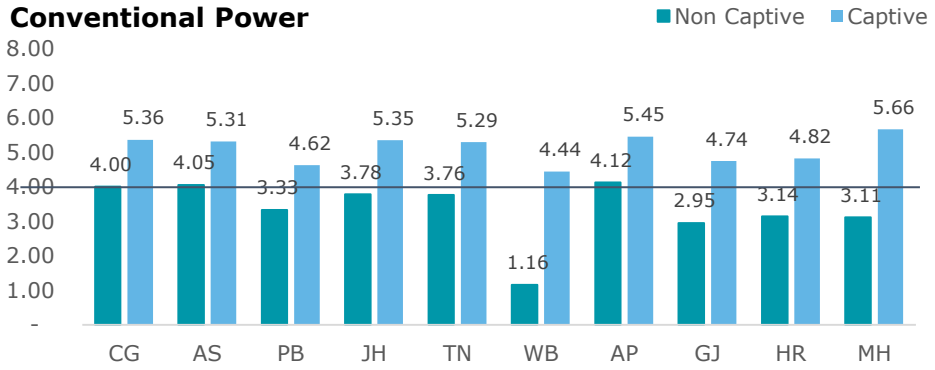
- Impact on Consumers
- Impact on Discoms

Impact on Consumers

Better viability observed for captive consumers or RE based OA

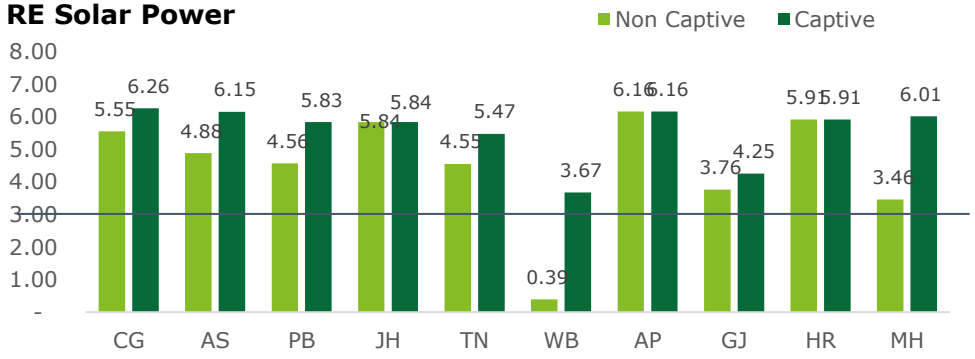
HT Industrial Consumers - Break Even Power Purchase Cost (Rs./Unit)

Conventional Power



- Only viable for captive consumers

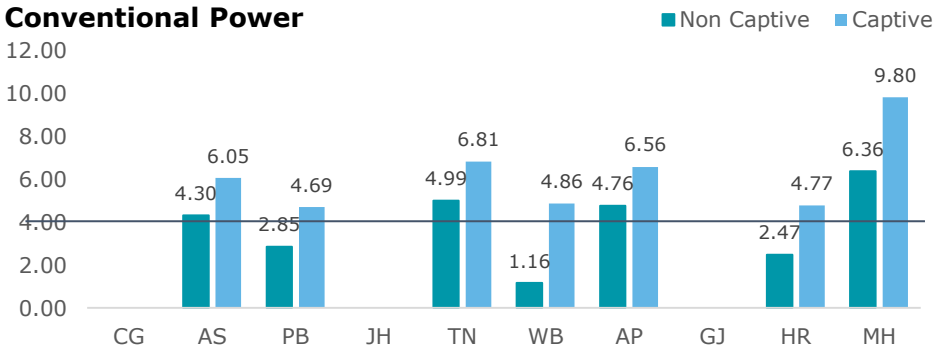
RE Solar Power



- Viable for all States except WB non-captive (due to high CSS)

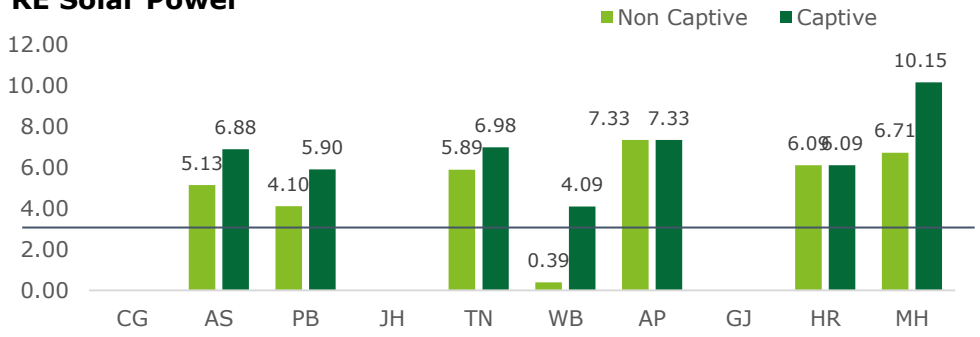
HT Commercial Consumers - Break Even Power Purchase Cost (Rs./Unit)

Conventional Power



- Viable for non-captive consumers in TN, AP and MH

RE Solar Power



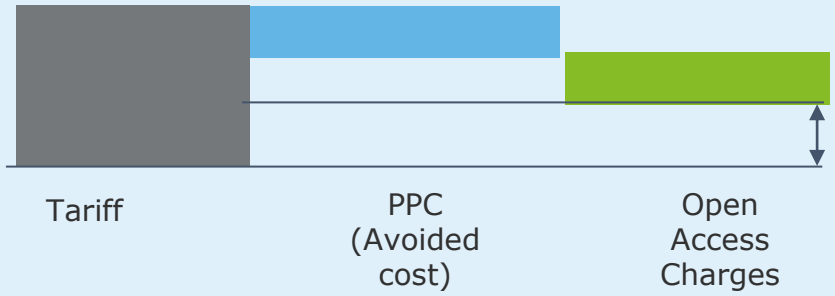
- Viable for all States except WB non-captive (due to high CSS)

Source: For the states of Punjab and Assam - Data collected from State Utilities, SERC Tariff Orders of respective states

Impact on Discoms

Loss of revenue due to migration of consumers to open access

Per Unit Impact on Discom



Gap = Per Unit Impact on Discom

Aggregate Impact on Discom

Sales Migration to Open Access × **Aggregate Impact on Discom** ÷ **Remaining Discom Sales** = **Average Tariff Hike Required to cover the Impact**

Scenario Analysis

Treatment of Contract Demand by Consumer

- Maintained with Discom
- Not maintained with Discom

Treatment of Surplus Power by Discom

- Backed Down
- Re-allocated to other consumers

Type of Open Access consumer

- Thermal, Non-Captive
- Thermal, Captive
- RE, Non-Captive
- RE, Captive

Sensitivity Analysis

Sales migration to Open Access

- 5%
- 10%
- 20%
- As per Load Profile

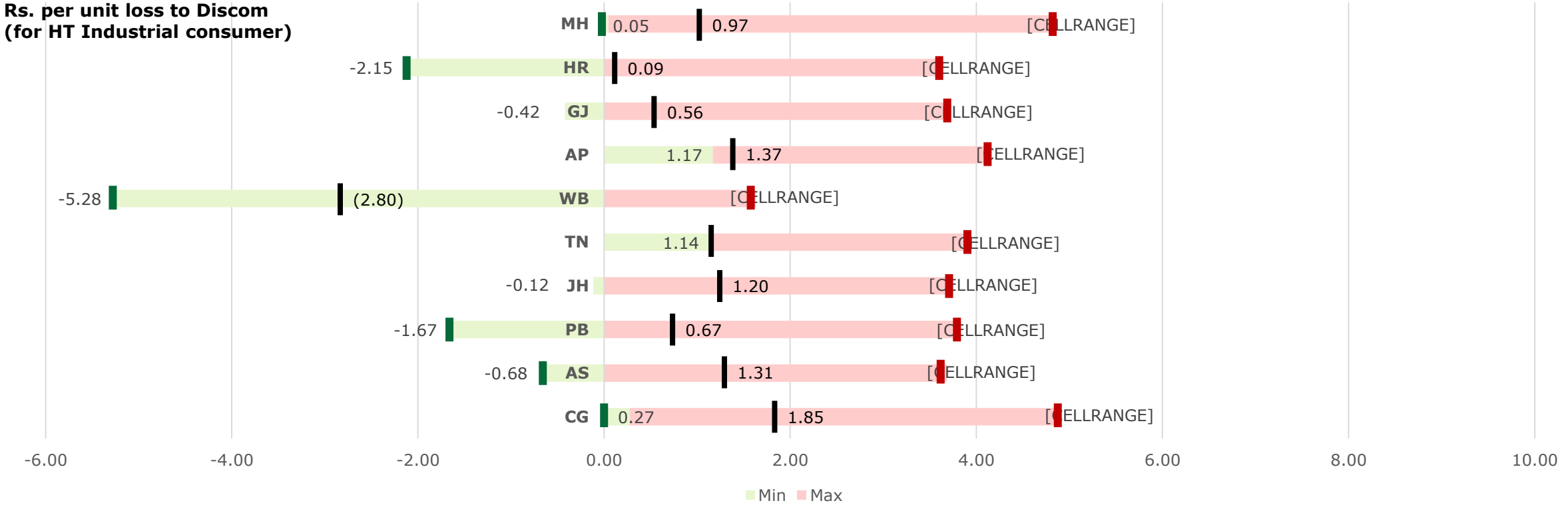
Per unit impact on Discoms

Significant difference in loss if contract demand not maintained with Discom; Discom can reduce loss by re-allocating surplus power

Minimum Impact on Discom
- HT Industrial Consumer, Non-Captive, Conventional Power
- Contract Demand Maintained with Discom
- Surplus Power Re-Allocated by Discom

Base Case
- Non-Captive, Conventional Power
- Contract Demand Maintained with Discom
- Surplus Power Backed Down by Discom

Maximum Impact on Discom
- Captive, RE Power
- Contract Demand Not-Maintained with Discom
- Surplus Power Backed Down by Discom

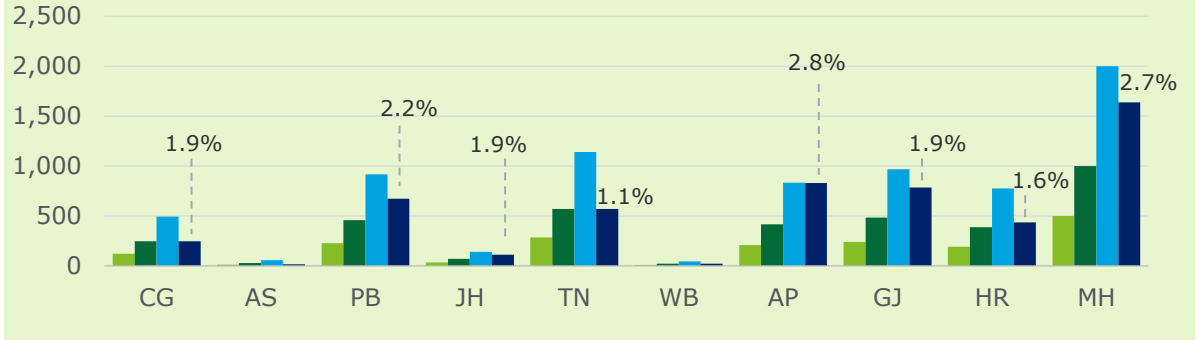


Aggregate Impact on Discoms

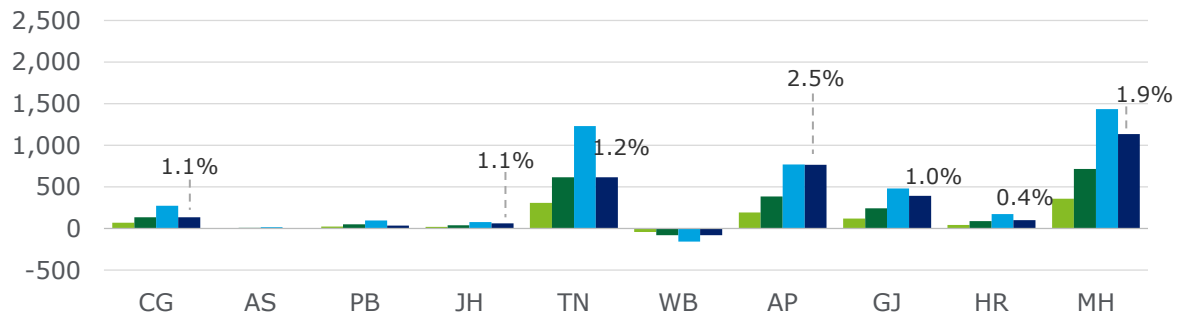
Punjab, Tamil Nadu, Andhra Pradesh, Gujarat and Maharashtra could be adversely impacted in base case

Contract demand maintained

1 Surplus power backed down

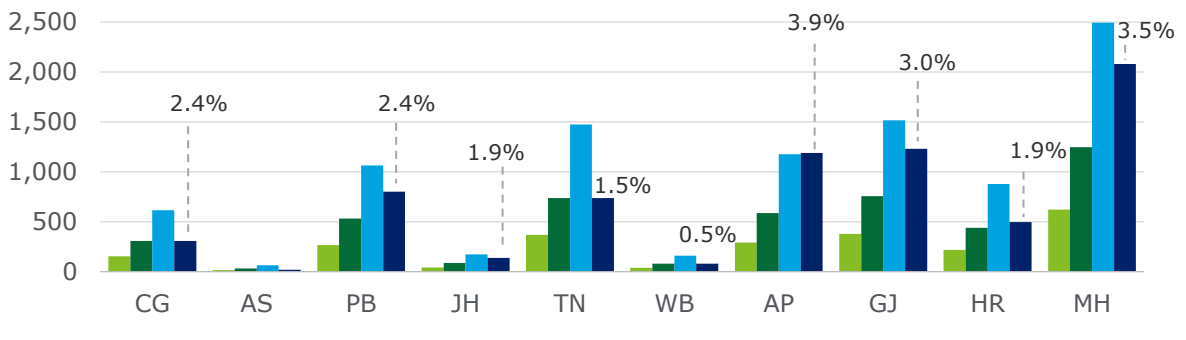


2 Surplus power re-allocated

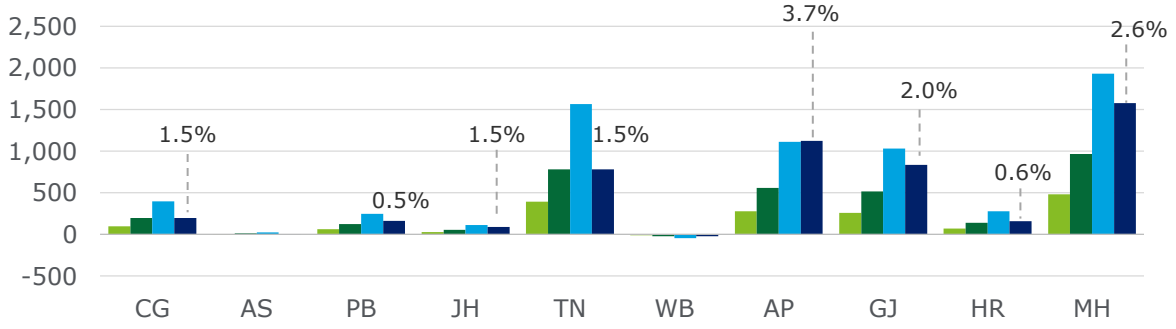


Contract demand not maintained

3 Surplus power backed down



4 Surplus power re-allocated



xx% - Tariff hike required to cover loss of revenue

% of sales migration 5% 10% 20% Load Profile

Measures for effective open access implementation

Measures for effective implementation of open access

Applicable on	Broad areas of measures for effective implementation of open access		
	Standardisation of regulations	**Balancing interests of consumers and Discoms**	**Improvement in operational procedures**
Regulator/ Policy	**Measures to enable wider adoption of open access**	**Measures to create a balance between consumer viability and impact on Discoms, through rationalisation of tariff and open access charges**	
SLDC, STU and Discom			**Measures to improve ease of operating under open access**

Measures for effective implementation of open access

Standardisation of regulations

Eligibility Conditions

- Allow OA to group of consumers meeting min requirements together
- Reduction in 1MW minimum requirement
- Removal of voltage/ dedicated feeder restrictions
- Compliances such as RPO, may be considered only in cases where repeated non-compliance is observed

Independence of nodal agency

- Implement recommendations of Pradhan Committee
- SLDC should be the nodal agency for all types of OA

Loss of OA power due to unscheduled outages

- Banking or adjustment in charges during unscheduled power cuts

Frequent shifting of consumers

- Minimum schedule of continuous 8 (eight) hours

Balancing interests of consumers and Discoms

Progressive tariff rationalization

- Simplify applicability of charges on various consumer types
- Reduce the cross subsidies
- Fixed charges in line with fixed costs of Discom

Methodology for determination of OA charges

- Uniformity in methodology for determination of CSS, Add. Surcharge and Standby charges
- Voltage wise wheeling charges
- Wheeling charges with fixed charge structure (except for RE)

Long Term certainty in OA charges

- Capping large variations in OA charges
- Determining OA charges for 3-5 yr (Control period)
- Roadmap for reducing incentives on RE power
- Discounts (for RE Power) limited to certain % of overall charges
- Driving efficiency in operations while determining OA charges (performance standard)

Improvement in operational procedures

Delay in grant of NOC/ OA approvals

- Nodal agency to coordinate getting NOC
- Online portal for OA application/ granting of NOC
- Provision for 'Deemed Approval'

Disputes with respect to OA provisions

- Regulators can issue regular and detailed open access practice directions

Lack of information

- Model document for standardization of information to be shared with the consumers
- Availability of information on the website of nodal agency
- Reduce and standardize the documentation required along with OA application

Deloitte.

Comments and Suggestions

Annexures

Annexures

- Shortlisting of States

Shortlisting of States

For detailed analysis in this report

Methodology	North	South	East	West	N-E
29 States & 7 UTs	1. J&K 2. Himachal 3. U'khand 4. Punjab 5. Haryana 6. Delhi 7. Uttar Pr. 8. Rajasthan 9. Chandigarh	1. Tamil Nadu 2. Kerala 3. Karnataka 4. Andhra 5. Telangana 6. Andaman 7. Laksha-dweep 8. Puducherry	1. West Bengal 2. Bihar 3. Jharkhand 4. Odisha	1. Gujarat 2. Maharashtra 3. Goa 4. Madhya Pr. 5. Chhattisgarh 6. D&D 7. D&NH	1. Assam 2. Arunachal 3. Manipur 4. Nagaland 5. Tripura 6. Mizoram 7. Meghalaya 8. Sikkim
Potential of Open Access • HT industry and HT commercial sales as % of total sales Top 5 States	1. Uttarakhand 2. Punjab 3. Chandigarh 4. Himachal 5. Haryana	1. Puducherry 2. Andhra 3. Telangana 4. Tamil Nadu 5. Kerala	1. Odisha 2. West Bengal 3. Jharkhand 4. Bihar	1. D&NH# 2. Gujarat 3. Goa 4. Chhattisgarh 5. Maharashtra	1. Sikkim 2. Arunachal 3. Nagaland 4. Meghalaya 5. Assam
Level of OA activity & Charges • No. of OA consumers • Inc. in OA consumers • OA charges Top & bottom States	1. Punjab 2. Haryana 3. Himachal 4. Chandigarh	1. Andhra 2. Tamil Nadu 3. Telangana 4. Puducherry	1. Odisha 2. Jharkhand 3. West Bengal 4. Bihar	1. Chhattisgarh 2. Gujarat 3. Goa 4. Maharashtra	1. Assam 2. Nagaland 3. Sikkim 4. Meghalaya
Final 10 States	**1. Punjab** **2. Haryana**	**1. Andhra** **2. Tamil Nadu**	**1. West Bengal** **2. Jharkhand**	**1. Gujarat** **2. Chhattisgarh** **3. Maharashtra**	**1. Assam**

Data

Data

*States highlighted in **green** reflect greater OA activity and lower OA charges as compared with state highlighted in **blue** based on the parameters considered under this stage of shortlisting.*

#Out of D&NH and D&D, only one UT is considered with higher HT industrial and HT commercial sales

Shortlisting of States

Level 1 Shortlisting - Data for HT sales as % of overall sales in the state

Region	State	Year	Industrial Sales (MU)	Commercial Sales (MU)	Total Sales (MU)	%
North	Uttarakhand	FY19	6,063	1,320	11,888	62%
	Punjab	FY19	15,650	5,226	49,561	42%
	Chandigarh	FY19	249	508	1,782	42%
	Himachal Pradesh	FY19	2,946	587	8,638	41%
	Haryana	FY18	9,030	4,388	36,449	37%
	J&K	FY17	1,364	1,124	7,955	31%
	Rajasthan	FY19	13,046	5,273	60,682	30%
	Uttar Pradesh	FY19	12,499	4,250	1,18,163	14%
West	Dadra & Nagar	FY19	5,532	34	5,941	94%
	Daman & Diu	FY19	1,903	65	2,318	85%
	Goa	FY19	1,398	79	3,645	41%
	Chhattisgarh	FY19	7,809	953	21,675	40%
	Gujarat	FY19	24,829	0	73,561	34%
	Maharashtra	FY19	28,648	1,900	99,039	31%
	Madhya Pradesh	FY19	7,468	1,087	52,652	16%
South	Puducherry	FY19	857	73	2,606	36%
	Andhra Pradesh	FY19	14,125	1,458	54,392	29%
	Telangana	FY19	9,838	2,453	49,721	25%
	Tamil Nadu	FY19	17,331	4,240	88,780	24%
	Kerala	FY18	2,010	2,597	21,840	21%
	Andaman	FY19	19	39	279	21%
	Karnataka	FY19	7,345	3,032	50,699	20%
	Lakshadweep	FY19	0	3	68	5%

Source: Respective tariff orders of SERCs

Region	State	Year	Industrial Sales (MU)	Commercial Sales (MU)	Total Sales (MU)	%
East	Odisha	FY17	5,412	0	10,855	50%
	West Bengal	FY17	5,593	847	25,324	25%
	Jharkhand	FY19	2,391	119	10,197	25%
	Bihar	FY19	1,784	1,889	22,100	17%
North East	Sikkim	FY19	196	43	472	51%
	Arunachal	FY19	118	58	424	41%
	Nagaland	FY19	96	110	695	30%
	Meghalaya	FY19	142	29	1,016	17%
	Assam	FY19	730	485	7,785	16%
	Tripura	FY15	39	46	784	11%
	Mizoram	FY19	10	8	388	5%
	Manipur	FY19	9	6	560	3%

