

**CENTRAL ELECTRICITY REGULATORY COMMISSION**

**NEW DELHI**

**Petition No. 132/MP/2022**

**Coram:**

**Shri I. S. Jha, Member**

**Shri Arun Goyal, Member**

**Shri P. K. Singh, Member**

**Date of Order 11.09.2023**

**In the matter of:**

Petition under Sections 28(1), 28(3) and 29 of the Electricity Act, 2003 read with Regulations 1.5(i), 2.3, 5.2(m) and 5.4.2 of Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2010 (as amended) in the matter of dealing with over drawl from the grid by regional entities leading to insecure operation of the grid and other associated matters.

**And in the matter of:**

Southern Regional Load Despatch Centre,  
Power System Operation Corporation Ltd. (POSOCO),  
(A Govt. of India Enterprise),  
29, Race Course Cross Road, Bangalore-560009  
(Regd office: B-9, Qutub Institutional Area, 1st Floor, Katwaria Sarai, New Delhi -  
110016

**.....Petitioner**

**Versus**

1. Andhra Pradesh State Load Despatch Centre, APTRANSCO,  
Chief Engineer,  
3rd Floor, APSLDC Building, Vidyut Soudha Gunadala,  
Vijayawada, Andhra Pradesh-520 004
2. Karnataka State Load Despatch Centre, KPTCL  
Chief Engineer,

No 27/1, Race Course Cross Road,  
Bangalore, Karnataka-560009

3. Tamil Nadu State Load Despatch Centre (TANTRANSCO),  
Chief Engineer,  
144, Anna Salai, Chennai 600 002, Tamil Nadu
4. Member Secretary, SRPC,  
No 29, Race Course Cross Road,  
Bangalore, Karnataka-560009

.....Respondent(s)

**Parties Present:**

Shri Venkateshan M, SRLDC  
Shri Nadim Ahmad, SRLDC  
Ms. Sakie Jakharia, Advocate, NTPC  
Shri Sidhant Kumar, Advocate, APSLDC  
Ms. Manya Chandok, Advocate, APSLDC  
Shri Gurpreet Singh Bagga, Advocate, APSLDC  
Shri S Vallinayagam, Advocate, TANTRANSCO  
Ms. Kajal Singhal, Advocate, TANTRANSCO

**ORDER**

1. Southern Regional Load Despatch Centre (SRLDC) (hereinafter to be referred as “the Petitioner”) has filed the present Petition under Sections 28(1), 28(3) and 29 of the Electricity Act, 2003 read with Regulation 1.5(i), 2.3, 5.2(m) and 5.4.2 of Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2010 ('Grid Code') for seeking appropriate orders from the Commission.
2. The Petitioner has made the following prayers:
  - a. *R1 to R3 to maintain actual drawl from the grid as per drawl schedule and avoid overdrawl from the grid in compliance with Regulation 5.4.2 of the Grid Code and DSM Regulations so as to ensure safety & security of the grid and obviate any possibility of a grid disturbance.*
  - b. *R1 to R3 to ensure the compliance of the directions of SRLDC issued under section 29 of the Act in the event of inadvertent deviation/Over Drawl and adhere to schedule by suitable action and report the action taken to SRLDC.*



- c. *To levy a suitable penalty on the R1 to R3 for the non-compliances of SRLDC directions mentioned in paragraph 20.1.*
- d. *R1 to R3 to ensure generation adequacy and adequate reserves for the state at all times as per their demand estimation, fuel supply position and uncertainty.*
- e. *R1 to R3 to ensure proper forecasting of demand and renewables & plan generation availability as per the profile of net demand (i.e., demand less RE generation) so as to avoid over-drawl from the grid.*
- f. *R1 to R3 to implement a comprehensive action plan for operationalizing the revised ADMS and Physical Regulation presently in vogue and as revised from time to time and ensure its effectiveness.*
- g. *R1 to R3 to ensure better coordination among hydro generation, agriculture load segregation and any specific load side ramp up/down limits to avoid large deviations.*
- h. *R1 to R3 to take necessary actions for augmentation of intrastate transmission system considering minimum internal generation scenario.*
- i. *R1 to R3 to declare and monitor intra-state ATC/TTC in real-time & take corrective action as per the CERC (Measures to relieve congestion in real-time operation) Regulations 2009 & the CERC approved Detailed Procedure under the said Regulations.*

Para 20.1 of the petition as referred in the prayer is at Para 3(s) of this order.