Source: Respective tariff orders of SERCs

Shortlisting of States

Level 2 Shortlisting - Data for open access activity and charges

Region	State	Growth in OA consumer[1]	Rank	OA consumers (PXIL + IEX) [2]	Rank	OA Landed Cost (Rs./Kwh) [3]	Rank	Average Rank
North	Haryana	25%	2	487	1	8.30	4	2.3
	Punjab	3%	4	485[4]	1	6.45	2	2.3
	Uttarakhand	8%	3	124	3	5.73	1	2.3
	Himachal Pradesh	55%	1	24	4	8.48	5	3.3
	Chandigarh	0%	5	0	5	7.11	3	4.3
West	Chhattisgarh	2%	3	80	2	6.49	1	2.0
	Gujarat	11%	2	627	1	6.98	4	2.3
	Maharashtra[5]	21%	1	54	3	7.88	5	3.0
	Dadra & Nagar	0%	5	22	4	6.49	1	3.3
	Goa	0%	5	0	5	6.85	3	4.3
South	Andhra Pradesh	3%	2	728	2	5.99	1	1.7
	Tamil Nadu[6]	2%	3	1,001	1	6.58	3	2.3
	Kerala	26%	1	24	4	6.39	2	2.3
	Telangana	-19%	5	27	3	7.25	4	4.0
	Puducherry	0%	4	0	5	7.67	5	4.7
East	Odisha	41%	1	58	1	6.10	1	1.0
	Jharkhand	0%	2	0	2	6.50	2	2.0
	Bihar	0%	2	0	2	8.17	3	2.3
	West Bengal	-100%	3	0	2	9.50	4	3.0
North East	Assam	0%	2	14	1	6.93	4	2.7
	Nagaland	0%	2	0	4	4.00	1	2.3
	Arunachal	-100%	4	0	4	4.19	2	3.3
	Meghalaya	-100%	4	0	4	6.61	3	3.7
	Sikkim	-100%	4	0	4	8.53	5	4.3

[1] From FY2014-15 to FY2016-17, as per CERC Market Monitoring Reports
[2] FY2016-17, as per CERC Market Monitoring Reports
[3] For industrial consumers, assuming Rs. 4.00/ unit as power purchase cost and converting monthly OA charges to per unit, with unity load factor
[4] Same rank is given to Haryana and Punjab, due to similar number of OA consumers
[5] Maharashtra is taken instead of Dadra & Nagar Haveli as Maharashtra has significantly higher OA activity
[6] Between Kerala and Tamil Nadu, Tamil Nadu is selected as it has significantly higher open access activity

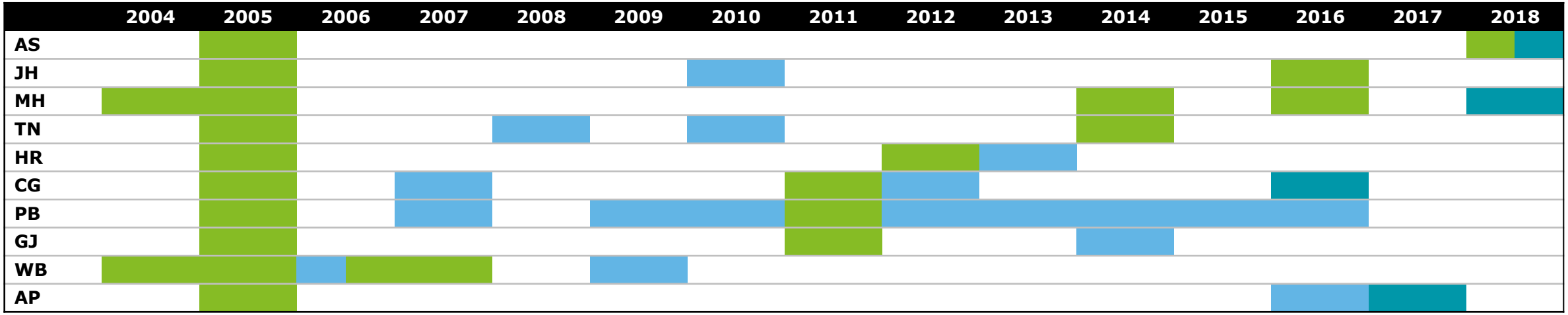
Annexures

- Regulatory Review

Open Access Regulations

As per the Provisions of the Act, all the SERCs came out with the Open Access Regulations early in 2004/05 with subsequent amendments from time to time

Timeline of regulations



Legend

- OA Regulation
- Amendment
- DSM Regulation

Key Observations

- **Chhattisgarh (2012)** - amended OA regulations to allow only bulk consumers connected on dedicated feeders to get OA
- **Haryana (2013)** - amended OA regulations to lower min load requirement for getting OA, from 1 MW to 0.5 MW
- **Punjab (2012)** – single distribution wheeling charges applied on all consumers irrespective of voltage level
- **Punjab (2014)** – CSS not applicable to the extent of regulatory measures imposed due to shortage of power

Open Access Regulations and Amendments.....(1/3)

Punjab

Year	Regulation/ Amendment	Key Amendment
2005	OA Regulation	-
2007	Amendment	• LTOA consumers to pay 1/3rd T&D wheeling charges and STOA 1/5th • OA consumers to bear 30% of agg. T&D losses above 66 kV and 50% of agg. T&D below 66 kV • 98% discount on T&D wheeling charges for RE power
2009	Amendment	• Congestion charges applied on OA consumers for overdrawl • In case of unscheduled outage, OA power banked for 3 months • Settlement of power demand in case of embedded consumers defined • Phasing of OA delayed. OA less than 1 MW to be allowed from 2010 • Stand-by power allowed for 6 weeks in a year at highest HT tariff
2010	Amendment	• SLDC may cancel any OA transaction to prevent network constraint
2011	OA Regulation	-
2012	Amendment	• Same wheeling charges applicable on all OA consumers above 11 kV, in addition to transmission charges
2012	Amendment	• Discount for RE power limited to wheeling of power within the state
2013	Amendment	• Defined Unauthorised Open Access Transaction
2014	Amendment	• CSS not leviable to the extent of regulatory measures imposed due to shortage of power
2015	Amendment	• Drawl of OA consumer from Discom during any time block shall not exceed admissible drawl wherein OA schedule is maximum
2016	Amendment	• No levy of Trans. and Dist. wheeling charges for RE power, for 10 yr from COD, for plants commissioned btw Jul 15 to Mar 17
2016	Amendment	• In case OA consumer fails to meet RPO obligation, OA approval may be withheld until RPO compliance is met

Chhattisgarh

Year	Regulation/ Amendment	Key Amendment
2005	OA Regulation	-
2011	OA Regulation	-
2012	Amendment	• Bulk consumers who are not connected through dedicated feeders disallowed open access • Requirement added to submit NOC along with open access application • Distribution wheeling charge for inter-state LTOA/ MTOA, to be paid on the basis of energy approved considering 100% load factor on the allotted capacity

Jharkhand

Year	Regulation/ Amendment	Key Amendment
2005	OA Regulation	-
2010	Amendment	• Open Access customer defined as Open Access Consumer (OAC) or Open Access Generator (OAG) including captive plants
2016	OA Regulation	• Eligibility to avail Open Access: 1 MW and above (not applicable in case of captive generating plants that is availing Open Access for its own use). • Requirement of minimum scheduling of eight hours for STOA consumers in OA regulations

Open Access Regulations and Amendments.....(2/3)

Andhra Pradesh

Year	Regulation/ Amendment	Key Amendment
2005	OA Regulation	-
2016	Amendment	• Deemed approval of OA application after 30 days • Solar and Wind power exempted from trans. and dist. Wheeling charges, CSS and Additional Surcharge • Dist. Losses exempted for solar power injecting <= 33 kV voltage

West Bengal

Year	Regulation/ Amendment	Key Amendment
2004	OA Regulation	• Defined phasing of open access
2005	OA Regulation	• Defined terms and conditions of availing open access
2006	Amendment	• Defined schedule of charges, fees & formats for open access
2006	OA Regulation	• Re-defined phasing of open access
2007	OA Regulation	• -
2009	Amendment	• Introduced reactive energy charge for open access

Gujarat

Year	Regulation/ Amendment	Key Amendment
2005	OA Regulation	-
2011	OA Regulation	• Limitation of 1 MW not be applicable for Captive OA consumers
2014	Amendment	• STOA period reduced from less than 6 months to less than 1 month • Methodology for transmission charges of Short Term OA re-defined (defined in Rs./MW/Day)

Maharashtra

Year	Regulation/ Amendment	Key Amendment
2004	OA Regulation	-
2005	OA Regulation	• Defined process for open access application • Apart from CSS and Additional Surcharge OA charges defined earlier in 2004 regulations, transmission charges and wheeling charges added as OA charges • Provision added for security deposit
2014	OA Regulation	• Provision to avail OA from multiple generating companies only to the extent to meet their RPO • Limitation of 1MW contract demand not applicable to avail OA from RE generating power • Section added for grant of connectivity to generating plants • Categories of open access consumers defined based on the period of open access sought and location of injection/ drawl point
2016	OA Regulation	• Contract demand for 1MW and above to avail OA restored for all consumers • Provision to avail OA from multiple generating station removed • Provision of banking for RE power introduced

Open Access Regulations and Amendments.....(3/3)

Tamil Nadu

Year	Regulation/ Amendment	Key Amendment
2005	OA Regulation	-
2008	Amendment	• Changes in billing and payment for open access charges to consumers
2008	Amendment	• Provision of Standby power; Standby power to be charged at temporary tariff till ABT regime is implemented • Revision in application fee for open access
2010	Amendment	• Phasing of open access re-determined; OA allowed to all HT consumers irrespective of load in fourth and final phase
2014	OA Regulation	-

Haryana

Year	Regulation/ Amendment	Key Amendment
2005	OA Regulation	-
2012	OA Regulation	• Introduced 'Medium Term' category of open access • Introduction of Stand-By charges, equivalent to temporary tariff • Introduction of 'Limited Short Term Open Access' and 'Embedded Open Access' consumers
2013	Amendment	• Minimum load for getting OA reduced from 1 MW to 0.5 MW • Change in methodology for Transmission charges • Settlement of energy in case of under/over drawl

Assam

Year	Regulation/ Amendment	Key Amendment
2005	OA Regulation	• Availability of OA to consumers with connected load of 3MW and above. Below that OA to be provided only under conditions when benefits to consumers outweigh the costs • Categorization of OA consumers into Long term and short term
2018	OA Regulation	• OA permissible to all consumers above 1MW only • Categorization of OA into long term, medium term and short term • Provisions for day ahead open access introduced

Documents required along with open access applications

	NOC	PPA	Declaration/ Undertaking	Proof of Grid Connectivity	Others documents
CG	✓	✓	✓	✓	• Registration certificate of SLDC, CSPTCL • No Dues Certificate
AS			✓		• Certificate from STU/ Discom that special energy meters are installed
PB		✓	✓	✓	• Copy of Continuous process industry letter • Board Resolution/ Authorization letter • Other self-attested documents and undertakings (listed in annexure)
JH	✓		✓		-
TN	✓	✓		✓	-
AP		✓ (LTOA)	✓		• UI undertaking (STOA) • RPO undertaking (STOA) • If Captive usage, a Chartered Accountant Certificate required, exhibiting capital structure and compliance with regard to requirements under Electricity Act 2003
WB					-
GJ	✓	✓	✓	✓	-
HR			✓		• Copy of Peak Load Exemption and/ or Continuous process industry letter • Feasibility clearance from Transco/ Discom for customer who is not consumer of Discom • Other self-attested documents and undertakings (listed in annexure)
MH	Only if injection point is outside MH	✓	✓	✓	• Copy of MoU • Consent from Seller/ Buyer • Techno Commercial Report issued by the concerned O&M, Circle Office • SEM Commissioning Certificate • No Dues Certificate from Discom • Documents related to RPO compliance

Open Access Charges

Additional Surcharge

Punjab –

- Ratio of Fixed PPC with Fixed Cost of Discom, is multiplied with per unit Fixed Revenue recovery from HT Consumers
- Fixed cost of Discom is calculated as 50% of ARR minus variable PPC and fuel cost

Gujarat

- Fixed charges of stranded capacity is estimated by multiplying average OA capacity by fixed charges of power per MW. In turn fixed charges of power per MW is estimated by dividing total fixed charges for power by average power availability in MW
- Demand charges recoverable from OA sales is reduced from the calculated fixed charges of stranded capacity
- Remaining fixed charges of stranded capacity is divided by scheduled OA energy, to calculate per unit Add. Surcharge

Haryana

- Lower of, Power Quantum backed down or OA sales, is multiplied with average fixed power purchase cost to estimate total stranded cost. Total stranded cost is then divided by total OA sales to estimate Add. Surcharge

Maharashtra

- Per Unit Wtd. Avg. Fixed Cost of thermal generating stations is taken as Add. Surcharge on OA sales

Compliance with FOR Recommendations

Most states are still to comply with the recommendations made by FOR regarding open access provisions and charges

Issue	Recommendations by FOR	HR	PB	GJ	MH	CG	JH	WB	AS	AP	TN
Frequent shifting of OA consumers	• OA consumers should schedule minimum 8 hours of continuous supply through OA	-	-	-	-	-	For embedded users taking STOA	-	-	-	-
Cross Subsidy Surcharge (CSS)	• Determination of CSS based on category wise CoS or VCoS is not suitable, as CoS of industrial consumers is lower than ACOS • SERCs must be guided by the philosophy of the Tariff Policy 2016, which uses ACoS	✓	-	✓	✓	-	✓	-	-	✓	✓
Additional Surcharge	• The working group endorsed the proposal of MoP's consultation paper to have three components of Additional Surcharge	-	-	-	-	-	-	-	-	-	-
Tariff Design and Rationalization	• Tariff should reflect actual breakup of fixed and variable charges. SERCs may revise fixed charges gradually	-	-	-	-	-	-	-	-	-	-
Stand By Charges	• Only 125% of variable charges for each category should be applicable as stand-by surcharge • Fixed charges are already recovered in demand charges and is in line with Tariff policy 2016	-	-	-	-	-	-	-	125% of normal tariff	-	-

Annexures

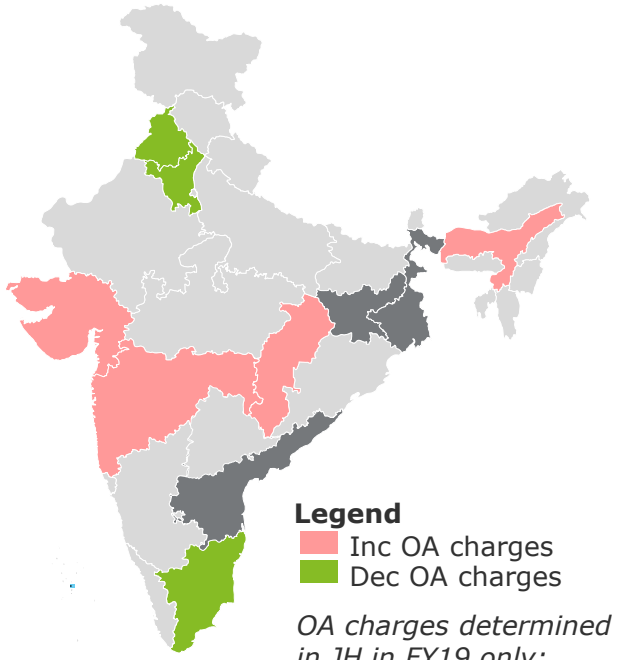
- Tariff and Open Access Charges Review

Recovery of fixed cost from fixed charges

HT Commercial consumer category

HT Commercial	Fixed ACoS	Fixed ABR	Conventional Power			Fixed ABR + Fixed OA charges	Fixed Cost Recovery from Fixed Charges
			Dist. Wheeling Charge	Trans. Wheeling Charge	Additional Surcharge		
State	(A)	(B)	(C)	(D)	(E)	(F) = (B)+(C)+(D)+(E)	(F)/(A)
PB	4.11	0.25	1.11	0.21	0.86	2.44	59%
WB	3.55	0.89	1.19	0.38	0.00	2.46	69%
MH	3.60	0.81	0.15	0.59	1.25	2.80	78%
AS	4.17	0.34	0.27	1.06	0.00	1.66	40%
TN	3.01	0.81	0.21	0.21	0.00	1.23	41%
AP	2.65	1.10	0.03	0.22	0.00	1.35	51%
HR	3.85	0.37	0.83	0.36	1.13	2.69	70%
CG	3.59	0.87	0.25	0.41	0.00	1.54	43%
JH	3.08	0.69	0.17	0.25	0.00	1.11	36%
GJ	2.84	1.10	0.15	0.29	0.57	2.10	74%

Trend of Open Access Charges (1/4)



OA charges determined in JH in FY19 only; Flat trend in AP

Key reasons for change in Open Access charges

- **AS:** CSS has increased by 2.5x in last 3 yr from Rs. 0.54/ Kwh in FY17 to Rs. 1.37/ Kwh in FY19 for HT Industrial consumers, and from Rs. 0.54/ Kwh in FY17 to Rs. 1.90/ Kwh in FY19 for HT commercial consumers
- **CG**: increase in CSS from Rs. 1.21/ kwh in FY17 to Rs. 1.41/ kwh in FY19 has contributed to overall increase in OA charges
- **MH:** CSS has slightly decrease from Rs. 1.64/kwh in FY17 to Rs. 1.55/kwh in FY19 for HT Industrial consumers (no change for CSS of HT Commercial consumers). However increase in Add. Surcharge and T&D charges have led to a marginal increase in overall OA charges
- **GJ:** increase in trans. charge and Add. Surcharge, have led to a marginal increase in overall OA charges
- **TN**: CSS reduced from Rs. 3.44/kwh in FY17 to Rs. 1.67/kwh in FY19 for HT Industrial consumers after adoption of NTP 2016 formula
- **HR:** dec in CSS from Rs. 1.57/kwh in FY17 to Rs. 0.81/kwh in FY19 for HT Industrial consumers has contributed for overall decrease in OA charges. The CSS has reduced for HT Industrial consumers due to dec in ABR considered for CSS calculation. Marginal increase can be observed for CSS of HT Commercial consumers
- **PB:** dec in CSS and Add. Surcharge have contributed to overall decrease in OA charges. CSS has decrease from Rs. 0.70/kwh in FY17 to Rs. 0.49/kwh in FY19 for HT Industrial consumers and from Rs. 1.14/kwh in FY17 to Rs. 1.06/kwh in FY19 for HT Commercial consumers. Additional Surcharge has decreased from Rs. 1.25/kwh in FY17 to Rs. 0.86/kwh in FY19

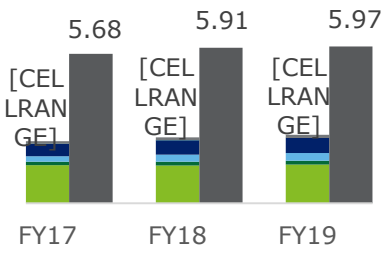
Trend of Open Access Charges (2/4)

CSS Trans. Wheeling Dist. Wheeling SLDC Charge Add. Surcharge Others Energy Tariff

Gujarat

OAC – ↗

HT Industry

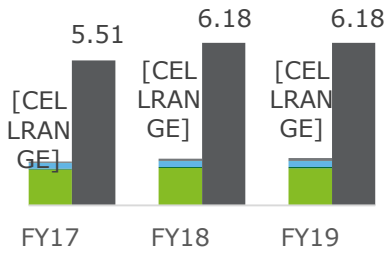


- CSS and Additional Surcharge form major component of OA charges
- Nominal increase in overall OA charges due to transmission wheeling and additional surcharge

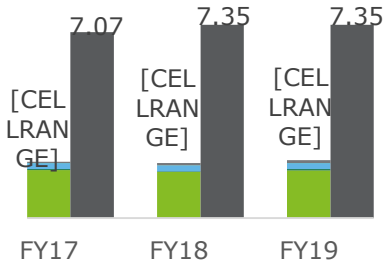
Andhra Pradesh

OAC – ↗

HT Industry



HT Commercial

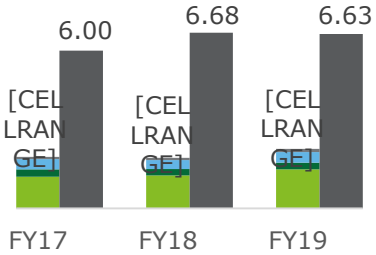


- Total OA charges are increasing each year with the tariff increases
- CSS form major component of OA charges
- Significant difference in 33 and 11kv wheeling charges

Chhattisgarh

OAC – ↗

HT Industry



- CSS Formula (ABR- ACoS) is different from Tariff Policy
- CSS increased by 23 paisa in FY19 resulting in increase in overall OA charges

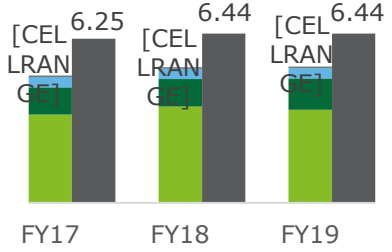
Trend of Open Access Charges (3/4)

CSS | Trans. Wheeling | Dist. Wheeling | SLDC Charge | Add. Surcharge | Others | Energy Tariff

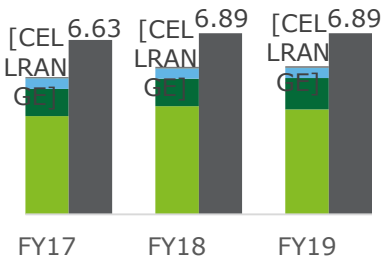
West Bengal

OAC – ↗

HT Industry



HT Commercial

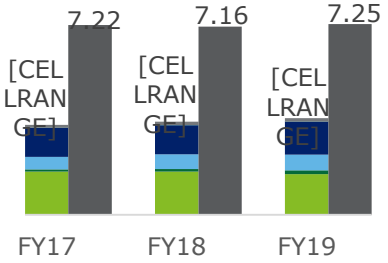


- One of the highest OA charges across states covered
- CSS is calculated based on modified formula (ABR-ACoS)
- High wheeling charge without provision for voltage wise losses

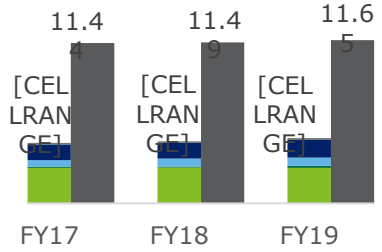
Maharashtra

OAC – ↗

HT Industry



HT Commercial

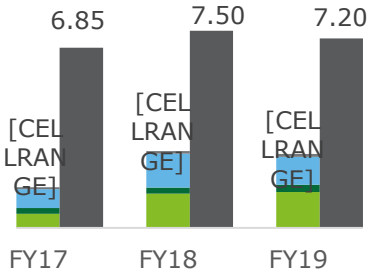


- Significant Additional Surcharge (more than Rs.1 per unit) imposed on OA consumers
- Highest in terms of overall open access charges
- Effect of small reduction in CSS has been covered through higher Additional Surcharge and Wheeling charges

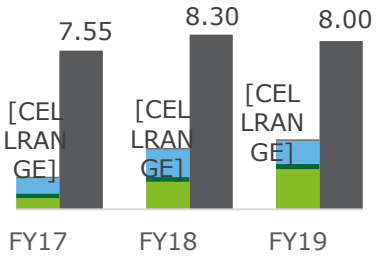
Assam

OAC – ↗

HT Industry



HT Commercial



- Substantial increase in OA charges during FY18 primarily on account of CSS and wheeling charge
- CSS has more than doubled in the last three years. Formula (ABR-ACoS) is not according to the Tariff Policy

Trend of Open Access Charges (4/4)

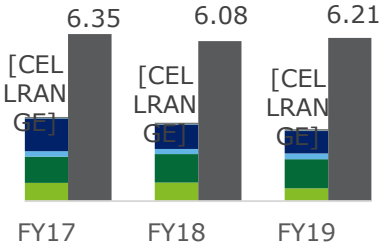
CSS | Trans. Wheeling | Dist. Wheeling | SLDC Charge | Add. Surcharge | Others | Energy Tariff

Trend of OA charges | Break Even PPC of Industrial consumer category | Break Even PPC of Commercial consumer

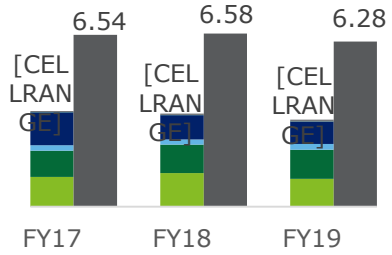
Punjab

OAC – ↘

HT Industry



HT Commercial

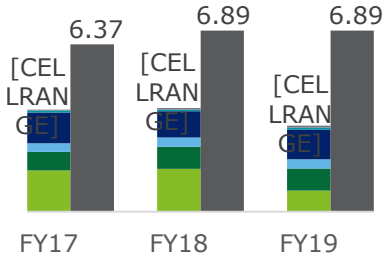


- The overall OA charges have reduced in Punjab
- While CSS is a small element, Additional surcharge and high wheeling charges contribute significantly to the OA charges

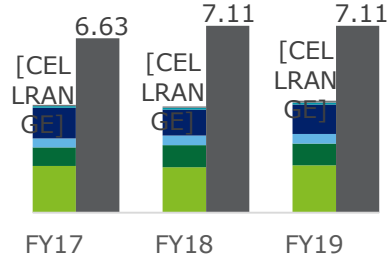
Haryana

OAC – ↘

HT Industry



HT Commercial



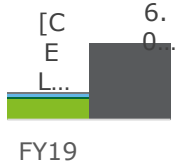
Additional surcharge contributes to the high OA charges in the state

CSS for HT industrial has decreased in last 3 years from Rs. 1.57 to Rs. 0.81 resulting in decline in OA charges

Jharkhand

-

HT Industry

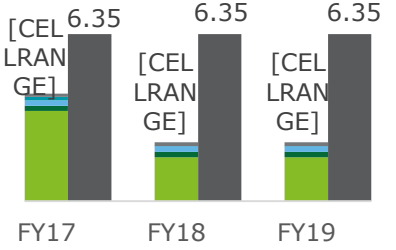


- OA charges determined for first time in FY19 Order
- CSS of Rs. 1.75 per unit forms major OA charge

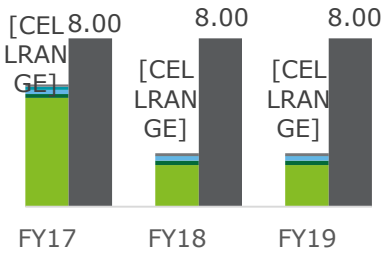
Tamil Nadu

OAC – ↘

HT Industry



HT Commercial



- CSS was significantly reduced in FY18 based on the revised formula of Tariff Policy 2016
- Due to reduction in the high OA charges, open access activity has increased significantly

Discount on OA charges for RE power

In most of the states, discount is given on OA charges for RE procurement

Discounts on OA charges for RE power

	CSS	Dist. Wheel.	Trans. Wheel	Add. Sur.	SLDC charge	T&D Losses
CG	50%	100%	100%	-	100%	6%
AS	-	67%	33%	-	-	-
PB	-	100%	100%	-	-	-
JH	100%	50%	50%	-	-	100%
TN	40%	60%	60%	-	60%	-
WB	-	-	-	-	-	-
AP	100%	100%	100%	-	-	100%
GJ	100%	-	-	-	-	-
HR	100%	100%	100%	100%	-	-
MH	-	-	-	-	-	-

Key Observations

- With a view to promote renewable energy, majority States are offering discount on OA charges for procurement of RE power. However, no discounts is offered in MH and WB
- In case of OA consumer procuring RE power under HT-Industrial category, States like AP, Haryana and Jharkhand offer lowest OA charges
- The discounts offered in States differ in several ways. Punjab does not offer discount for RE power on CSS as compared with States like Andhra Pradesh, Gujarat and Haryana which provide 100% discount on CSS
- Viability of procurement from RE sources is therefore different as compared to conventional sources

HT Industry (for RE Power)

	CSS	Dist. Wheel.	Trans. Wheel	Add. Sur.	SLDC charge	Total
CG	0.75	-	-	-	-	0.75
AS^	1.37	0.09	0.43	-	0.01	1.90
PB	1.06	-	-	0.86	0.01	1.93
JH	-	0.09	0.13	-	0.00	0.21
TN	1.00	0.08	0.28	-	0.01	1.39
WB	3.54	1.19	1.27	-	0.01	6.02
AP	-	-	-	-	0.02	0.02
GJ	-	0.15	0.97	0.57	0.00	1.69
HR	-	-	-	-	0.07	0.07
MH#	1.55	0.15	0.34	1.25	0.01	3.30

^In Assam, Transmission Charge for Short Term Open Access is taken, as transmission charges for LTOA/ MTOA when converted to per unit charge comes out to be more than Rs. 3 per unit

 # in Maharashtra, for renewable energy, per unit transmission charges determined for STOA are applicable

HT Commercial (for RE Power)

	CSS	Dist. Wheel.	Trans. Wheel	Add. Sur.	SLDC charge	Total
CG*	0.75	-	-	-	-	0.75
AS	1.90	0.09	0.43	-	0.01	2.43
PB	0.49	-	-	0.86	0.01	1.36
JH*	-	0.09	0.13	-	0.00	0.21
TN	1.19	0.08	0.28	-	0.01	1.57
WB	3.99	1.19	1.27	-	0.01	6.47
AP	-	-	-	-	0.02	0.02
GJ*	-	0.15	0.97	0.57	0.00	1.69
HR	-	-	-	-	0.07	0.07
MH#	2.53	0.15	0.34	1.25	0.01	4.28

**Since no separate HT commercial category is present, same charges of HT Industry category are represented for comparison with other states*

Total Open Access Charges
For HT Commercial Consumers

Long Term Open Access

In Rs. per unit for HT Commercial consumer

	Total Open Access Charges				HT Industrial Tariff	
	Non Captive, Non RE Power	Captive, Non RE Power	Non Captive, RE Power	Captive, RE Power	ABR	Energy Tariff
CG	2.27	0.78	0.75	0.00	7.50	6.63
AS	3.34	1.44	2.43	0.53	8.34	8.00
PB	3.31	1.39	1.93	0.01	7.08	6.82
JH	2.14	0.52	0.21	0.21	6.75	6.05
TN	2.55	0.57	1.57	0.38	8.81	8.00
WB	5.64	1.64	6.47	2.47	7.78	6.89
AP	2.19	0.37	0.02	0.02	8.45	7.35
GJ	2.60	0.56	1.69	1.12	7.06	5.97
HR	4.26	1.33	0.07	0.07	7.48	7.11
MH	4.66	0.88	4.28	0.50	12.46	11.65

Short Term Open Access

In Rs. per unit for HT Commercial consumer

	Total Open Access Charges				HT Industrial Tariff	
	Non Captive, Non RE Power	Captive, Non RE Power	Non Captive, RE Power	Captive, RE Power	ABR	Energy Tariff
CG	2.34	0.85	0.75	0.00	7.50	6.63
AS	2.93	1.03	2.43	0.53	8.34	8.00
PB	3.66	1.74	1.93	0.01	7.08	6.82
JH	3.77	0.66	0.67	0.67	6.75	6.05
TN	2.55	0.57	1.57	0.38	8.81	8.00
WB	5.11	1.11	5.27	1.28	7.78	6.89
AP	2.19	0.37	0.02	0.02	8.45	7.35
GJ	2.82	0.78	1.54	0.98	7.06	5.97
HR	4.26	1.33	0.07	0.07	7.48	7.11
MH	4.41	0.63	4.28	0.50	12.46	11.65

- Due to absence of harmonization in short term and long term charges, it can be observed in few states long term open access is expensive than short term
- Further it can be observed that Open Access for RE power and Captive power is cheaper than Conventional and Non Captive power, because of incentives and discount
- However in West Bengal, the OA charges for RE power are higher than conventional power, due to absence of any incentive for RE power and lower load factor of RE power, which leads to higher per unit charge from monthly wheeling charges

Annexures

- Impact Assessment of OA migration

Scenario and Sensitivity Analysis

For estimating the impact on Discoms

Parameter	Possibilities for Scenarios/ Sensitivity			Difference on impact assessment
Scenario Analysis				
Treatment of surplus power by Discom	A1	•	Surplus power backed down (as per merit order)	Variable PPC avoided by Discom
	A2	•	Surplus Power re-allocated (to under-served consumer categories)	No change in PPC, additional revenue from sales
Treatment of contract demand by Consumer	B1	•	Contract Demand maintained with Discom	Loss of only energy charge to Discom
	B2	•	Contract Demand not maintained with Discom	Loss of demand & energy tariff to Discom
Type of OA consumer	C1	•	Type of OA consumer – Thermal, Non Captive	Different set of open access charges applicable in each case
	C2	•	Type of OA consumer – Thermal, Captive	
	C3	•	Type of OA consumer – RE, Non-Captive	
	C4	•	Type of OA consumer – RE, Captive	
Sensitivity Analysis				
Sales Migration to Open Access	D1	•	5% sales migration	The total impact amount in rupees would differ
	D2	•	10% sales migration	
	D3	•	20% sales migration	
	D4	•	Estimated sales migration, as per load profile analysis of HT consumers	

Per unit impact on Discom

Surplus Power is backed down by Discom

HT Industrial Consumer

Loss to Discom (Rs. Per Unit)	Contract Demand Maintained with Discom (B1)				Contract Demand Not Maintained with Discom (B2)			
	Thermal Non-Captive (C1)	Thermal, Captive (C2)	RE, Non-Captive (C3)	RE, Captive (C4)	Thermal Non-Captive (C1)	Thermal, Captive (C2)	RE, Non-Captive (C3)	RE, Captive (C4)
CG	1.85	3.34	3.26	4.01	2.72	4.21	4.13	4.87
AS	1.31	2.68	1.89	3.26	1.72	3.09	2.31	3.68
PB	0.67	2.02	1.99	3.34	1.14	2.49	2.46	3.81
JH	1.20	2.82	3.03	3.03	1.89	3.51	3.72	3.72
TN	1.14	2.81	1.87	2.87	1.95	3.62	2.68	3.68
WB	-2.80	0.74	-3.69	-0.15	-1.91	1.63	-2.80	0.74
AP	1.37	2.80	3.04	3.04	2.47	3.90	4.14	4.14
GJ	0.56	2.59	1.35	1.91	1.66	3.69	2.45	3.01
HR	0.09	2.03	3.22	3.22	0.48	2.42	3.61	3.61
MH	0.97	3.77	1.22	4.02	1.78	4.58	2.03	4.83

HT Commercial Consumer

Loss to Discom (Rs. Per Unit)	Contract Demand Maintained with Discom (B1)				Contract Demand Not Maintained with Discom (B2)			
	Thermal Non-Captive (C1)	Thermal Captive (C2)	RE, Non-Captive (C3)	RE, Captive (C4)	Thermal Non-Captive (C1)	Thermal Captive (C2)	RE, Non-Captive (C3)	RE, Captive (C4)
CG	1.85	3.34	3.26	4.01	2.72	4.21	4.13	4.87
AS	2.11	3.48	2.69	4.06	2.44	3.81	3.03	4.40
PB	1.33	2.68	2.65	4.00	1.58	2.93	2.91	4.26
JH	1.20	2.82	3.03	3.03	1.89	3.51	3.72	3.72
TN	2.79	4.46	3.52	4.52	3.60	5.27	4.33	5.33
WB	-2.35	1.19	-3.24	0.30	-1.46	2.08	-2.35	1.19
AP	2.54	3.97	4.21	4.21	3.64	5.07	5.31	5.31
GJ	0.56	2.59	1.35	1.91	1.66	3.69	2.45	3.01
HR	0.30	2.24	3.43	3.43	0.67	2.61	3.80	3.80
MH	5.52	8.32	5.77	8.57	6.33	9.13	6.58	9.38

Per unit impact on Discom

Surplus Power is re-allocated by Discom

HT Industrial Consumer

Loss to Discom (Rs. Per Unit)	Contract Demand Maintained with Discom (B1)				Contract Demand Not Maintained with Discom (B2)			
	Thermal Non-Captive (C1)	Thermal, Captive (C2)	RE, Non-Captive (C3)	RE, Captive (C4)	Thermal, Non-Captive (C1)	Thermal, Captive (C2)	RE, Non-Captive (C3)	RE, Captive (C4)
CG	0.27	1.76	1.69	2.43	1.14	2.63	2.55	3.30
AS	-0.68	0.69	-0.09	1.28	-0.26	1.11	0.32	1.69
PB	-1.67	-0.32	-0.34	1.01	-1.19	0.16	0.13	1.48
JH	-0.12	1.50	1.71	1.71	0.58	2.20	2.41	2.41
TN	1.36	3.03	2.09	3.09	2.17	3.84	2.90	3.90
WB	-4.39	-0.84	-5.28	-1.73	-3.50	0.05	-4.39	-0.85
AP	1.17	2.60	2.84	2.84	2.27	3.70	3.93	3.93
GJ	-0.42	1.61	0.37	0.93	0.68	2.71	1.47	2.03
HR	-2.15	-0.21	0.98	0.98	-1.75	0.19	1.38	1.38
MH	0.05	2.85	0.29	3.09	0.86	3.66	1.10	3.90

HT Commercial Consumer

Loss to Discom (Rs. Per Unit)	Contract Demand Maintained with Discom (B1)				Contract Demand Not Maintained with Discom (B2)			
	Thermal Non-Captive (C1)	Thermal Captive (C2)	RE, Non-Captive (C3)	RE, Captive (C4)	Thermal Non-Captive (C1)	Thermal Captive (C2)	RE, Non-Captive (C3)	RE, Captive (C4)
CG	0.27	1.76	1.69	2.43	1.14	2.63	2.55	3.30
AS	0.12	1.49	0.71	2.08	0.46	1.83	1.04	2.41
PB	-1.00	0.35	0.32	1.67	-0.75	0.60	0.57	1.92
JH	-0.12	1.50	1.71	1.71	0.58	2.20	2.41	2.41
TN	3.01	4.68	3.74	4.74	3.82	5.49	4.55	5.55
WB	-3.94	-0.39	-4.83	-1.28	-3.05	0.50	-3.94	-0.40
AP	2.34	3.77	4.00	4.00	3.44	4.87	5.10	5.10
GJ	-0.42	1.61	0.37	0.93	0.68	2.71	1.47	2.03
HR	-1.94	0.00	1.19	1.19	-1.57	0.37	1.56	1.56
MH	4.60	7.40	4.84	7.64	5.41	8.21	5.65	8.45

Share of OA consumer types and load profile analysis

For estimation of aggregate impact on Discom

Share of various consumer types

State	Viability of migrating to open access				Share of each consumer type in sales migrating to open access			
	Non Captive, Non RE	Captive, Non RE	Non Captive, RE	Captive, RE	Non Captive, Non RE	Captive, Non RE	Non Captive, RE	Captive, RE
CG		✓	✓	✓	-	33%	33%	33%
AS	✓	✓	✓	✓	25%	25%	25%	25%
PB		✓	✓	✓	-	33%	33%	33%
JH		✓	✓	✓	-	33%	33%	33%
TN		✓	✓	✓	-	33%	33%	33%
WB		✓		✓	-	50%	-	50%
AP	✓	✓	✓	✓	25%	25%	25%	25%
GJ		✓	✓	✓	-	33%	33%	33%
HR		✓	✓	✓	-	33%	33%	33%
MH		✓	✓	✓	-	33%	33%	33%

OA migration of sales bases load profiling

Assumption on % of sales migration to OA	
HT Industrial	
1-5 MW	10%
6-10 MW	20%
11–50 MW	30%
51–100 MW	40%
> 100 MW	50%
HT Commercial	
1-5 MW	0%
6-10 MW	5%
11–50 MW	10%
51–100 MW	15%
> 100 MW	20%

	% of sales that can migrate to Open Access	
	HT Ind.	HT Comm.
PB	20%	1%
HR (UH)	13%	
AP (S)	18%	1%
AP (E)	29%	2%
AS	12%	0%
GJ (P)	16%	
GJ (M)	18%	
GJ (U)	13%	
GJ (D)	18%	
MH	19%	0%
JH	16%	

Back

Aggregate impact on Discom

Surplus Power is backed down by Discom

Impact in Rs. Crore

Loss to Discom (Rs. Crore)	Contract Demand Maintained with Discom (B1)				Contract Demand Not Maintained with Discom (B2)			
	5%	10%	20%	Load Profile	5%	10%	20%	Load Profile
CG	123	247	494	247	154	307	615	307
AS	15	29	58	16	17	33	67	19
PB	229	458	916	674	266	532	1,064	803
JH	35	71	141	112	44	87	175	139
TN	285	570	1,140	570	368	737	1,474	737
WB	11	23	46	23	40	80	160	80
AP	208	417	834	832	294	588	1,176	1,188
GJ	242	484	968	786	379	757	1,515	1,229
HR	194	388	775	438	220	439	879	496
MH	499	999	1,998	1,637	623	1,246	2,492	2,078

Average Tariff Hike required

Average tariff hike required	Contract Demand Maintained with Discom (B1)				Contract Demand Not Maintained with Discom (B2)			
	5%	10%	20%	Load Profile	5%	10%	20%	Load Profile
CG	0.9%	1.9%	3.9%	1.9%	1.2%	2.4%	4.9%	2.4%
AS	0.3%	0.5%	1.0%	0.3%	0.3%	0.6%	1.2%	0.3%
PB	0.7%	1.5%	3.0%	2.2%	0.8%	1.7%	3.5%	2.6%
JH	0.6%	1.2%	2.4%	1.9%	0.7%	1.5%	3.0%	2.4%
TN	0.6%	1.1%	2.3%	1.1%	0.7%	1.5%	3.0%	1.5%
WB	0.1%	0.1%	0.3%	0.1%	0.2%	0.5%	1.0%	0.5%
AP	0.7%	1.3%	2.8%	2.8%	0.9%	1.9%	3.9%	3.9%
GJ	0.6%	1.2%	2.4%	1.9%	0.9%	1.8%	3.8%	3.0%
HR	0.7%	1.4%	3.0%	1.6%	0.8%	1.6%	3.4%	1.9%
MH	0.8%	1.6%	3.3%	2.7%	1.0%	2.0%	4.2%	3.5%

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Aggregate impact on Discom

Surplus Power is re-allocated by Discom

Impact in Rs. Crore

Loss to Discom (Rs. Crore)	Contract Demand Maintained with Discom (B1)				Contract Demand Not Maintained with Discom (B2)			
	5%	10%	20%	Load Profile	5%	10%	20%	Load Profile
CG	68	137	274	137	99	197	395	197
AS	4	7	14	2	6	11	23	5
PB	25	49	98	35	61	123	246	164
JH	20	39	79	62	28	56	112	89
TN	308	616	1,232	616	391	783	1,565	783
WB	-40	-79	-158	-79	-11	-22	-44	-22
AP	192	385	770	765	278	556	1,112	1,121
GJ	121	241	483	392	257	514	1,029	835
HR	44	88	176	99	70	140	279	157
MH	359	717	1,434	1,133	482	964	1,928	1,575

Average Tariff Hike required

Average tariff hike required	Contract Demand Maintained with Discom (B1)				Contract Demand Not Maintained with Discom (B2)			
	5%	10%	20%	Load Profile	5%	10%	20%	Load Profile
CG	0.5%	1.1%	2.2%	1.1%	0.7%	1.5%	3.1%	1.5%
AS	0.1%	0.1%	0.3%	0.0%	0.1%	0.2%	0.4%	0.1%
PB	0.1%	0.2%	0.3%	0.1%	0.2%	0.4%	0.8%	0.5%
JH	0.3%	0.7%	1.4%	1.1%	0.5%	0.9%	1.9%	1.5%
TN	0.6%	1.2%	2.5%	1.2%	0.8%	1.5%	3.2%	1.5%
WB	-0.2%	-0.5%	-1.0%	-0.5%	-0.1%	-0.1%	-0.3%	-0.1%
AP	0.6%	1.2%	2.6%	2.5%	0.9%	1.8%	3.7%	3.7%
GJ	0.3%	0.6%	1.2%	1.0%	0.6%	1.2%	2.6%	2.0%
HR	0.2%	0.3%	0.7%	0.4%	0.3%	0.5%	1.1%	0.6%
MH	0.6%	1.2%	2.4%	1.9%	0.8%	1.6%	3.2%	2.6%

Annexures

- Data Collection

Data Collection

Required for detailed state wise review of open access

Secondary data

Primary data

Others

Sl.	Data Source	Data Collected	States	Remarks
1.	Open Access Regulations	• Open access eligibility • Application process and Constraints • Applicable charges and RPO obligations	All States	-
2.	Renewable Energy Policies	• Concessions available to RE power	All States	-
3.	SERC Tariff Orders and petitions	• Retail Tariffs • OA charges • HT Sales and Revenue • Discom ARR and ACoS • Power Purchase Cost Merit Order	All States	-
4.	CERC Market Monitoring Reports	• OA volume and consumers on power exchanges	All States	-
5.	Guidelines for availing open access	• Application process for OA	All States	-
6.	Details of open access consumers	• OA sales, consumers and load • Type of OA - Captive/ Non-Captive - LTOA, MTOA or STOA - RE/ Conventional	AP, AS, MH, GJ, PB, HR (UHBVN)	• No OA activity in JH and WB • CERC market monitoring data considered for TN and CG
7.	Details of open access applications	• Number of applications received • Status of application, along with reasons of rejection	PB, AS, CG, GJ	• Review of SERC cases and stakeholder interviews, covered the analysis for other states
8.	Details of HT consumers	• Load profile of HT consumers in the state	AP, AS, MH, GJ, PB, HR (UH), JH	• Sensitivity analysis built to analyse open access migration
9.	Interviews with stakeholders	• Issues and constraints in open access	All states	-
10.	Review of SERC/ APTEL cases	• Issues and constraints in open access	All states	-

Annexure-II

Implementation of Security Constrained Economic Dispatch (SCED) in Inter State Generating Stations (ISGS) pan-India

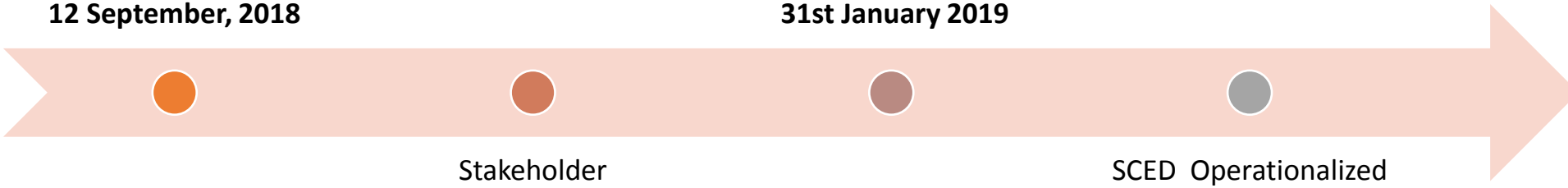
Timelines, Stakeholder Consultations

Consultation paper on "Security Constrained Economic Dispatch (SCED) of Inter-State Generating Stations pan India"