### **Submissions of the Petitioner**

3. The Petitioner has mainly submitted as follows:

- (a) Under section 28(1) and 28(3) of the Act and various provisions of the Grid Code, the Petitioner is responsible for integrated operation of the electricity grid in Southern Region which comprises of the power systems of Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Telangana and Union Territory of Puducherry and parts of Goa.
- (b) The Petitioner would like to highlight the critical operational conditions encountered in the grid from 1st February 2022 to 20th April 2022 leading to an alert state of grid operation for a significant period. The Grid Code has prescribed an operational band for grid frequency from 49.90 Hz to 50.05 Hz. However, due to over drawl by some of the state control areas in the national grid, the frequency went below the lower limit (49.90 Hz) on multiple occasions during the above-mentioned period (i.e., 1st February 2022 to 20th April 2022). The time series plot (Figure-1) of frequency based on the archived PMU data at SRLDC are depicted below:



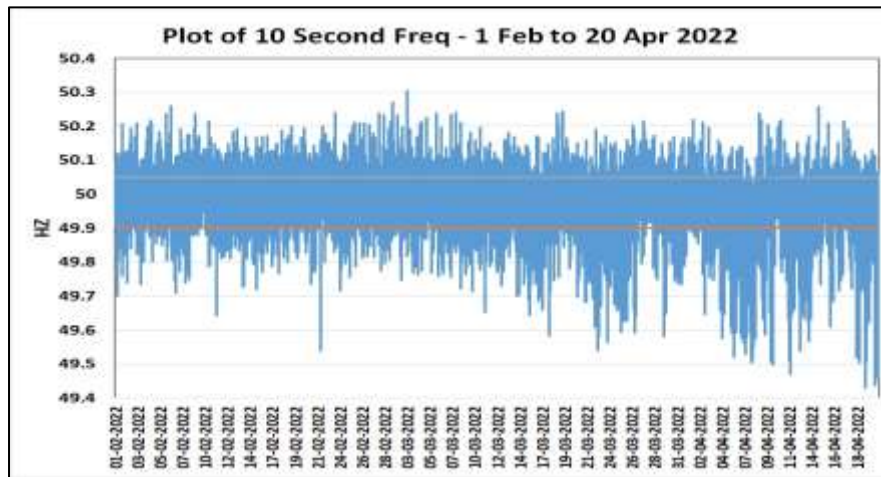


Figure 1: Time series plot of Grid Frequency from 01.02.2022 to 20.04.2022

(c) As can be seen from figure above, frequency remained below 49.90 Hz for a cumulative duration of 290 hours during the said period. On a few occasions, the grid frequency touched very low values ranging from 49.4 to 49.7 Hz thereby driving the grid to an insecure state. The frequency remained below 49.7 Hz for a cumulative duration of 27 hours during the said period. It was observed from the frequency data (of 10-second resolution) that during the said period (1st February 2022 to 20th April 2022):

- i. frequency declined below 49.90 Hz. on 103342 instances
- ii. frequency declined below 49.70 Hz. on 9613 instances

The decline of grid frequency to such low levels made the grid vulnerable to any large contingency during those periods of low frequency. Frequency dipped below 49.5 Hz on a few occasions which endangered the security of the national grid to a high extent.

(d) During the said period, several factors such as high irrigation load, rise in ambient temperature etc. contributed to a sharp rise in electricity demand viz. peak demand season of Southern Region. At the same time, supply-side constraints viz. lower fuel supply for coal-fired power plants, together with lower hydro reservoir levels, planned & forced generation outages, expected low wind season during this period, low reserve under RRAS etc. further stressed the load generation balance.

- (e) Under such stressed conditions, massive over-draw from the grid by several constituents aggravated the situation further and led to prolonged periods of low-frequency operation as indicated in the figure.1 & 2. Any untoward tripping or incident during such stressed operational condition would have led to a major disruption/disturbance in the Grid. The high risk at which the grid was subjected can be readily appreciated from the following example, on 20.04.2022 (at 15:47 hours) 1300 MW loss of Thermal generation at SEIL - P2 (in Southern Region) led to a fall in grid frequency from 49.72 Hz to 49.61 Hz (fall of 0.11 Hz) as shown in figure 2.