12 September, 2018

CERC Order Petition No. 02/SM/2019 (Suo-Motu)

31st January 2019



Stakeholder Consultation

28 September 2018 – 20 November 2018

(10 Nos. Responses)

SCED Operationalized on 01st April 2019

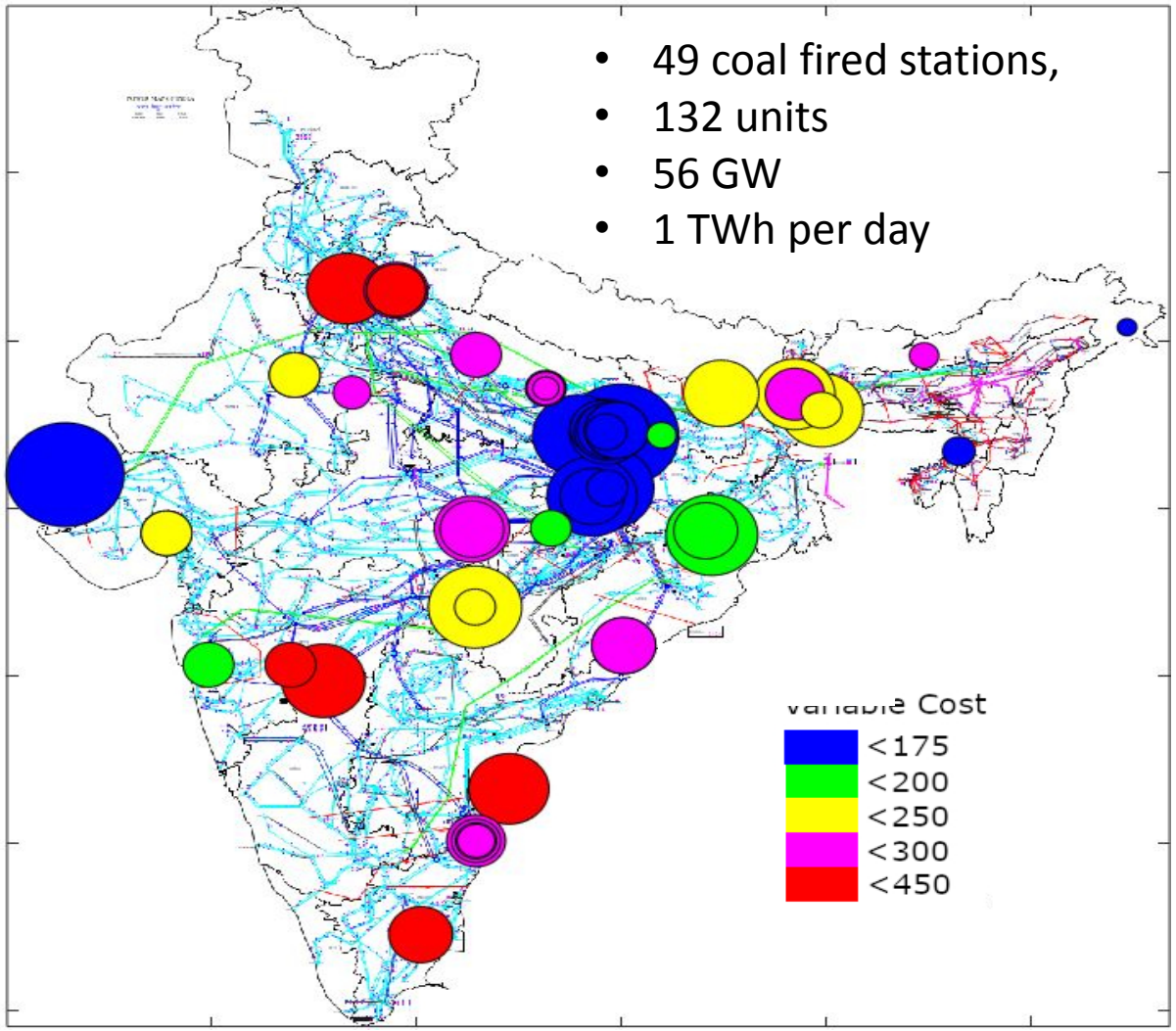
Consultations at RPCs	
NRPC (Delhi)	12th February, 2019
WRPC (Mumbai)	11th February, 2019
SRPC (Bengaluru)	12th February, 2019
NERPC (Agartala)	14th February, 2019
ERPC (Mejia-DVC)	21st February, 2019

Detailed SCED Procedures

- Draft Circulated to RPCs, SCED Generators
- Draft also shared with CERC, Discussion with CERC Staff on 19-March-2019
- Final issued 29-March-2019
- Revised on 18-April-2019

Meetings with SCED Generators – 22nd & 25th March 2019

Spatial Distribution of Variable Cost of Generators under SCED



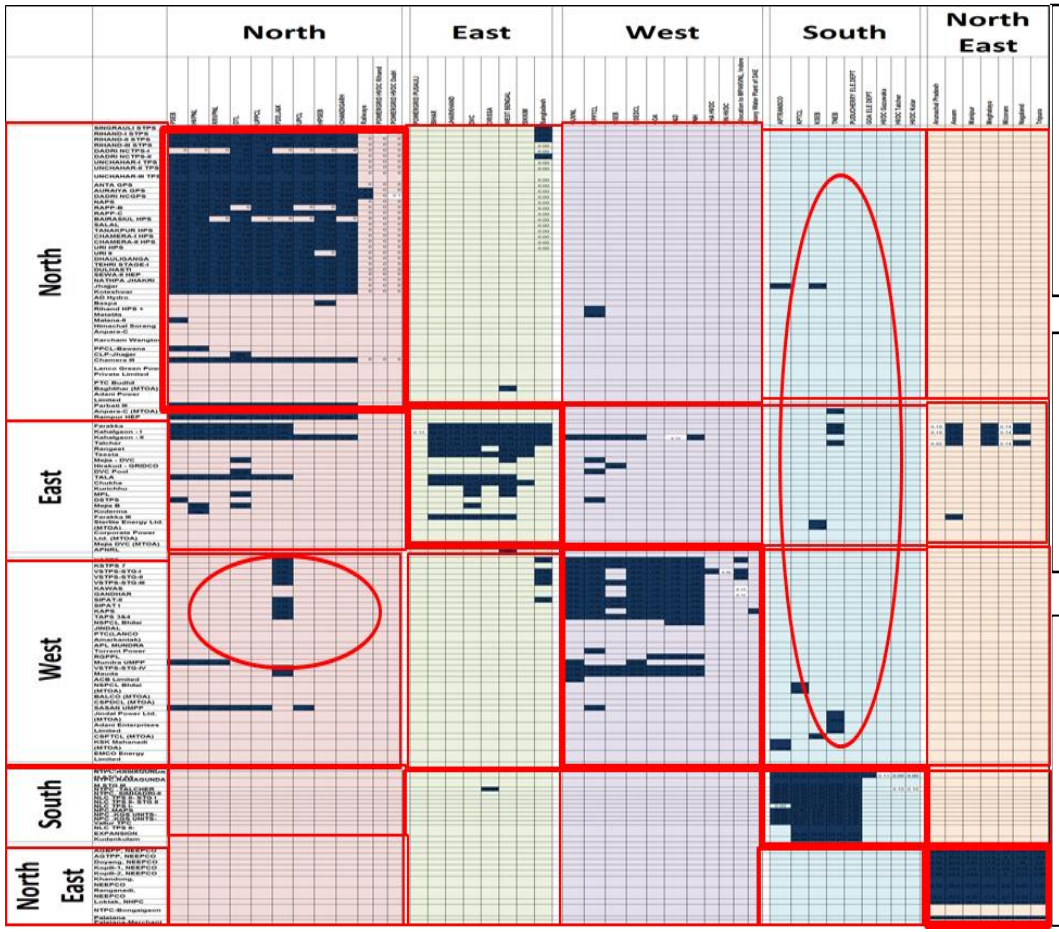
VC(Variable Cost) Paisa/kWh

- VC<175
- 175<=VC<200
- 200<=VC<250
- 250<=VC<300
- 300<=VC<450

Installed Capacity (MW)

- 200<=MW<300
- 300<=MW<500
- 500<=MW<800
- 800<=MW<1500
- 1500<=MW<2500
- 2500<=MW<4500

Complexity of Allocations to Beneficiaries Portfolio



Composition of Allocation Matrix

- ~150 Plants (Inter-State)
- 36 States/UTs
- Approx. half a Million contracts/day (~ 150x 36 x 96)

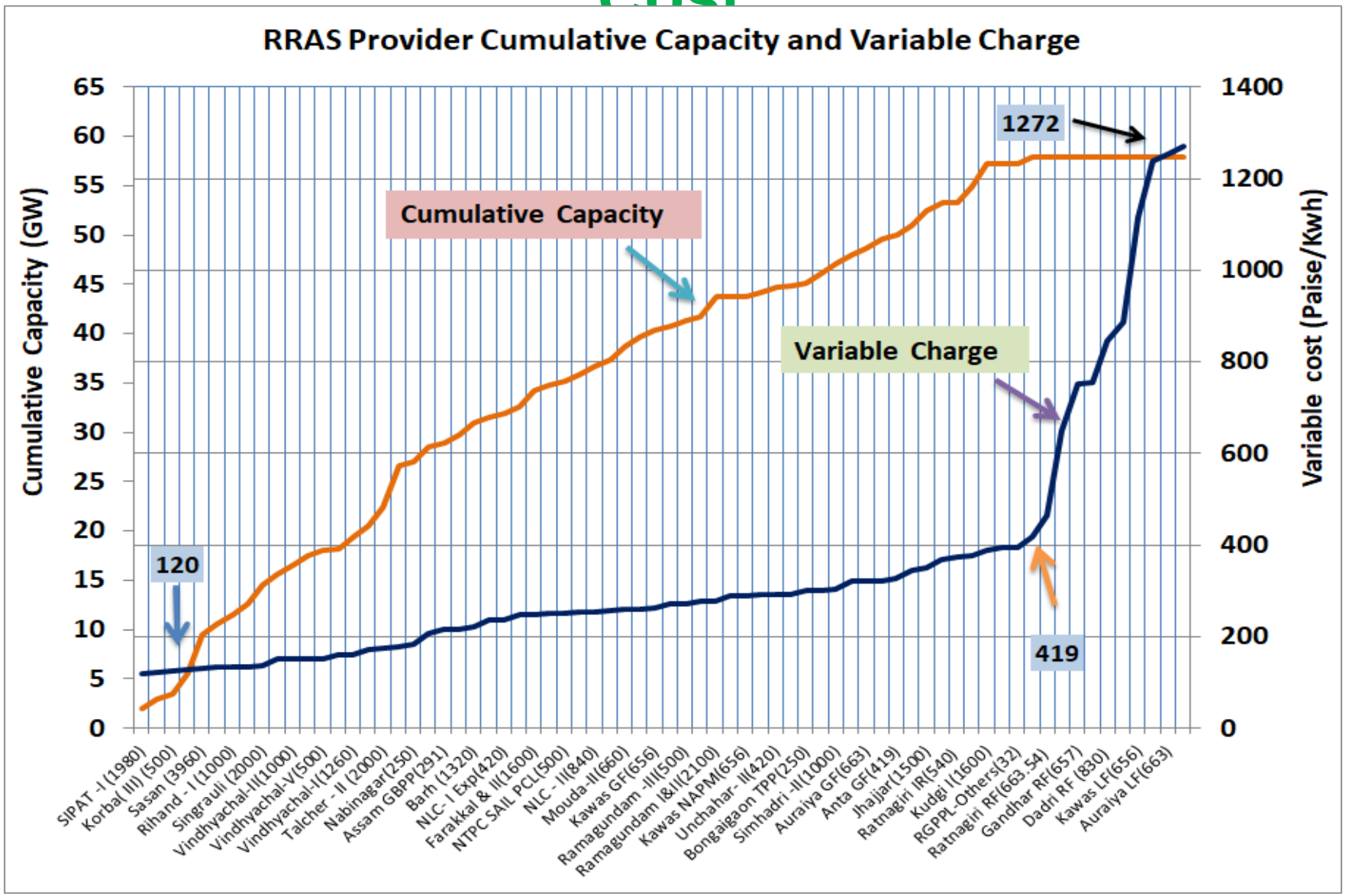
Need for Optimization

- Fragmented allocation
- Savings in Total Production Costs
- Harness Flexibility in scheduling

Scope for Incremental Optimization and Generating Savings

- Diversity
- Decentralized scheduling
- Transaction Cost

Cumulative Installed Capacity vs Variable Cost



Economic Despatch - Mathematical Formulation

Objective Function

- Minimize Pan India ISGS Variable Cost

Subject to Constraints

- Meeting Total Requisition by States from ISGS
- Transmission Constraints (ATC)
- Technical Minimum of Plants
- Maximum Generation (DC-on-bar)
- Ramp up/down rates

Minimise $\sum_{i=1}^{k} C_i P_i + \sum(Violation\ Penalties)$ .....(1)

- k = *total number of Plants*
- *Where* C_i *is the variable per unit cost of the* i^{th} *Plant*
- P_i *is the optimised scheduled power of the* i^{th} *Plant*
- $Violation\ Penalties$ are computed based on constraint violations

Subject to

- $\sum_{i=1}^{k} P_i = \sum_{i=1}^{k} S_i - Schedule\ violation$ ..... (2)
- $P_i \leq (DC\ on\ bar)$ .....(3)
- $P_i \geq P_{i,min}$ .....(4)
- $P_{i,t} \leq P_{i,t-1} + Ramp\ up\ rate + Ramp\ up\ violation$ .....(5)
- $P_{i,t} \geq P_{i,t-1} - Ramp\ down\ rate - Ramp\ down\ violation$ .....(6)
- $\forall\, r \in R,\ \sum_r (P_{i,r} - S_{i,r}) \geq \min((SCHIR_r - ATC_r), 0) - ATC\ violation$ .....(7)
  - *S* -is the scheduled power
  - *t* -represents current time of execution
  - *R* -represents each of the regions viz., North, East, West, South and North East
  - *ATC* -is the Available Transmission Capability of each region *R*
  - *SCHIR* -is the Scheduled Net Interchange of the region *R*
  - $P_{i,min}$ is the *technical minimum* for thermal power plants considered at 55% DC on bar or schedule whichever is less

- Improved Optimization algorithm
  - To make it more robust to deal with infeasibility
  - Ride through within the given constraints in real time
- The updated version of the software has been deployed w.e.f 14:45 hours of 18th Apr'19.
- Revised Detailed Procedure uploaded on POSOCO website

SCED Software at NLDC

Home | Schedule and Optimal | Opt. Sch - Pres. Sch | Opt. Sch - Old Opt. Sch | System Marginal Price | Logout

Security Constrained Economic Dispatch 18/03/2019 03:49:20 pm present time block: 64

SNo	Type	Plant Name	Reg.	State	Inst. Cap.	Total	DC	DC on bar	(A) Sch. for (66)	Pmax	(B) VC (P/U)	(C)Opt. Sch. for (66)	(D) = C x B x 10 / 1Lakh Opt. Cost (Lk/Hr)	Pmin	(E) =A x Bx 10/1Lakh Present Cost (Lk/Hr)	(F) =(C-A) Opt. Sch. minus Pres. Sch.(66)	G=(D-E) Savings (Lk/Hr) (66)	(H) Old Opt. Sch. for (65)	(I) = (C-H) Opt. Sch. minus Old Opt. Sch.	Ramp up rate in MW / 15min	Ramp down rate in MW / 15min
1	T	Sipat STPS Stage 1	2	Chhattisgarh	3x660	1980	1866	1866	1866	1866	119.2	1866	22	1026	22	0	0	1866	0	90	90
2	T	Sipat STPS Stage 2	2	Chhattisgarh	2x500	1000	942	942	942	942	122.9	942	11	518	11	0	0	942	0	70	70
3	T	Korba-Stage-3	2	Chattisgarh	1X500	500	471	471	471	471	124.7	471	5	259	5	0	0	471	0	35	35
4	T	Korba STPS Stage 1 and 2	2	Chhattisgarh	3x200 + 3x500	2100	1959	1959	1959	1959	126.7	1959	24	1077	24	0	0	1959	0	135	135
5	T	Sasan	2	MP	6x660	3960	3700	3700	3700	3700	131.4	3700	48	2035	48	0	0	3700	0	180	180
6	T	Rihand 2	1	UP	2x500	1000	471	471	469	471	134.7	471	6	259	6	1	0	471	0	50	75
7	T	Singrauli TPS	1	UP	5x200 + 2x500	2000	1835	1835	1831	1835	135.3	1835	24	1009	24	3	0	1835	0	135	200
8	T	Rihand 1	1	UP	2x500	1000	922	922	922	922	135.3	922	12	507	12	0	0	922	0	100	150
9	T	Rihand 3	1	UP	2x500	1000	942	942	942	942	137.7	942	12	518	12	0	0	942	0	100	150
10	T	Vindhyachal STPS Stage 2	2	MP	2X500	1000	932	932	932	932	144.1	932	13	512	13	0	0	932	0	70	70
11	T	Vindhyachal STPS Stage 3	2	MP	2X500	1000	942	942	913	942	144.4	942	13	518	13	28	0	942	0	70	70
12	T	Vindhyachal STPS Stage 4	2	MP	2X500	1000	942	942	941	942	144.4	942	13	518	13	0	0	942	0	70	70

	ATC	SCHIR	Reg		No. Of Units	Total Cap.	DC	DC on bar	Sch. for (66)	Pmax	SMP (P/U)	Opt. Sch. for (66)	Opt. Cost (Lk/hr)	Pmin	Present Cost (Lk/hr)	Opt. minus Present Sch.	Savings (Lk/hr)	Old Opt. Sch.	Opt. minus Pres. Sch.	Ramp up rate MW / 15min	Ramp down rate MW / 15min
	13600	8602	NR	UP,Haryana	28	9870	7112	7112	6466	7112	283.1	6078	118	3911	130	-387	-12	6118	-39		
	9999	1000	ER	Bihar,WB,Orissa	21	7650	6641	6641	5811	6641	283.1	6641	145	3652	126	830	18	6641	0		
	9999	1000	WR	MP,Chg,Guj,Mah	43	21930	19579	19579	19285	19579	283.1	19044	301	10768	309	-241	-7	19015	28		
	9750	8557	SR	AP,Tel,TM,Kar	34	13890	10328	10328	8655	10328	283.1	8442	226	5680	235	-212	-9	8378	63		
	855	0	NER	Assam	1	250	455	455	299	455	283.1	310	9	250	9	11	0	340	-30		
			AI		127	53590	44116	44116	40517	44116	283.1	40517	801	24264	811	0	-10	40495	22		

Guiding Principles

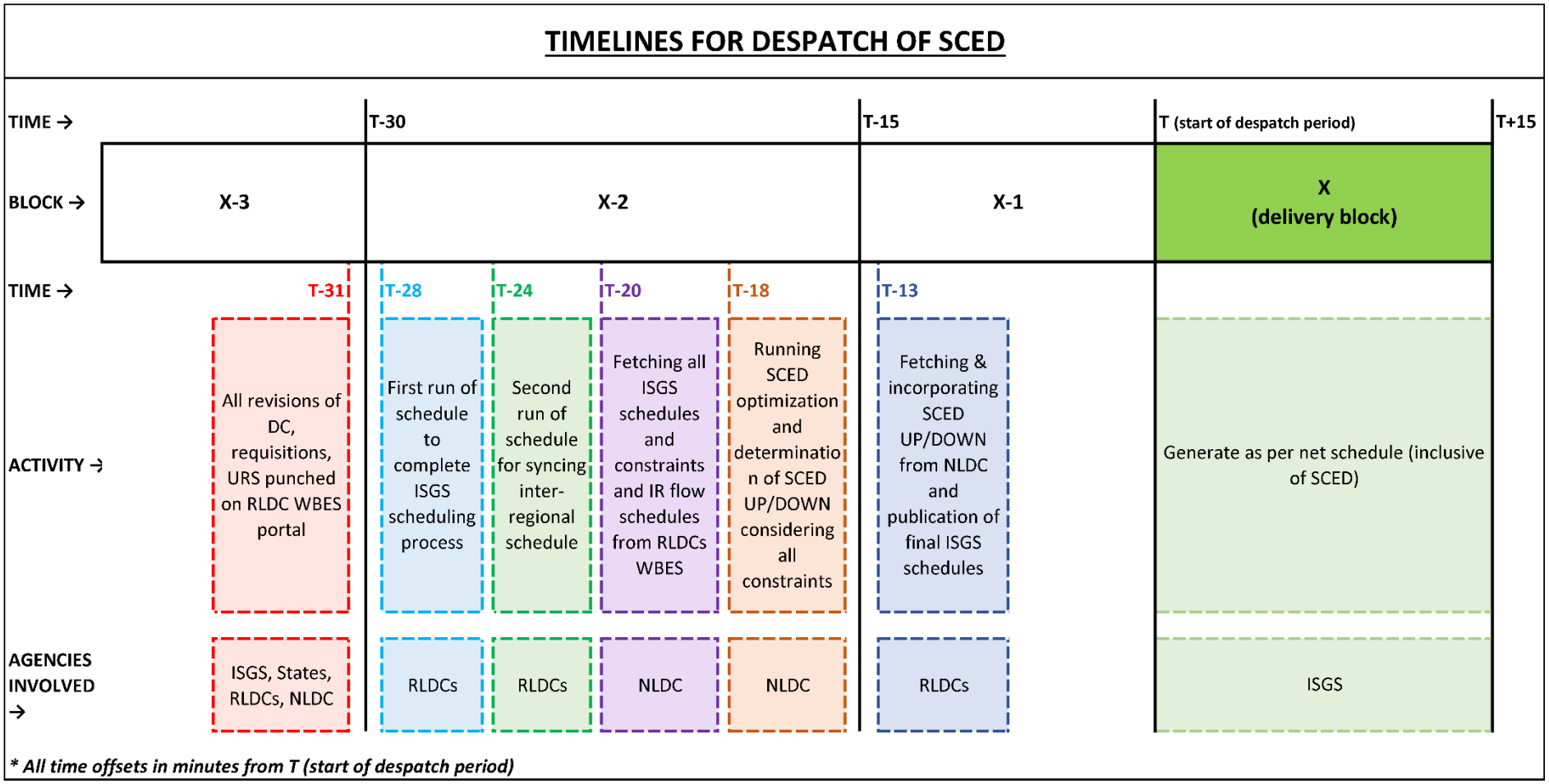
- **Robust enough to run continuously in real time**
- **Self healing / Ride-through in case of infeasibility**
- **No manual user intervention**

- In-house development of software application
- Team of people pan-India validating the data exchange and information protocols on day to day basis.
- Data interfacing a challenge

Continuous Internal Review Meetings across RLDCs/NLDC

Changes in Web Based Energy Scheduling System (WBES)

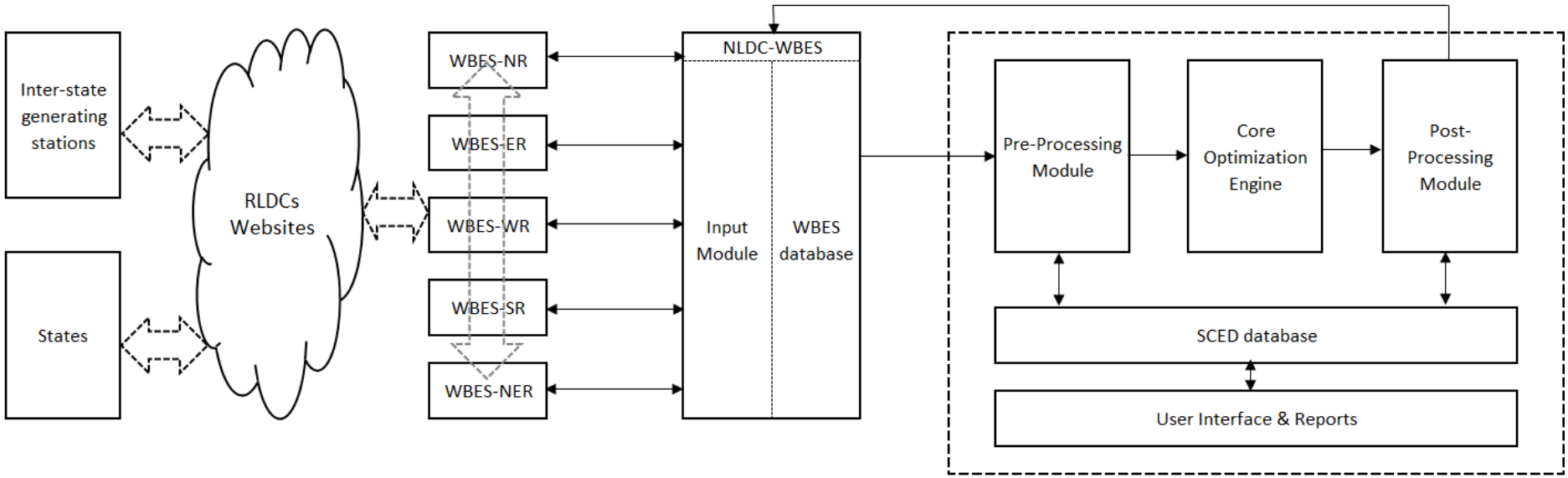
Data Exchange Timelines



Integration of Regional Scheduling Software Applications at NLDC

- Scheduling software hitherto working on regional basis
  - Integrated at National level for implementation of SCED
- Schedule revisions triggered manually & on-demand earlier
  - Now schedule revisions running periodically and automatically
- Tight data exchange & processing timelines
  - Time bound execution at every step
  - Less than 3 minutes available at NLDC
  - Complete process repeating every time block
- ~1,80,000 parameters handled by SCED on daily basis

Information Flow in SCED



Technologies used:

Internet	Oracle DB .NET	POSOCO WAN Internet	Oracle DB .NET	Python MS Excel	GAMS	Python MS Excel
				Mongo DB PHP, Javascript, node.js		

Increase and Decrease in Generation based on Merit Order

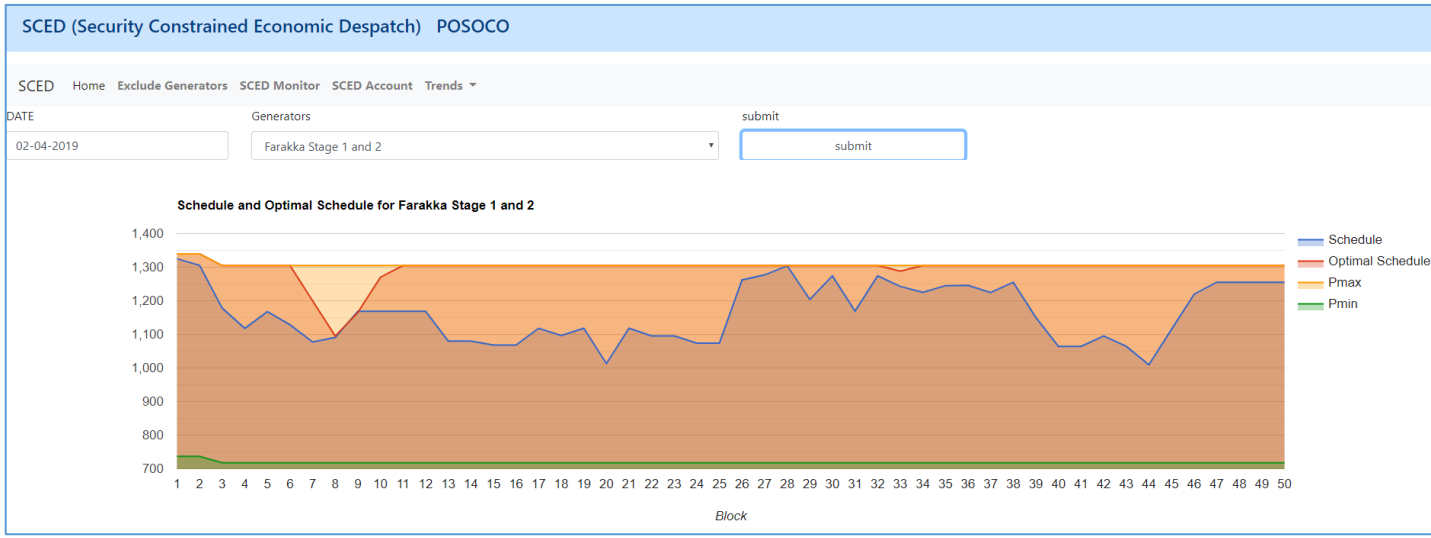
Cheaper pit head Generation
Increased in Northern Region

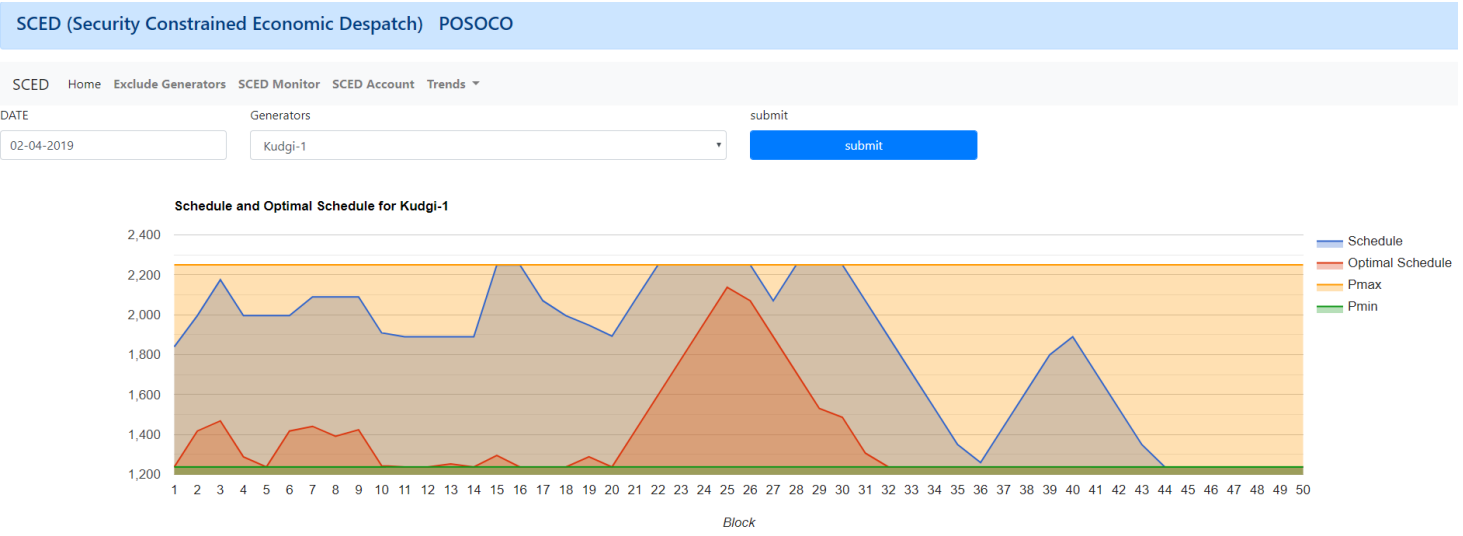
Cheaper Generation
Increased in Eastern Region

Costly Generation
Decreased in Southern Region

Generation Change under Security Constrained Economic Dispatch

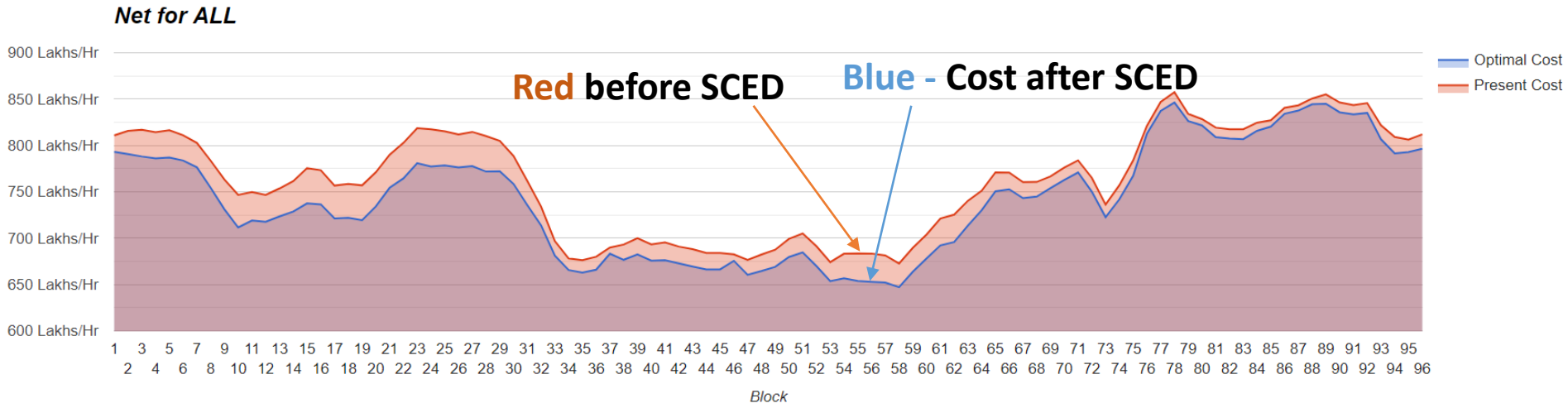
Cheaper stations such as Farakka Maximised





Kudgi Ramping only when absolutely needed

Variable Cost of Generation before and after SCED



- (+) means payable from the 'National Pool Account (SCED)' to SCED Generator
- (-) means receivable by the 'National Pool Account (SCED)' from SCED Generator

Region	Up energy (MU)	Down Energy(MU)	Charges to be paid to SCED Generator (Rs Cr)	Charges to be refunded by SCED Generator (Rs Cr)	Net Charges* (Rs Cr)
SR	176	988	46	328	-281
WR	541	323	103	86	17
NR	513	308	92	104	-13
ER	532	169	121	39	82
NER	42	50	13	15	-2
All India	1805	1837	375	572	**-196**

Reduced Average Variable cost of generation (Apr-May 19)

210 Paise/unit → 207 Paise/unit

196 Crores reduction in fuel cost for Apr-May19 on a base of approx.

(without considering heat rate compensation)

Impact of SCED on generators' operation

For April & May 2019 after SCED

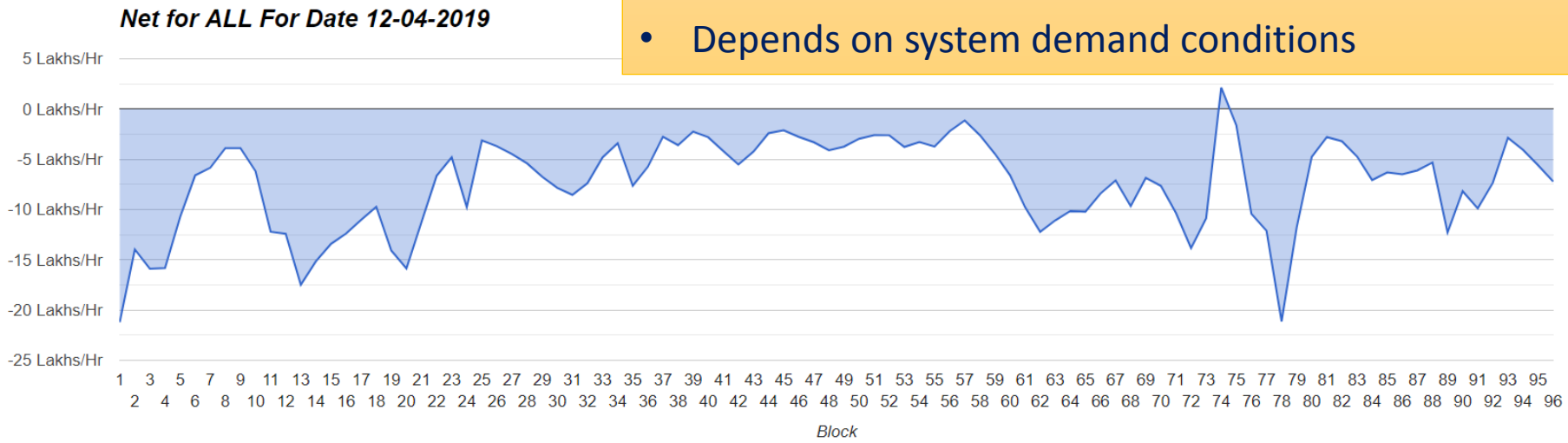
- 42% reduction in number of schedule changes
- 32% reduction in Schedule MW changes
- Increased PLF in cheaper power stations & vice versa

No. of Instructions (count)		
Post SCED	**Pre SCED**	**% Change**
63953	110534	-42 %

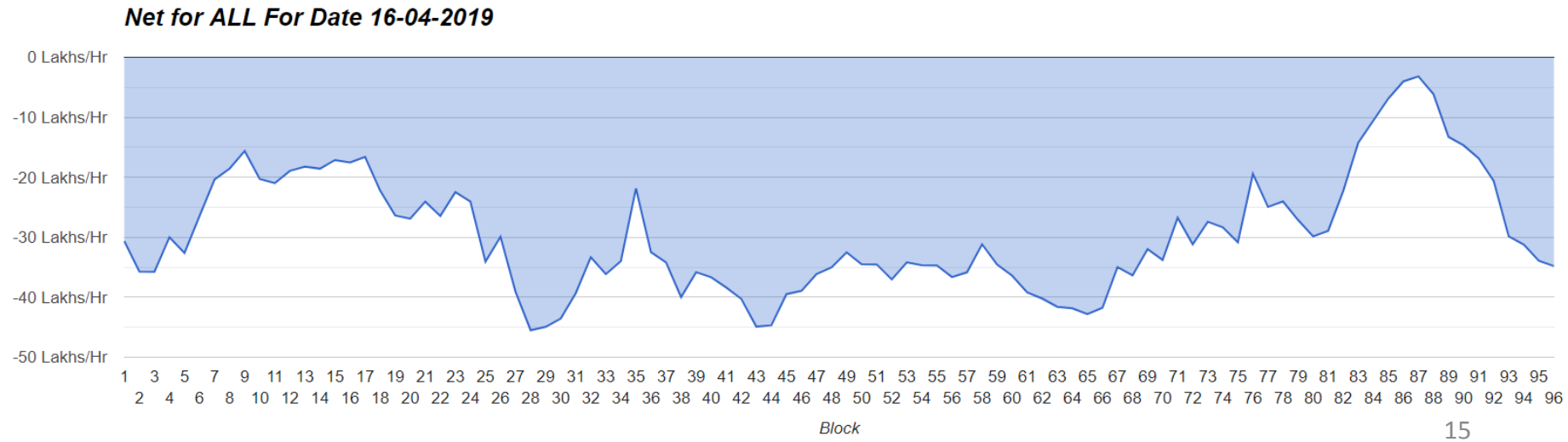
Changes in Schedule (GW)		
Post SCED	**Pre SCED**	**% Change**
3404 GW	5071 GW	-32 %

Trend of Reduction in Cost of Generation

- Holidays / weekends exhibit typically higher savings
- During load crash schedule gets revised to technical minimum within the region; diversity harnessed
- Depends on system demand conditions



Cumulative Net :-176.48 (in Lakhs)



Cumulative Net :-706.88 (in Lakhs)

SCED (Security Constrained Economic Despatch) POSOCO

SCED Home Exclude Generators SCED Monitor SCED Account Trends

Fill the ATC details to be incorporated in SCED

ATC NR

ATC NR

ATC SR

8750

ATC NER

ATC NER

Save ATC

Schedule Data Updation Status

NR	ER	WR	SR	NER

SCED Output

Output

SCED Application Status

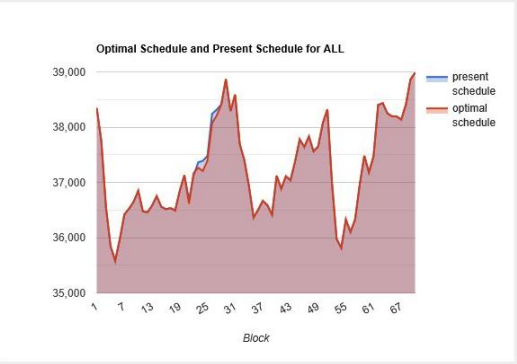
Application Running

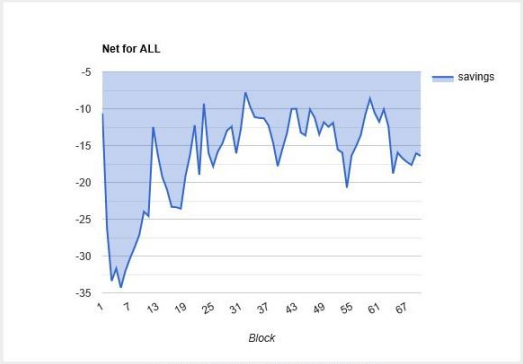
Core Engine Status

Core Engine Working

Start SCED

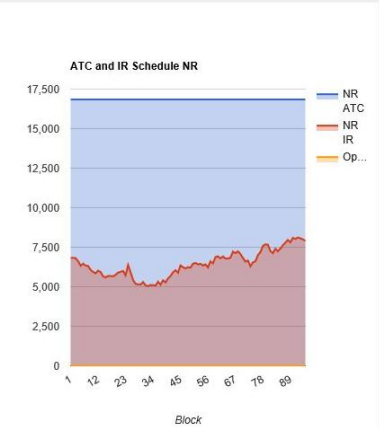
Stop SCED

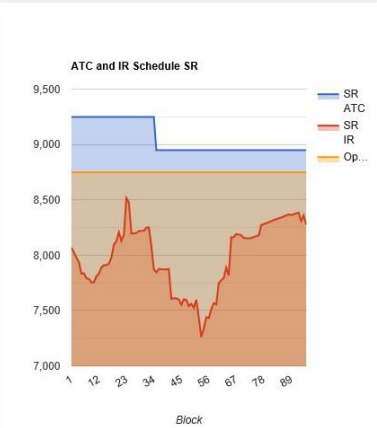


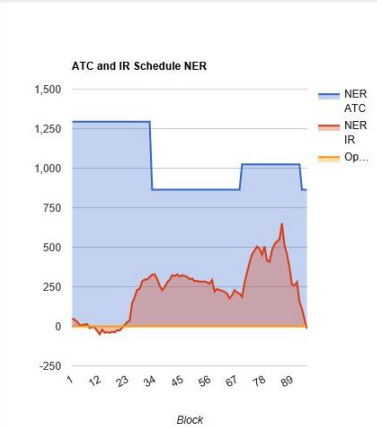


Cumulative Net :-289.63 (in Lakhs)

Average SMP NER	Average SMP NR	Average SMP SR	Average SMP ALL India
224.71	224.71	287.69	224.71





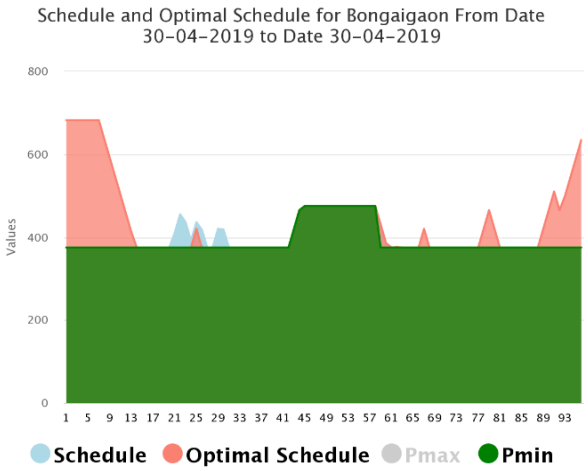


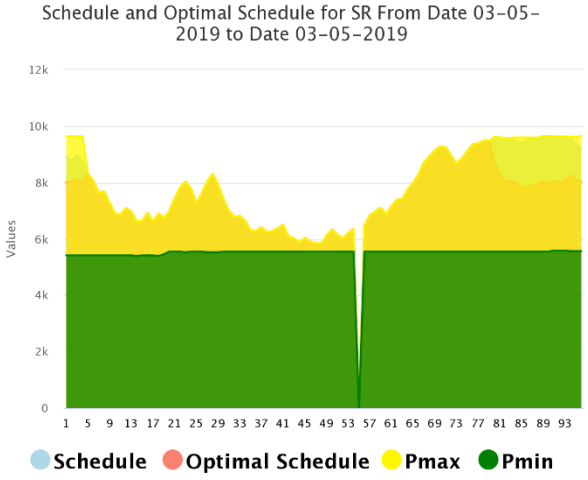
ATC and IR Schedule for Current Optimization

Region	Fetched Values(ATC)	SCH IR	Operator Filled ATC
NR	16857	6671	0
SR	8950	8153	8750
NeR	1025	403	0

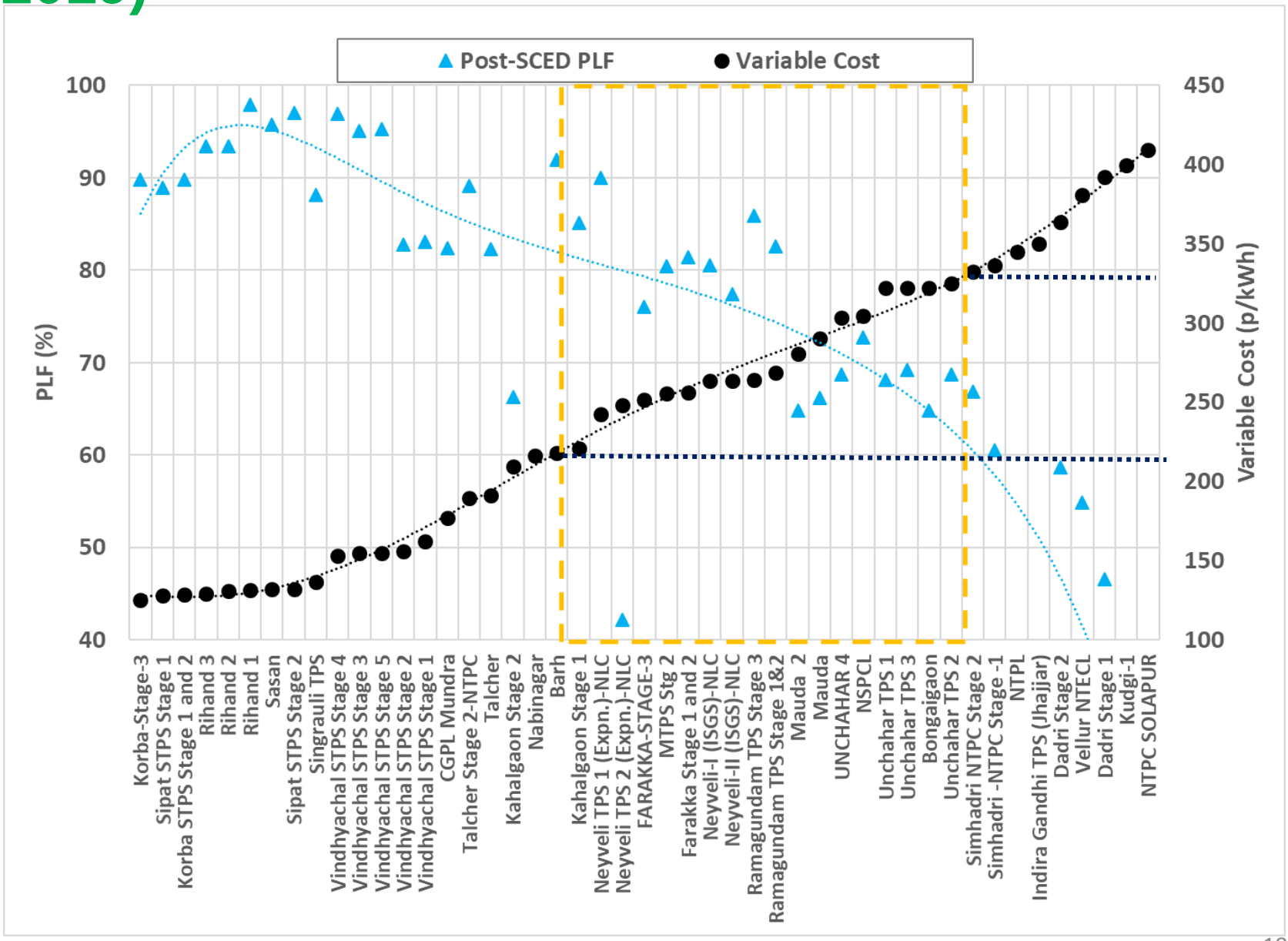
Operational Flexibility Provisions in SCED

- All SR Generators excluded from SCED application w.e.f. 23:00 hrs on 2nd May 2019 till 1930 hrs of 3rd May 2019
  - ➢ In anticipation of forced outages of major links in ER-SR Corridor due to Cyclone " FANI"
- Performance guarantee tests facilitated by increasing technical minimum in SCED at
  - BRBCL (18 Apr 2019)
  - Kudgi (4-10 Apr 2019)
  - Bongaigaon (29 Apr – 1 May 2019)
- Technical Minimum increased at Dadri-II for facilitating boiler modification works (24-26 Apr 2019)
- Technical Minimum increased at MPL for facilitating PSS tuning (19 Jun 2019)
- Facilitated implementation of CERC Order on increased technical minimum for NLC units

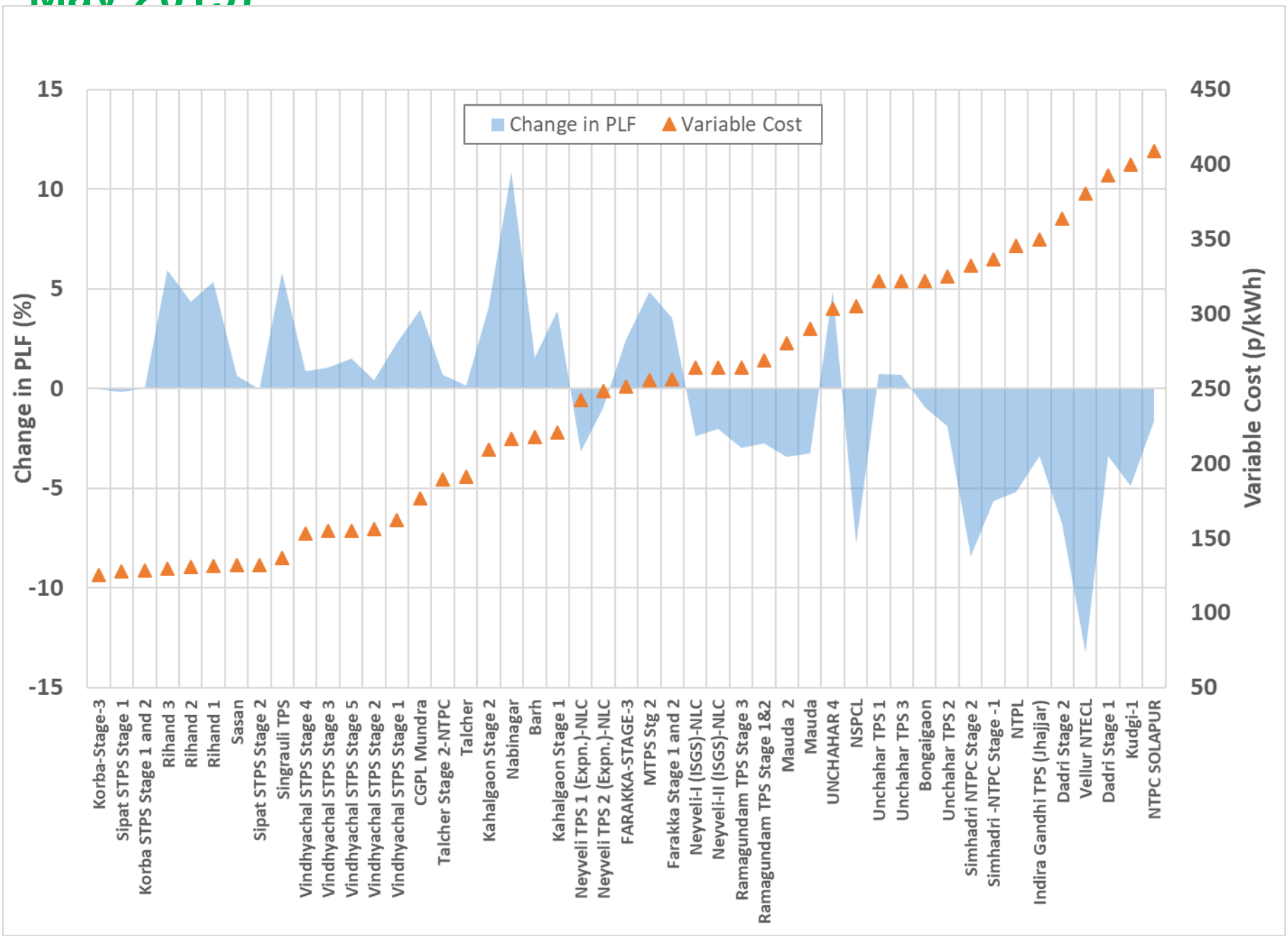




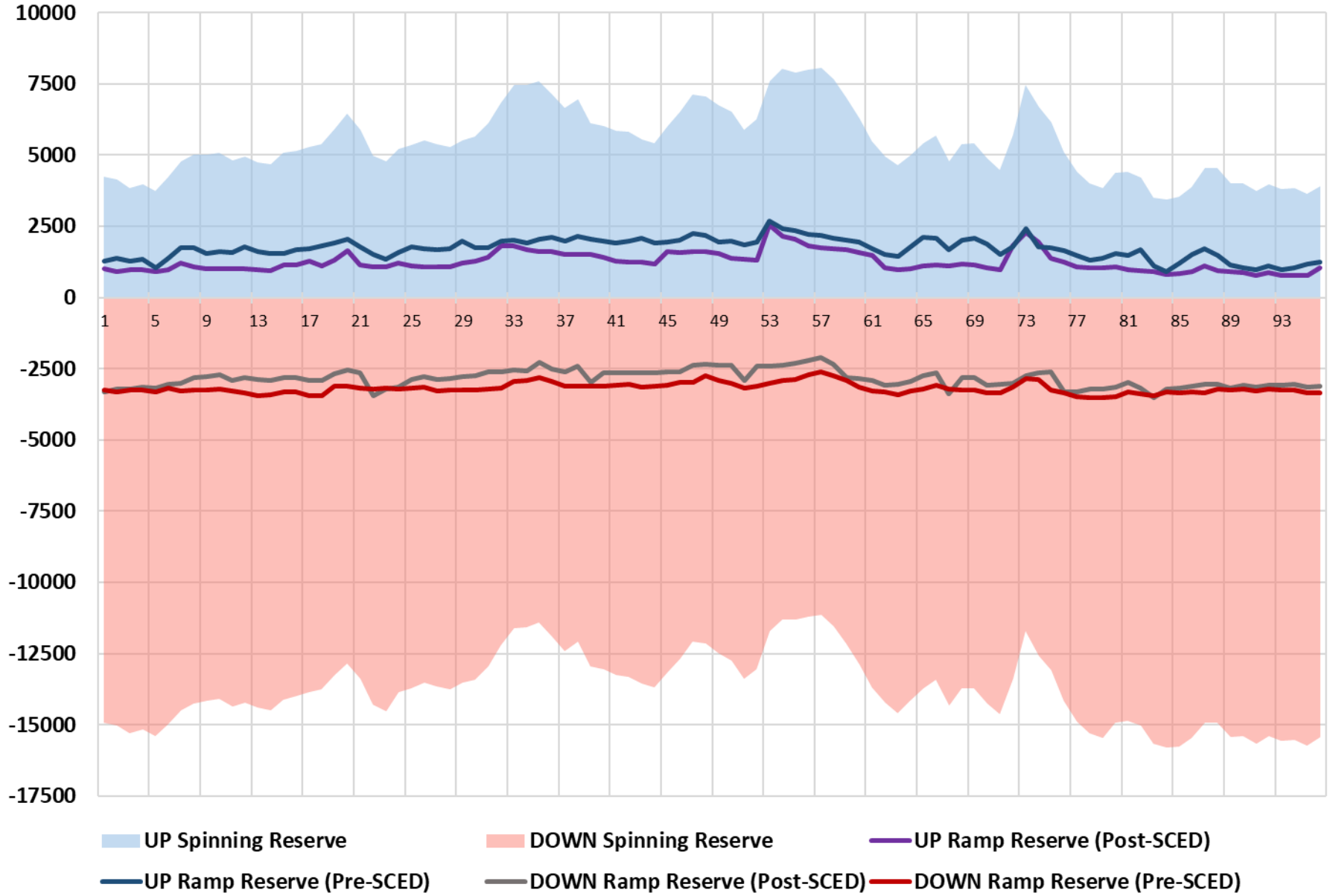
Post SCED PLF of SCED Generators (Apr-May 2019)



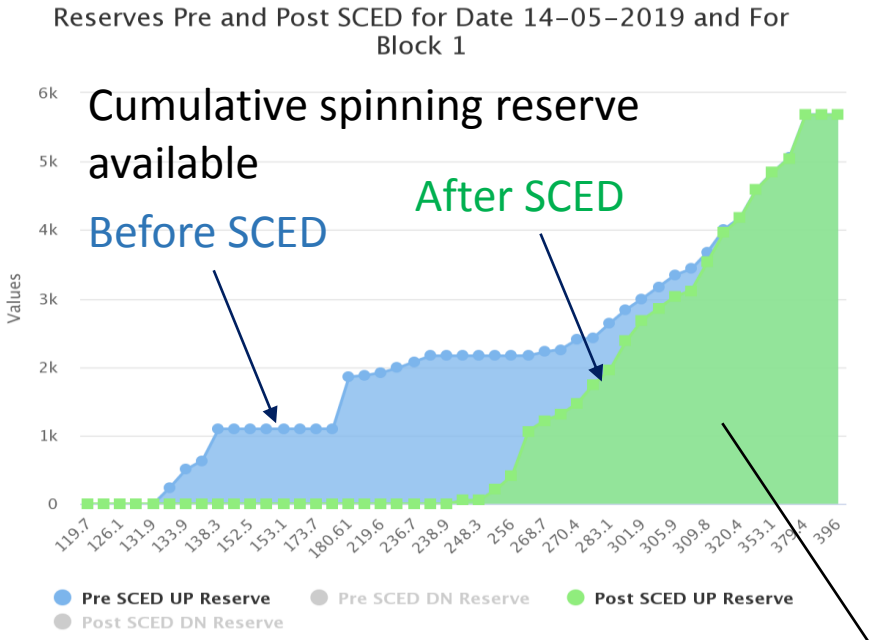
Change in PLF due to SCED vs Variable Cost (Apr-May 2019)

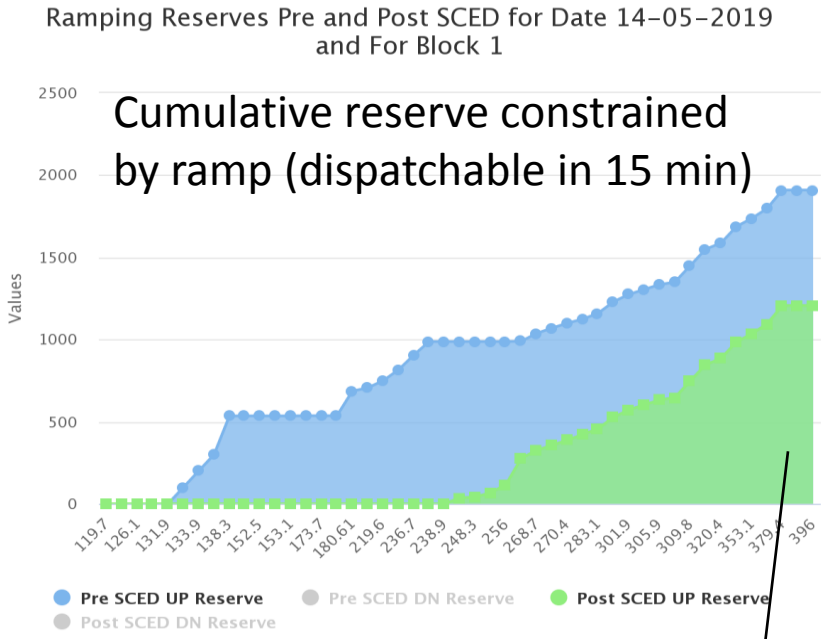


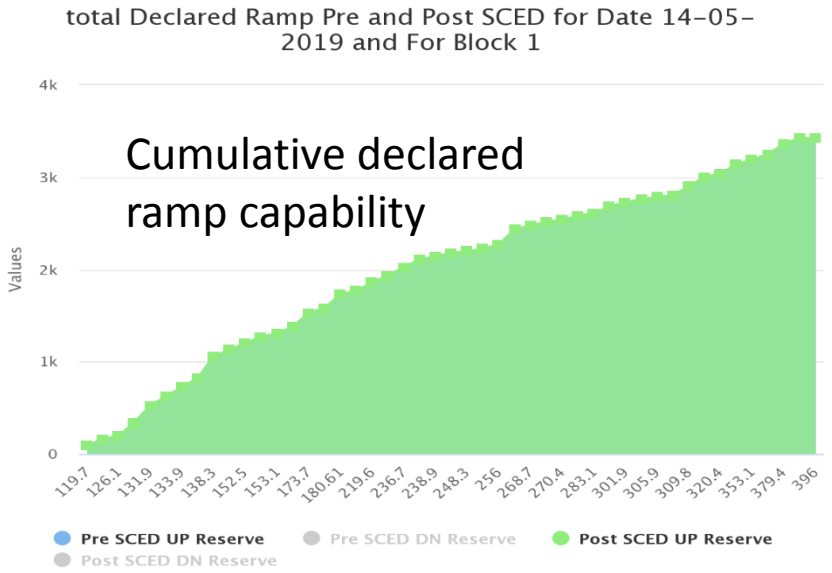
Spinning and Ramp Reserves for 20th April 2019 (MW)



Effect of SCED on Ramping Reserves







- Available spinning reserve consolidated in expensive plants due to SCED
- Reserve constrained by ramp capability of units carrying reserve
- Reduction in cumulative reserve constrained by ramp after SCED

Newer learnings during real time implementation

- **1st April'19 – SCED in conjunction with grid security**
  - ATC modification feature for handling contingencies for secure operation by operator
- **7th April'19 – Communication of non-plausible values**
  - Process crash detection with a 'Stop' feature incorporated
  - Execution logs strengthened
  - Hardware resource monitoring CPU and RAM usage
- **14th April'19 - SCED process crash**
  - Software 'Stopped' automatically due to data exchange issues
- **18th April'19 - Sailing through infeasibility**
  - Algorithm modified to penalize the objective function to ride through infeasibility
  - Procedures updated & revised procedures issued
- **21st April'19 - SCED process crash**
  - Database read / write issues
- **12th June'19 – MPL included in SCED**

Challenges – Need for Systemic Changes

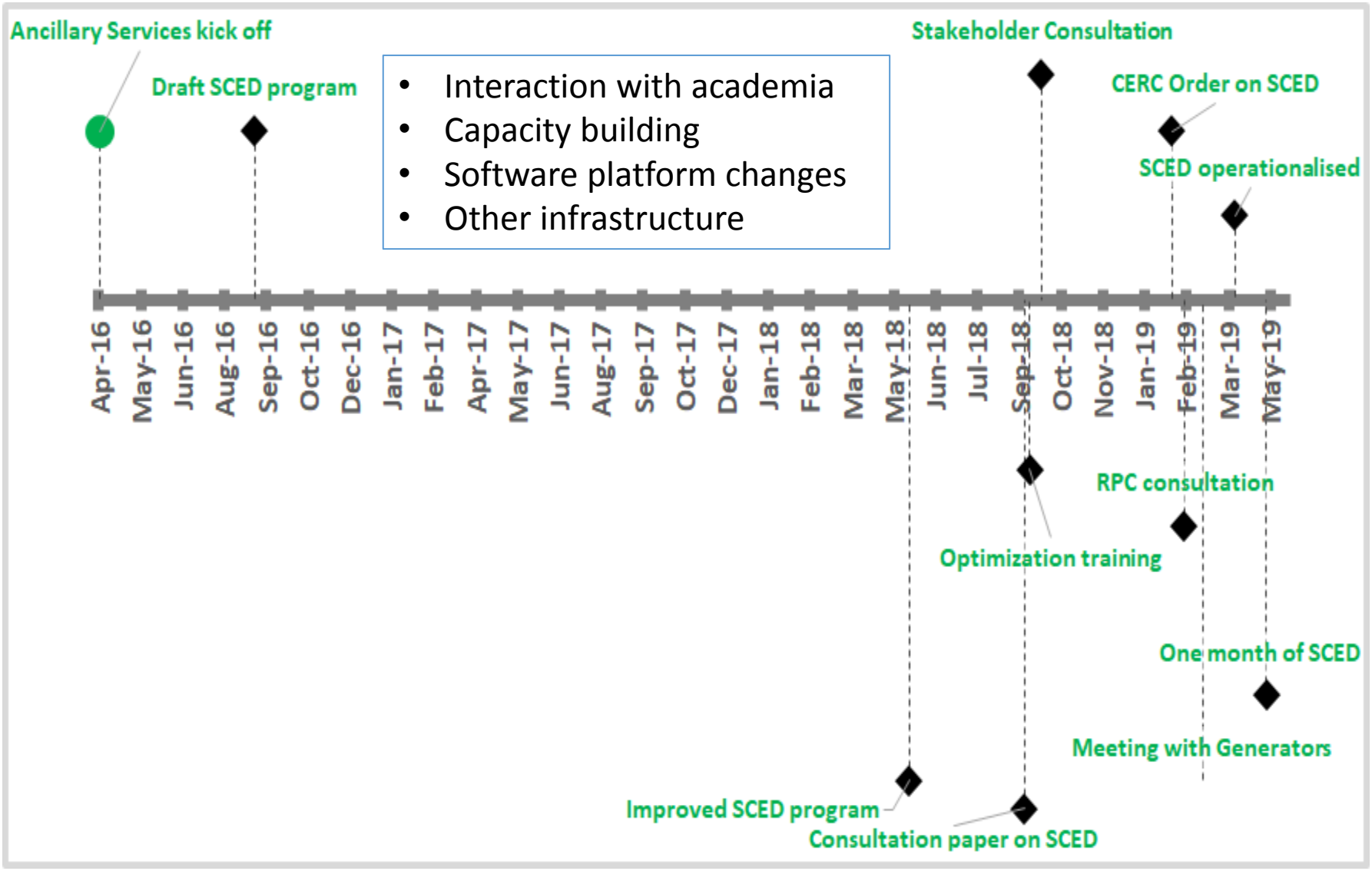
- Further streamlining the scheduling process at all levels
- Need for Gate Closure
- Need for Robust and Seamless communication

Way Forward

- **Expanding the ambit of SCED**
- **Co-optimization of Energy and Ancillary Services**
- **Unit Commitment**
  - Facilitate decision making process for reserve shutdown
  - Time frame and periodicity of execution
- **Spinning Reserves**
  - Payment for reserves (standby and utilization)
- **Implementation of Ancillary / SCED at Intra State level**
- **40 % Technical Minimum**
- **Higher Ramp Rate (3% per minute)**

Thank You

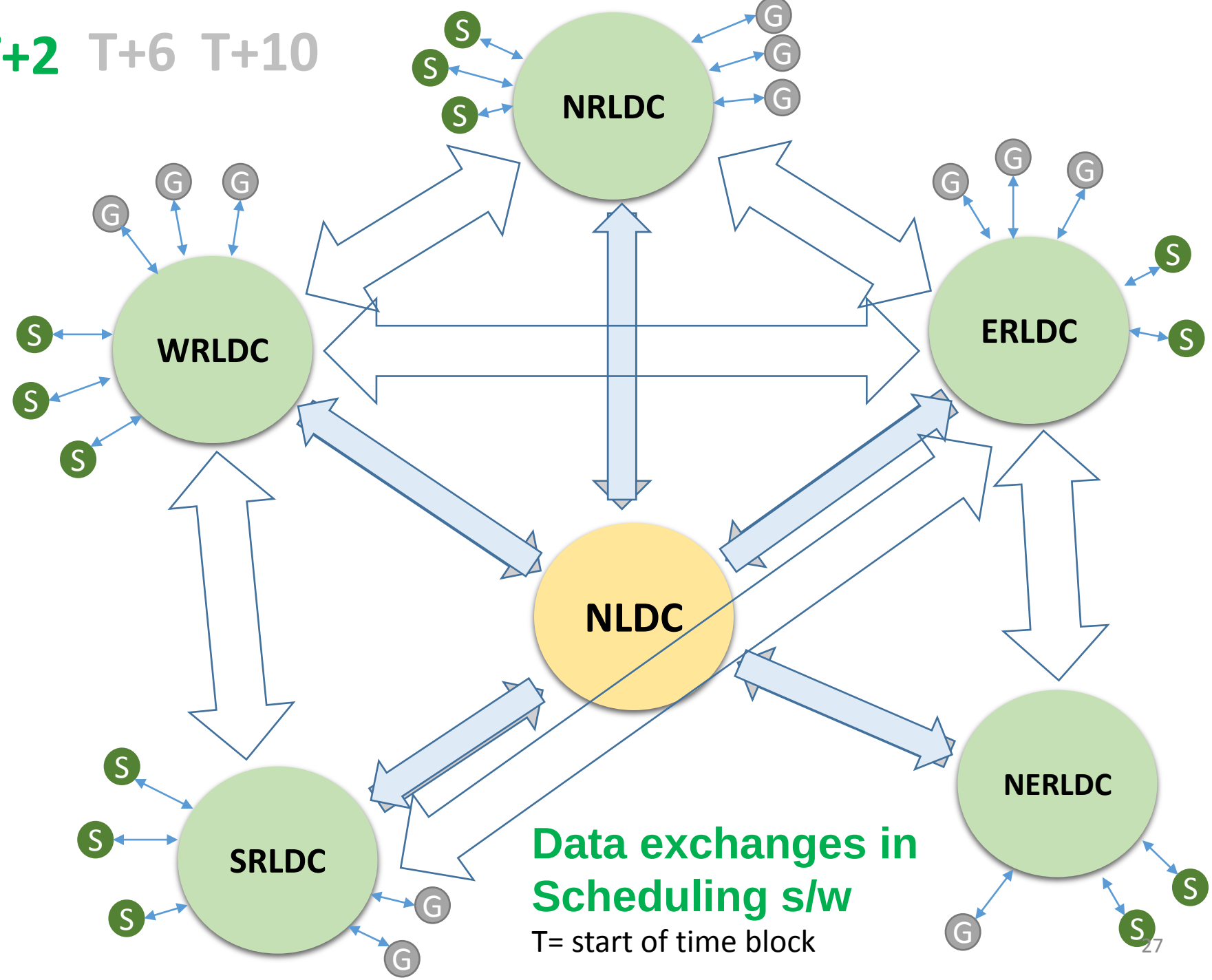
Milestones and Breakthroughs



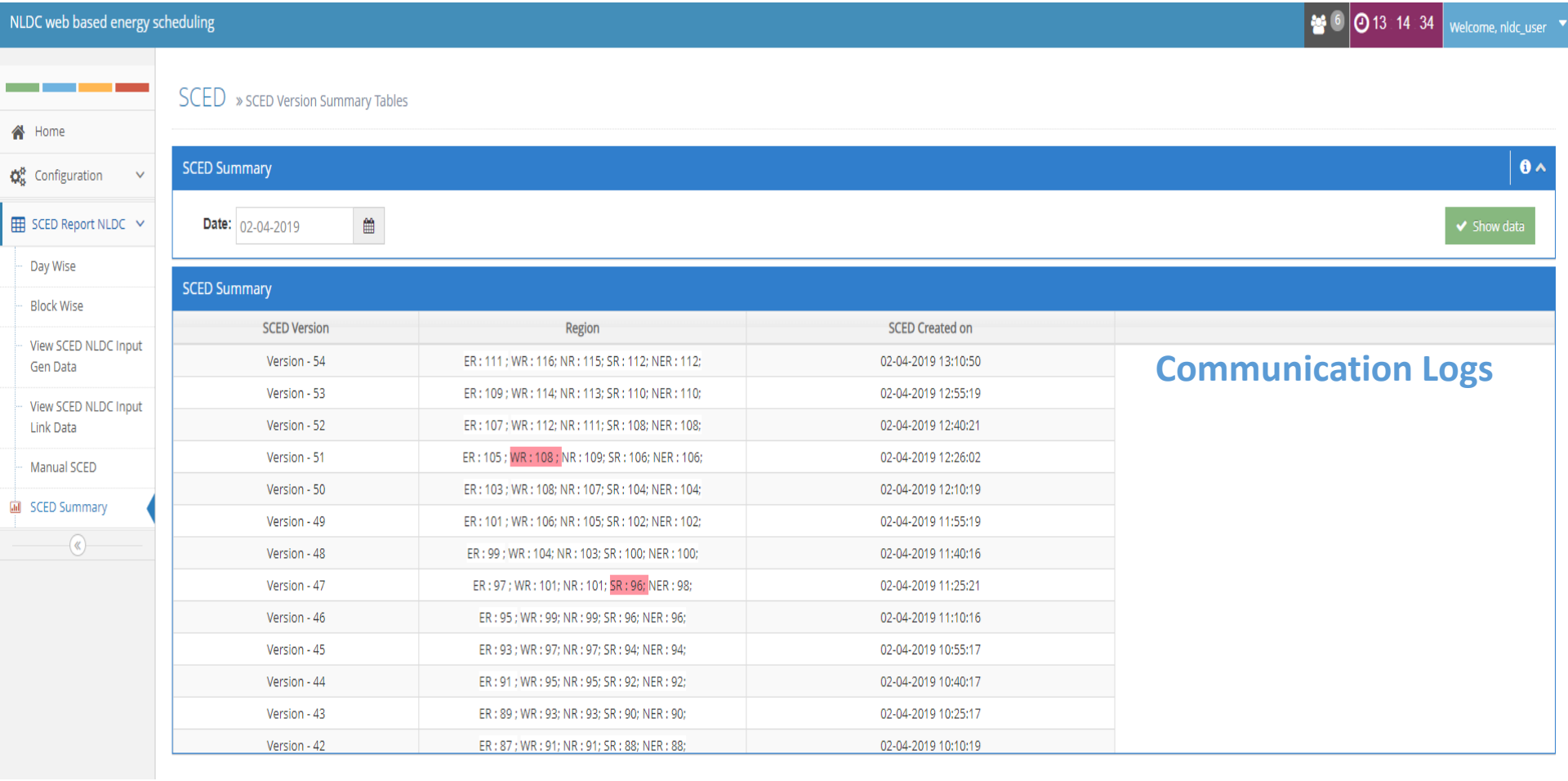
Beneficiary Allocations in ISGS

Station	No of Beneficiaries	No of regions with share	HHI
Barh Stg-II	5	2	0.829
DADRI NCTPS-I	2	1	0.820
KBUNL-II	7	2	0.581
DADRI NCTPS-II	14	3	0.578
Vallur TPC	6	1	0.511
NTPC, SIMHADRI-I	2	1	0.503
Jhajjar	7	2	0.429
UNCHAHAR-I TPS	11	3	0.394
NLC TPS I- EXPANSION	4	1	0.386
NLC TPS II- EXPANSION	4	1	0.386
NTPC_Bongaigaon	8	1	0.362
NTPC, Kudgi	5	1	0.354
UNCHAHAR-IV TPS	9	2	0.319
Solapur STPP	11	3	0.317
Mundra UMPP	5	2	0.301
Talcher	13	3	0.292
Farakka III	6	3	0.277
VSTPS-STG-I	15	4	0.272
VSTPS-STG-II	13	4	0.268
NTPL	6	1	0.255
SINGRAULI STPS	11	3	0.252
Mauda (MSTPS - I)	13	3	0.249
Mauda (MSTPS - II)	13	4	0.242

Station	No of Beneficiaries	No of regions with share	HHI
Farakka	17	4	0.236
NLC TPS II- STG II	6	1	0.230
VSTPS-STG-IV	12	3	0.225
VSTPS-STG-V	12	3	0.222
Kahalgaon - I	18	4	0.222
VSTPS-STG-III	13	4	0.216
SASAN UMPP	7	2	0.215
NLC TPS II- STG I	6	1	0.213
NTPC, SIMHADRI-II	6	1	0.212
RIHAND-III STPS	10	2	0.211
SIPAT-II	13	4	0.210
SIPAT I	12	3	0.207
UNCHAHAR-II TPS	10	2	0.201
UNCHAHAR-III TPS	10	2	0.197
RIHAND-I STPS	12	3	0.196
KSTPS	13	4	0.194
RAMAGUNDAM STG III	6	1	0.194
RIHAND-II STPS	11	3	0.188
RAMAGUNDAM STG I &II	8	1	0.178
NTPC ,TALCHER STG II	9	2	0.174
Korba - III	14	4	0.153
BRBCL Nabinagar TPS	10	3	0.119
Kahalgaon - II	23	5	0.084

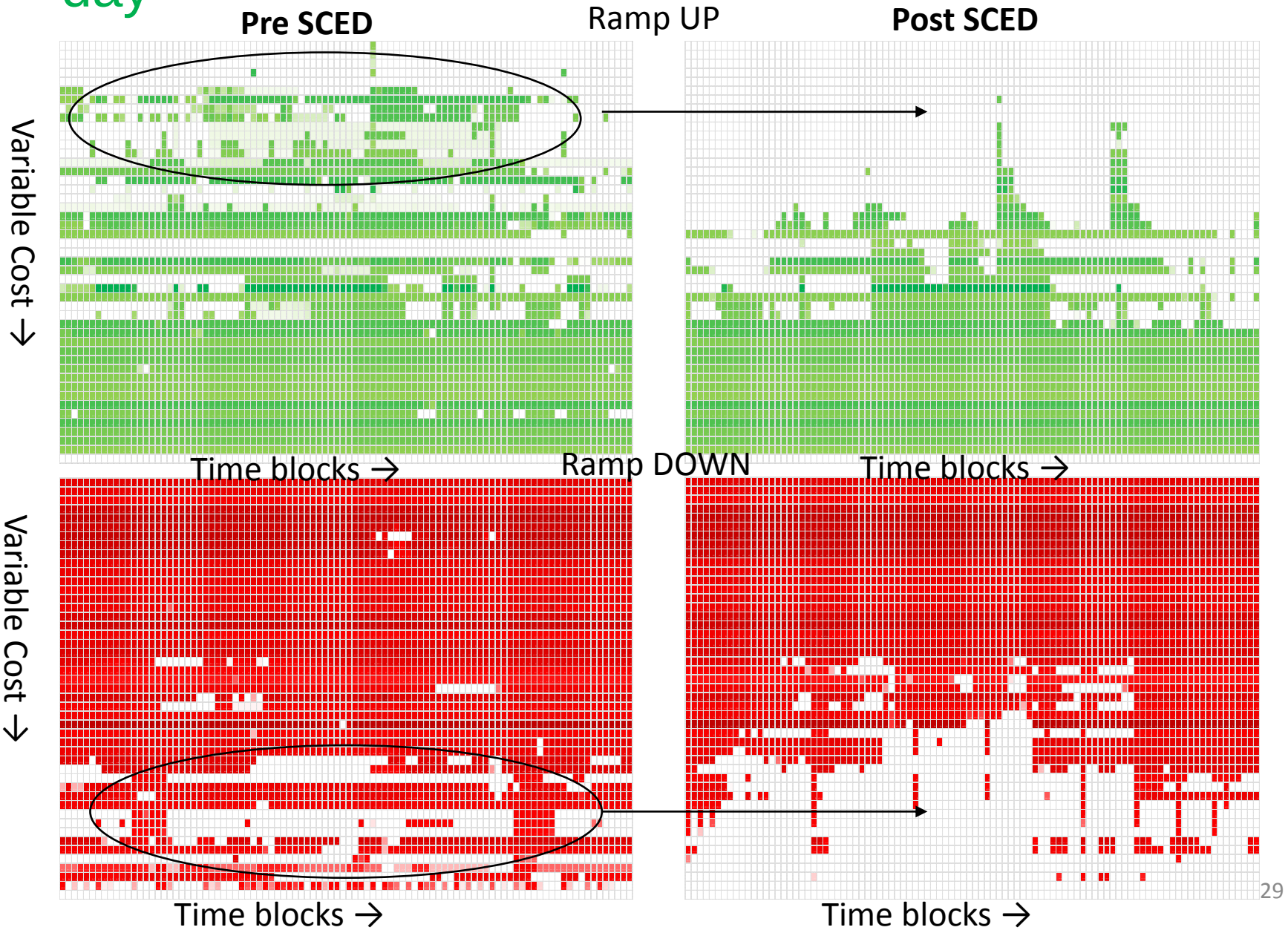

T+2
T+6
T+10
NRLDC
WRLDC
ERLDC
NLDC
SRLDC
NERLDC
S
G
Data exchanges in Scheduling s/w
T= start of time block

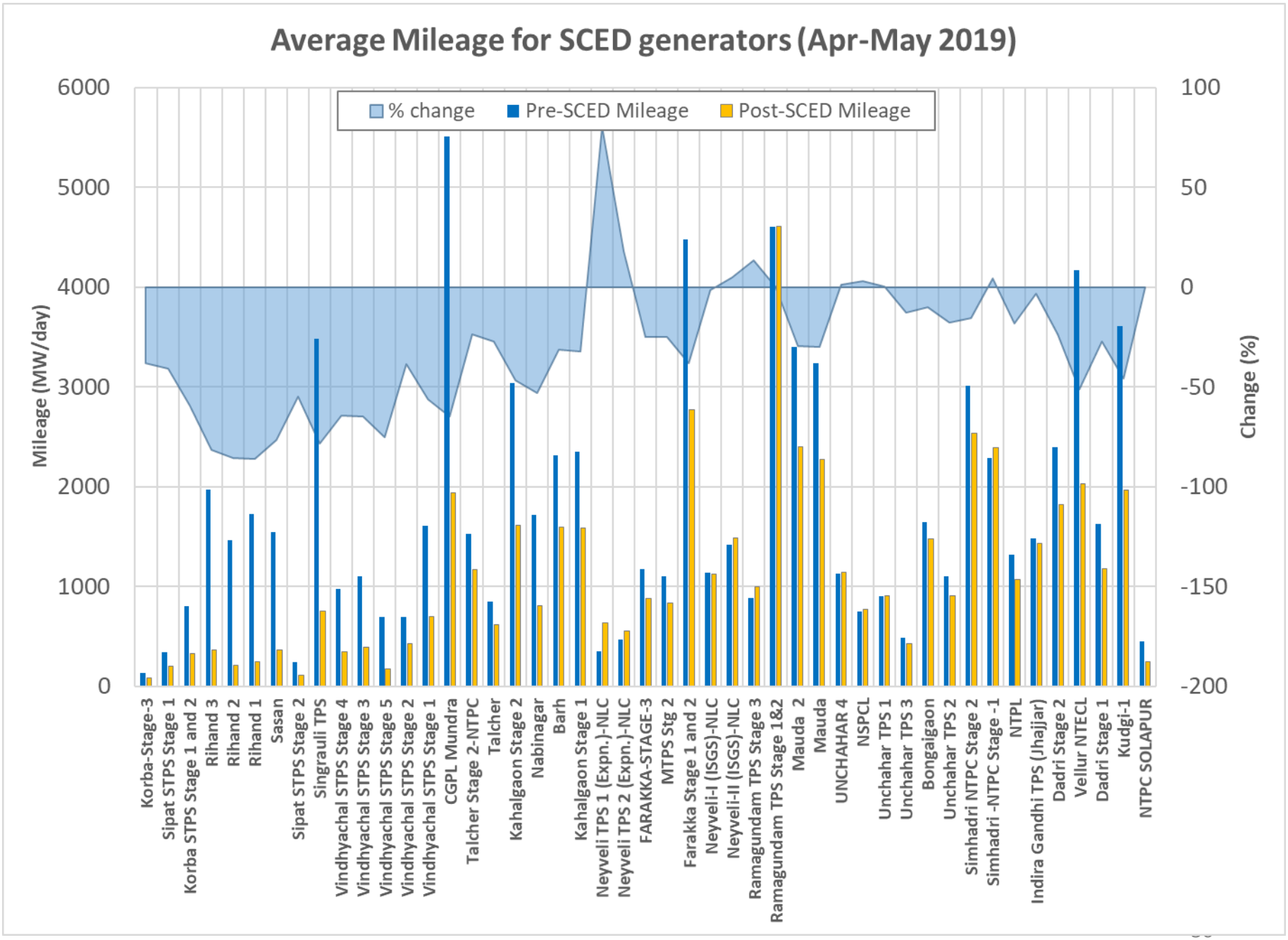
Continuous Data Fetch from all the five RLDCs at NLDC



Dual Redundant communication between RLDCs and NLDC

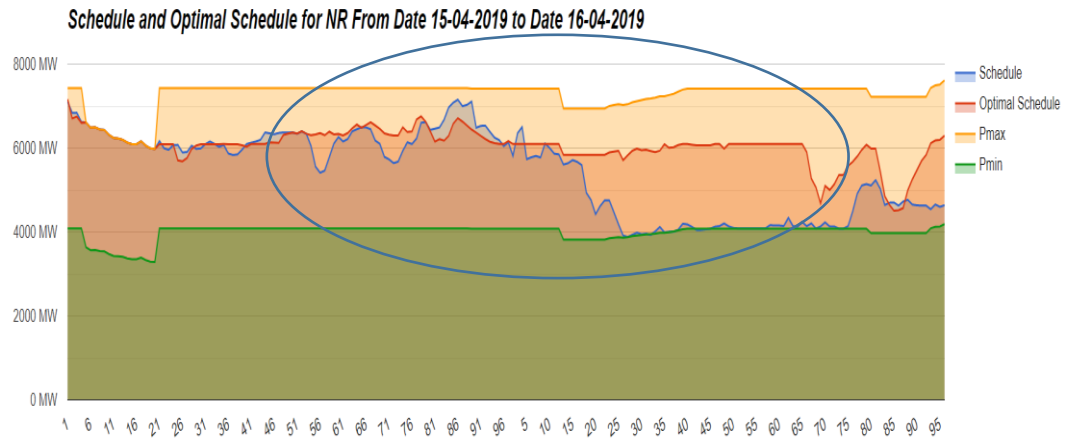
Heatmap of Plantwise ramp reserves for sample day

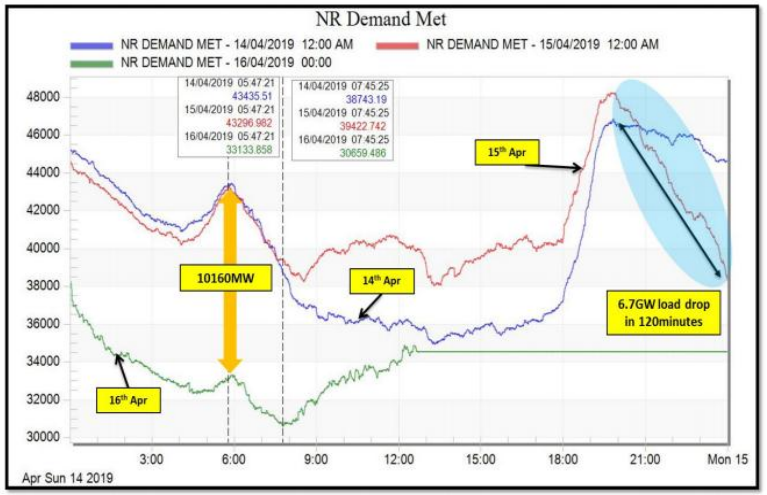



Average Mileage for SCED generators (Apr-May 2019)
% change
Pre-SCED Mileage
Post-SCED Mileage
Mileage (MW/day)
Change (%)
6000
5000
4000
3000
2000
1000
0
100
50
0
-50
-100
-150
-200
Korba-Stage-3
Sipat STPS Stage 1
Korba STPS Stage 1 and 2
Rihand 3
Rihand 2
Rihand 1
Sasan
Sipat STPS Stage 2
Singrauli TPS
Vindhyachal STPS Stage 4
Vindhyachal STPS Stage 3
Vindhyachal STPS Stage 5
Vindhyachal STPS Stage 2
Vindhyachal STPS Stage 1
CGPL Mundra
Talcher Stage 2-NTPC
Talcher
Kahalgaon Stage 2
Nabinagar
Barh
Kahalgaon Stage 1
Neyveli TPS 1 (Expn.)-NLC
Neyveli TPS 2 (Expn.)-NLC
FARAKKA-STAGE-3
MTPS Stg 2
Farakka Stage 1 and 2
Neyveli-I (ISGS)-NLC
Neyveli-II (ISGS)-NLC
Ramagundam TPS Stage 3
Ramagundam TPS Stage 1&2
Mauda 2
Mauda
UNCHAHAR 4
NSPCL
Unchahar TPS 1
Unchahar TPS 3
Bongaigaon
Unchahar TPS 2
Simhadri NTPC Stage 2
Simhadri -NTPC Stage -1
NTPL
Indira Gandhi TPS (Jhajjar)
Dadri Stage 2
Vellur NTECL
Dadri Stage 1
Kudgi-1
NTPC SOLAPUR

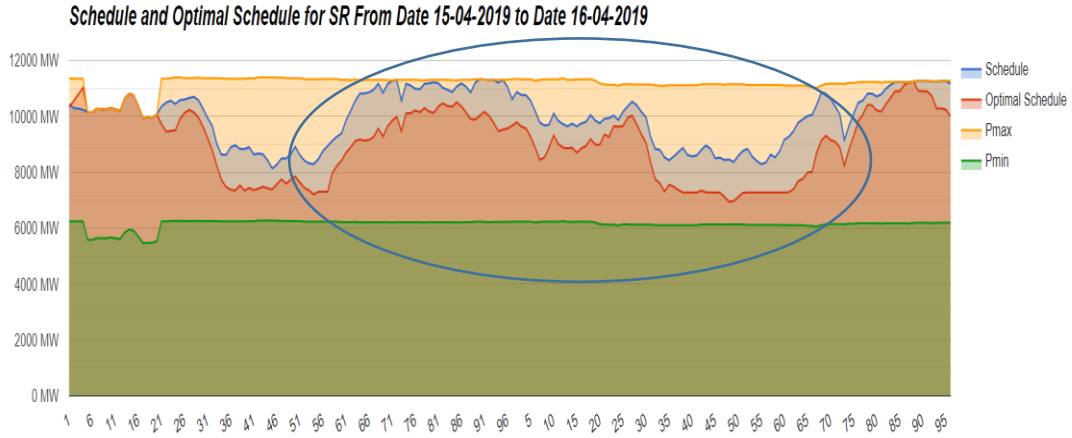
SCED performance during 15th -16th April'19 Load Crash

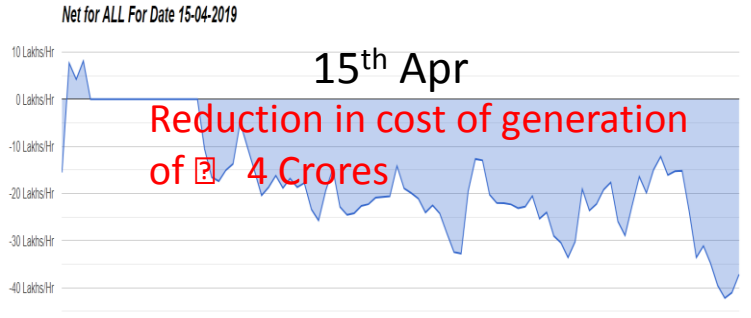
~ 10 GW Load Crash





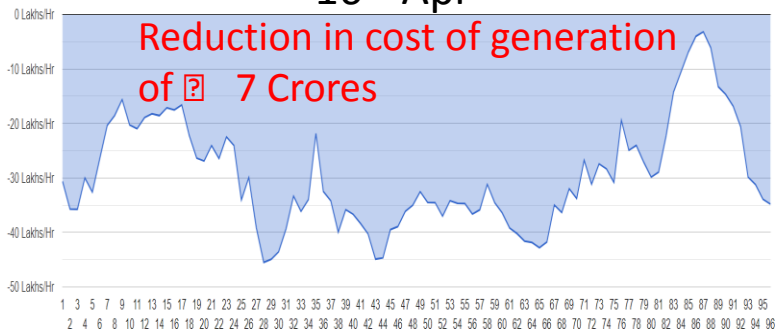
- NR generation scheduled to Technical Minimum including cheaper generation
- SCED increased cheaper generation in NR and decreased costly generation in SR, subject to transmission constraints





15th Apr

Reduction in cost of generation of ₹ 4 Crores



16th Apr

Reduction in cost of generation of ₹ 7 Crores

एनटीपीसी NTPC
A Maharatna Company

Annexure-III

Indian Accounting Standards (Ind AS) & Impact of IND AS Adoption on Capital Cost in Tariff

एनटीपीसी NTPC
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Indian Accounting Standards (Ind AS)

Salient Features of IFRS Converged Ind AS

- More importance to concept of **'Substance Over Form',** i.e., economic reality of a transaction.
- Rely more on '**Fair Valuation Approach'**, and measurements based on "**Time value of Money'**.
- Principle-based Standards.
- Applicable on Separate as well as Consolidated Financials.
- More disclosures of relevant information and assumptions.
- Require higher degree of judgment and estimates.

Areas of Impact

1. Asset Accounting.
2. Borrowings (accounting of transaction costs).
3. Exchange Rate Variations.
4. Measurement of Employee Loans.
5. Discounting of Non-Current Vendor Liabilities.
6. Accounting of Rebate to Customers.
7. Presentation of Govt. Grants (For purchase of Assets).

Areas of Impact

8. Fair valuation of investments in Equity Instruments and Mutual Funds (Non DDR).
9. Proposed Dividend and DDT.
10. Actuarial Gains/Losses – Employee Benefits.
11. Prior Period Items.
12. Related Party Disclosures.

Areas of Impact

13. Equity Method of Consolidating JVs.
14. Lease Accounting – Finance / Operating.
15. Regulatory Deferral Accounts
16. Embedded Derivatives

1. Asset Accounting

Deemed Cost

As per Ind AS 101, previous GAAP carrying values of PPE and Intangible assets on the date of transition considered as Deemed cost, as new Gross Block in the financial statements.

Capitalization of Spares

- Spares which meet the definition of PPE are capitalized.
- Spares capitalized till 31 March 2015 as per erstwhile guidelines accounted at their carrying value.
- Spares procured from 1 April 2015 onwards are delinked from main assets & capitalized as individual assets with life specified.

Asset Accounting – contd..

Cost of Major Inspection

- Cost of major inspection/overhaul, taken up at the intervals of more than 12 months, is capitalised as a separate component and amortised over the period of next major overhaul.

- Major inspection/overhaul cost shall include both spares and service cost..

Asset Accounting – contd..

Asset Retirement Obligations (ARO)

- Cost of PPE shall include estimate of the costs of dismantling & removing item & restoring the site. Obligation to be measured at the best estimate of the expenditure to be incurred.

- Applicable for Handing over of the project land after say 25 years & Coal Mining Projects.

2. Borrowings

- Borrowings are to be carried at amortised cost using Effective Interest Rate Method (EIR).

- Transaction costs such as processing fees, upfront fees, etc. to be considered in EIR calculations. Such transaction costs to be amortised over the tenure of the borrowings.

- New methodology shall be applied to new borrowings contracted during 2015-16 and beyond.

- As a result, transaction costs upto COD are capitalised and balance charged to the Statement of Profit and Loss.

3. Exchange Rate variation (ERV)

- As per Ind AS 101, Company continued to capitalise ERV on long-term FC Monetary Items recognised in the financial statements before 31 March 2016.

- After 31 March 2016, ERV on borrowings bifurcated into BC and ERV. ERV to the extent regarded as BC capitalised till COD. Balance ERV charged to the Statement of Profit & Loss.

- NTPC being a rate regulated entity, ERV charged to the P&L but recoverable from/payable to beneficiaries in future on payment, treated as 'Regulatory Deferral Account Balances'.

4. Measurement of Employee Loans

- As per Ind AS 109, employee loans are to be measured at amortised cost using EIR Method.
- Incremental Quarterly Borrowing Rate used as discount rate, as it approximates the market rate of interest.
- PV of the employees loans as at 1 April 2015 calculated for initial measurement. Difference between the PV of employees loans and their carrying value treated as 'Deferred Payroll Expense' and amortised over the period of the loan.
- Amortisation of 'Deferred Payroll Expenses' disclosed under 'Employee benefit expense'.
- Interest income recognised considering the market rate of interest on employees loans and is credited to P&L.

5. Discounting of Non-Current Vendor Liabilities

- As per Ind AS 109, non-current financial liabilities discounted to their PV using quarterly EIR.
- On the transition date, difference between the carrying value of the liability and their PV adjusted in the Retained Earnings.
- Such difference after the transition date is being credited in CWIP or P&L as applicable by debit to liability.
- Subsequent unwinding of liability debited to CWIP or P&L as applicable by credit to liability.
- Difference is amortised over the period of the liability or till it gets discharged/adjusted or becomes current by debit to ‘Unwinding of discount on vendor liabilities’ under ‘Finance cost’.

6. Rebate to Customers

- Rebates & other incentives is taken into account for measuring the fair value of the consideration/sales, received or receivable.

- Revenue is presented net of rebate/incentive allowed to the customers.

- Rebate/incentive to be accounted on accrual basis based on the past experiences.

7. Government Grants

Grants Related to PPE:

- AS per Ind AS 20 - Government grants related to assets presented in the balance sheet as ‘Deferred Income.’

- The grant accounted as ‘Deferred Income’ is recognized in P&L on a systematic basis over the useful life of the asset in the proportion of depreciation charged on such assets.

8. Fair Valuation of Investments

Equity Instruments:

- As per Ind AS 109, investment in PTC Ltd. to be measured at fair value.
- Corresponding impact as on the transition date transferred to the Retained Earnings.
- Thereafter, investment is valued at the current prevailing rate and difference is shown under ‘Other Comprehensive Income (OCI)’.

9. Proposed Dividend and Tax Thereon

- As per para 12 of Ind AS 10, Dividend declared on equity instruments & DDT thereon, after the reporting period, not to be recognised as liability at the end of the reporting period.

- Such dividends to be disclosed in the Notes to Accounts.

- In the subsequent periods, final dividend and DDT are accounted only after approval of the same in the AGM.

10. Actuarial Gains & Losses - Employee Benefits

- As per Ind AS 1, actuarial gains or losses arising on post employment defined benefit plans should be recognised in OCI.

- Actuarial gains or losses on other long-term employee benefits continue to be recognised in the P&L.

11. Material Prior Period Items

As per Ind AS 8, an entity is required to correct **material prior period errors** retrospectively in the first set of financial statements approved for issue after their discovery by:

a) restating the comparative amounts for the prior period(s) presented in which the error occurred; or

b) if the error occurred before the earliest prior period presented, restating the opening balances of assets, liabilities and equity for the earliest prior period presented.

14. Lease Accounting

- As per Para 9 of Appendix C (Determining Whether an Arrangement contains a Lease) of Ind AS 17 - 'Leases', three stations of the Company fall under Leases.

- Para 10 (c) of Ind AS 17, provides that if the lease term is for the major part of the economic life of the asset even if title is not transferred, the lease is to be classified as **Finance Lease.**

- PPAs with beneficiaries reviewed. One station of the Company falls under the definition of **Finance Lease** as the Company has agreement with single beneficiary to sell the power of and the PPA is for the entire life of the power plant.

- Accordingly, cost of fixed assets of this station (except land & other miscellaneous assets) de-recognized and accounted as 'Finance Lease Receivables'.

14. Lease Accounting

- Recovery of capacity charges (Depreciation, interest on loan & return on equity (pre-tax)) adjusted against 'Finance Lease Receivable'. Interest component pertaining to the finance lease are recognized under the head 'Other income' as 'Interest - Assets under Finance Lease'.

- Recovery of other components of capacity charges (interest on working capital and O&M expenses, which are in the nature of services income) and other components viz. energy charges, FPA, UI, etc. are continue to be recognized as capacity charges under the head 'Sale of energy'.

- Other two station fall under **Operating Lease,** as the PPAs are not for the entire life of the power plant.

- In case of operating leases, revenue related to capacity charges (Depreciation, interest on loan & return on equity (pre-tax)) is shown as 'Lease rentals on assets on operating lease' .

Lease Accounting – contd..

- Revenue from the other components of capacity charges (interest on working capital and O&M expenses) and revenue from energy charges, FPA, UI etc. are accounted as ‘Sale of Energy’.

Land Lease Accounting

- Under previous GAAP, leasehold land was capitalized at an amount equal to the upfront payments made at the time of lease. However, under Ind AS, such leases are capitalised at the present value of the total minimum lease payments to be paid over the lease term.

- Accordingly, future lease rentals have now been recognised as ‘Finance Lease Obligation’ at their present values.

Regulatory Deferral Accounts

- An entity shall present separate line items in the balance sheet for:

  (a) the total of all regulatory deferral account debit balances; and

  (b) the total of all regulatory deferral account credit balances.

- When an entity presents current and non-current assets, and current and non-current liabilities, as separate classifications in its balance sheet, it shall not classify the totals of regulatory deferral account balances as current or non-current.

Regulatory Deferral Accounts – contd..

The Company has accounted 'Rate Regulated Assets/Liability' in respect of the following items:

1. Exchange rate variation in respect of loans drawn after 1.4.2016;
2. Impact of wage revision arrears w.e.f. 1.1.2017;
3. Deferred Tax;
4. Ash transportation expenses w.e.f. 25.1.2016.

16. Embedded Derivatives

- Ind AS 109 defines an embedded derivative as ‘a component of a hybrid contract that also includes a **non-derivative host with the effect that some of the cash flows of the combined instrument vary in a way similar to a standalone derivative**’.

- An **embedded derivative to be separated from the host contract and accounted for as a derivative** inter-alia, if its economic characteristics are not closely related to those of the host contract.

- In case of non-financial host contracts e.g. those for supply of goods or services, separation of embedded derivative is not required if the contract is denominated in the functional currency of either of the parties to the contract, or if the contract is in a currency which is used worldwide for the items, or if the contract is in a currency used in contracts for the items in the economic environment in which the transaction takes place.

- The issue has been referred to EAC of ICAI towards the applicability of the same. Opinion of the ICAI is awaited.

IND AS Notified Subsequent to Initial Rollout

Ind AS 115 – Revenue from Contracts with Customers

- Applicable from 1 April 2018.
- Replaced existing standards Ind AS 11 - ‘Construction contracts’ and Ind AS 18 - ‘Revenue’.
- Recognise revenue at an amount that reflects the consideration to which the entity expects to be ‘entitled’ in exchange for transferring goods or services.
- **‘Risks and Rewards**’ model **replaced** with **‘Control’** Model.
- Transaction price allocated to ‘performance obligations’, i.e. at a point of time versus over time.
- **Principal Vs. Agent considerations**.

Ind AS 116 – Leases

- Applicable from 1 April 2019.
- Replaced existing Ind AS 17 – ‘Leases’.
- The new standard requires lessee to recognize assets and liabilities for the rights and obligations created by all leases.
- There is no classification of operating and finance leases from lessee point of view.
- Only exceptions are
  - **short term leases** and
  - leases for which the underlying asset is of **low value**.

Impact of IND AS Adoption on Capital Cost in Tariff

Capital cost as per CERC Regulation

Capital Cost means the capital cost as determined in accordance with Regulation 9 of CERC Regulations i.e. the Capital cost of the generating station as determined by the Commission after prudence check in accordance with these regulations shall form the basis for determination of tariff for existing and new projects.

Capital Cost of a new project shall include the following:

(a) ***Expenditure incurred or projected to be incurred*** *up to the date of COD of the project;*

(b) ***Interest during construction and financing charges****, on the loans (i) being equal to 70% of the funds deployed, in the event of the actual equity in excess of 30% of the funds deployed, by treating the excess equity as normative loan, or (ii) being equal to the actual amount of loan in the event of the actual equity less than 30% of the funds deployed;*

(c) Any gain or loss on account of ***foreign exchange risk variation*** *pertaining to the loan amount availed during the construction period;*

(d) ***Interest during construction and incidental expenditure during construction*** *as computed in accordance with these regulations;*

Capital cost as per CERC – contd..

*(e) Capitalized **initial spares** subject to the ceiling rates in accordance with these regulations;*

*(f) Expenditure on account of **additional capitalization and de-capitalisation** determined in accordance with these regulations;*

*(g) Adjustment of revenue due to **sale of infirm power** in excess of fuel cost prior to the date of commercial operation as specified under Regulation 7 of these regulations;*

*(h) Adjustment of **revenue earned** by the transmission licensee by using the assets before the date of commercial operation;*

*(i) Capital expenditure on account of **ash disposal and utilization** including handling and transportation facility;*

*(j) Capital expenditure incurred towards **railway infrastructure** and its augmentation for transportation of coal upto the receiving end of the generating station but does not include the transportation cost and any other appurtenant cost paid to the railway;*

*(k) Capital expenditure on account of **biomass handling equipment and facilities**, for co-firing;*

Capital Cost as per CERC – contd..

*(l) Capital expenditure on account of **emission control system** necessary to meet the revised emission standards and sewage treatment plant;*

*(m) Expenditure on account of fulfilment of any conditions for obtaining **environment clearance** for the project;*

*(n) Expenditure on account of **change in law** and force majeure events; and*

*(o) Capital cost incurred or projected to be incurred by a thermal generating station, on account of implementation of the norms under **Perform, Achieve and Trade (PAT) scheme** of Government of India shall be considered by the Commission subject to sharing of benefits accrued under the PAT scheme with the beneficiaries.*

The capitalization as per erstwhile IGAAP and CERC regulations was ***almost same*** (except the cash basis concept). With implementation of IND AS, the basic definition of "capitalization" & "Plant, property & equipment" has undergone change.

To match with the books of accounts under Ind AS, either the definition of 'capital cost' under CERC Regulation need to amended suitably or there will be the perpetual need to reconcile the *additional capitalization and de-capitalisation* on yearly basis.

Difference in Capital Cost of Plant, Property & Equipment under IGAAP & IND-AS

A. First Time Adoption - Adjustment of Accumulated Depreciation as on 1.4.2015

- On transition date, Most of the Companies opted for carrying **deemed cost** (GB as at 1.4.2015 minus AD).

- Accordingly, GB in the Accounts is unparalleled with CERC Capital cost.

- While preparing the gross block reconciliation, adjustments as discussed in the previous slides required to be made.

B. GB Adjustment with AD Decapitalisation

- Once Gross block of assets has been adjusted with corresponding accumulated depreciation, any subsequent decapitalization out of assets procured before 01.04.2015 shall be on Net basis (carrying value).
  - Decapitalizations pertaining to assets procured before 1.04.2015 shall be shown separately on yearly basis. and
  - Capital cost shall get reduced on gross basis due to decapitalization out of allowed capital cost.

C. Capital Overhauling/Major Inspection Capitalised out of Revenue Expenses

- As per para 14 of IND AS 16, followings expenditure are to be capitalized:
  - Cost of each major inspection performed is recognized in carrying amount, as a replacement, if the recognition criteria are met.
  - Any remaining carrying amount of the cost of the previous inspection is derecognized.

    - As per erstwhile IGAAP as well as CERC Regulations, these expenditure are of revenue nature and hence shall be met out of O&M Recovery.
    - In order to arrive at pre Ind AS Gross Block, such capitalization shall be deducted from Ind AS Gross Block.

D. Capitalization of Spares out of Inventory

- As per para 8 of Ind AS 16, Items of spare parts, stand-by equipment and servicing equipment are capitalised when they meet the definition of PPE. Otherwise, such items are classified as inventory.
  - Revenue spares fulfilling the Ind AS criteria of PPE have been capitalised.
  - This Ind AS Adjustment does not require any reconciliation with CERC capital cost (IGAAP), since the same will not be claimed from CERC under O&M prospectively.

E. Vendor Discounting/Unwinding

- As per Ind AS 109 on ‘Financial Instruments’, non-current financial liabilities shall be discounted to their present value and presented in the financial statements.
  - Discounting causes de-recognition of Asset/CWIP /Expenses corresponding to the liability.
  - Subsequently, at each balance sheet date, discounted liabilities are unwound by debit to P&L and liabilities are updated.
  - Consequently, the amount debited to P&L is capitalised as IDC in case the station has not achieved COD.

F. Exchange Rate Variation

- During construction period, in the erstwhile IGAAP as per Para 46A of AS-11, FERV on loan was to be capitalized and accordingly the same was claimed as part of capital cost. As per Ind AS, FERV on FC loans drawn after 1.04.2016 shall not form part of Gross Block and shall be charged to P&L as Borrowing cost/FERV and corresponding regulatory asset is created as per Ind AS 114.

- As per Regulations, any gain/loss on account of FERV pertaining to the loan availed during the construction period shall be included in capital cost.

- FERV on FC loan drawn after 1.04.2016 charged to P&L shall be included in the capital cost till the project achieve COD in line with the provisions of the Regulation.

G. Finance Charges

- In the erstwhile IGAAP, loan issue expenses paid upfront were accounted as and when incurred and the same were used to be claimed as a part of IDC during construction period.
- Under Ind AS, the upfront expenditure pertaining to bond issue expenses is to be amortized over the tenure of the loan resulting in part capitalization as IDC till construction period.
- Since actual cash expenditure is to be included in capital cost, the unamortized part of bond issue expenses shall be included in capital cost.

Summary of reconciliation of Gross Block of PPE

SL		Particular
1		Opening Gross Block as per Audited IND AS Balance Sheet as on 01.04.2016
2.1	IND AS ADJ	Add: Adjustment of accumulated Dep as on 01.04.2015
2.2		Less:Gross block adjustment with regard to Acc. Dep for decapitalisation during 2015-16
2.3		Less: Capital Overhauling/Major Inspection Capitalised **OUT OF REVENUE**
2.4		Less: Capital Spares capitalised out of Inventory sys cir 126
2.5		Less: Capital Spares capitalised out of Inventory sys cir 146
2.6		Less: Capitalisation of PV of Future minimum lease obligation in Lease hold land
2.7		Less: Unwinding expenses Capitalised during 2015-16
2.8		Add: Vendor Discounting in the year 2015-16
2.9		Add: Borrowing cost adj for the year 2015-16 due to change in interest rate (EIR)
2.10		Add/Less: Any other Adj in PPE due to IND AS implementation
2		**IND AS ADJ 2015-16 --------Sub total (2.1-2.2-2.3-2.4-2.5-2.6-2.7+2.8+2.9+2.10)**
3		Closing Gross Block as per IGAAP Audited Balance Sheet as on 31.03.2016

SL		Particular
3A		Opening Gross Block after IND AS adjustment as on 01.04.2016 (row 3+2.4+2.5)
4	Should match with sum of "Addition" & "Adjustment" as per note-2	Add: Additions as per Note-2
5		Add: Additions as per Note-2 out of adjustment coloumn
6		Less: Decapitalisation as per Note-2 out of adjustment coloumn
7	IND AS ADJ	Add: Vendor discounting out of assets in the year 2016-17
8		Less: IND AS Adj of Decapitalisation out of ROW 6 (Mitigating the impact of carrying cost exemption to arrive)
9		Less: Total addition in capital OH asset class (including adjustments also)
10		Add: Decapitalisation of capital Overhauling during the year
10		Add/Less: Any other IND AS adjustment having impact on PPE (Specify each item)
11		**IND AS ADJ 2016-17 --------Sub total (7-8-9+10)**
12		Closing Gross Block after IND AS adjustment as on 31.03.2017 (row 3+4+5-6+11)
13		Exclusions (Items not allowable/not claimed)
14		Net Additional Capital Expenditure Claimed (accrual basis)
15		Less: Undischarged liabilities
16		Net Additional Capital Expenditure Claimed (Cash basis)

Thank You

17. Financial impact in NTPC

Adjustment in Retained Earnings on 1 April 2015

Particulars		` Crore	
Surplus as reported under Indian GAAP			**589.50**
Less:	Depreciation on account of capital spares	49.54	
	Amortization of leasehold land	35.34	**84.88**
Add:	Reversal of proposed dividend of 2014-15	1,442.96	
	Reversal of tax on proposed dividend of 2014-15	293.75	
	Investments in Equity instruments of PTC at fair value	85.08	
	Transferred from deferred revenue (Tanda Stage-I)	24.49	
	Measurement of vendor liabilities at amortized cost	411.65	
	Others	108.00	**2,365.93**
Retained Earnings in accordance with Ind AS			**2,870.55**

Total Comprehensive Income - FY 2015-16

Particulars	` crore	
Profit as reported under Indian GAAP		**10,242.91**
Add :		
Reversal of R&M expenses due to capitalisation of major inspection/ overhaul and spares	468.54	
Depreciation and amortization on spares & capital OH	148.83	
Actuarial loss on defined benefit plans recognised in OCI (net of tax)	38.35	655.72
Less :		
Recognition of financial assets and liabilities at amortised cost	62.44	
Provision of Rebate to Customers	40.59	
Impact of Finance Lease (Tanda Stage I)	26.00	129.03
Profit after tax as per Ind AS		**10,769.60**
Other comprehensive Income		
Less :		
Actuarial loss on defined benefit plans recognised in OCI (net of tax)	38.35	
Fair valuation of investment (PTC)	20.28	58.63
Total Comprehensive Income		**10,710.97**

Reconciliation of Total Equity

PARTICULARS	31 March 2016	1 April 2015
Total equity (Shareholder's funds) as per previous GAAP	**88,782.00**	**81,657.35**
Adjustments:		
Proposed dividend and tax	1,732.64	1,736.71
Capitalisation of major overhaul & spares	468.54	-
Recognition of financial assets/liabilities at amortised cost	349.20	411.65
Depreciation and amortization	99.28	(49.55)
Fair valuation of investments	64.80	85.08
Recognition of government grant as deferred revenue	(125.33)	(0.30)
Provision of rebate to customers	(40.59)	-
Impact of embedded leases	(1.52)	24.48
Recognition of liabilities on leasehold land	(35.32)	(35.32)
Total adjustments	**2,511.70**	**2,172.75**
Total equity as per Ind AS	**91,293.70**	**83,830.10**