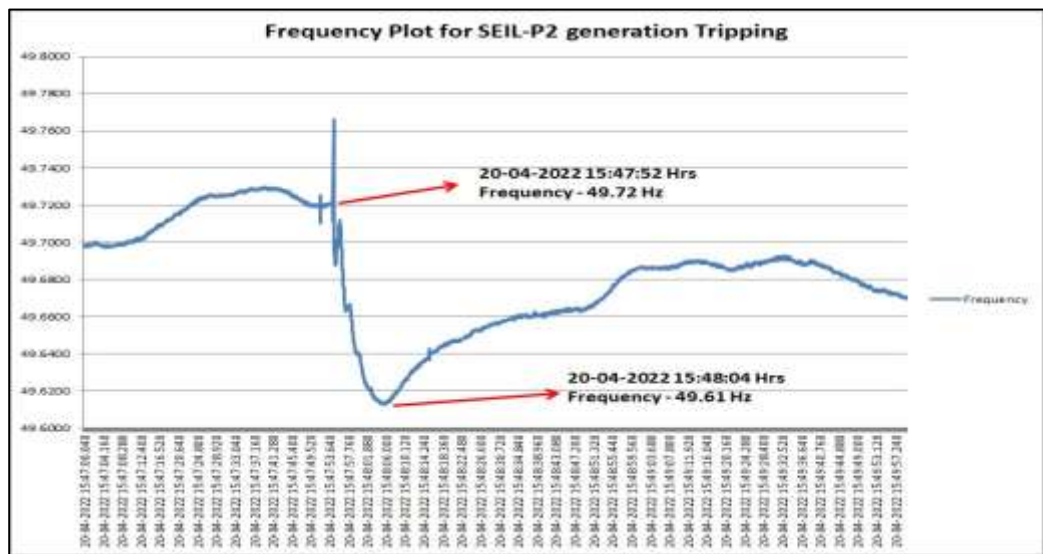


Figure 2: Grid Disturbance on 20.04.2022

- (f) The ensuing paragraphs elaborate on the over-draw pattern and demand portfolio management done by the 3 major SR states during the said observation period (1<sup>st</sup> February 2022 to 20<sup>th</sup> April 2022).

**Andhra Pradesh:**

- (g) **Over-draw:** The 15-minute time block-wise over-draw (OD) from the grid during the concerned period (1<sup>st</sup> February 2022 to 20<sup>th</sup> April 2022) for Andhra Pradesh has been shown in figure 3. Similarly, the time block-wise OD at a frequency less than 49.90 Hz has been plotted in figure 4. It can be seen that over-draw by Andhra Pradesh remained in the range

of 400 to 1200 MW in several time blocks even at a frequency below 49.90 Hz.

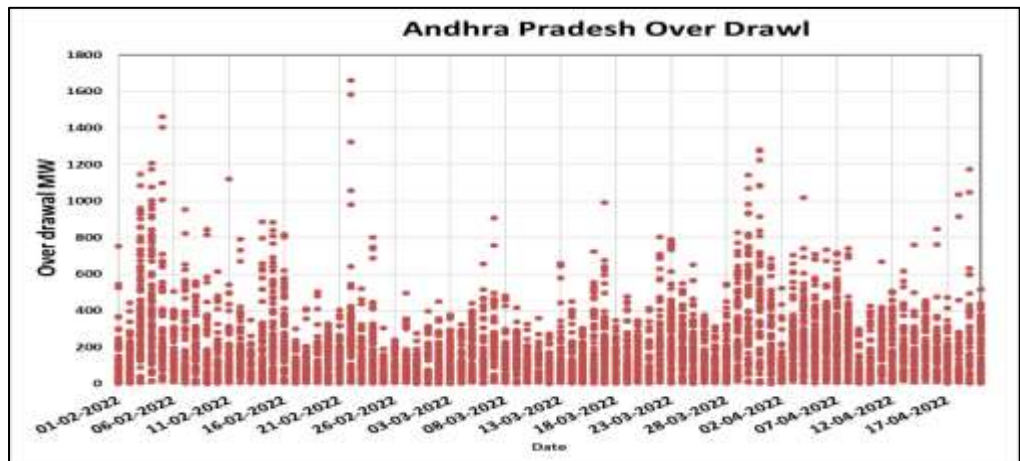


Figure 3: Andhra Pradesh over drawl in MW

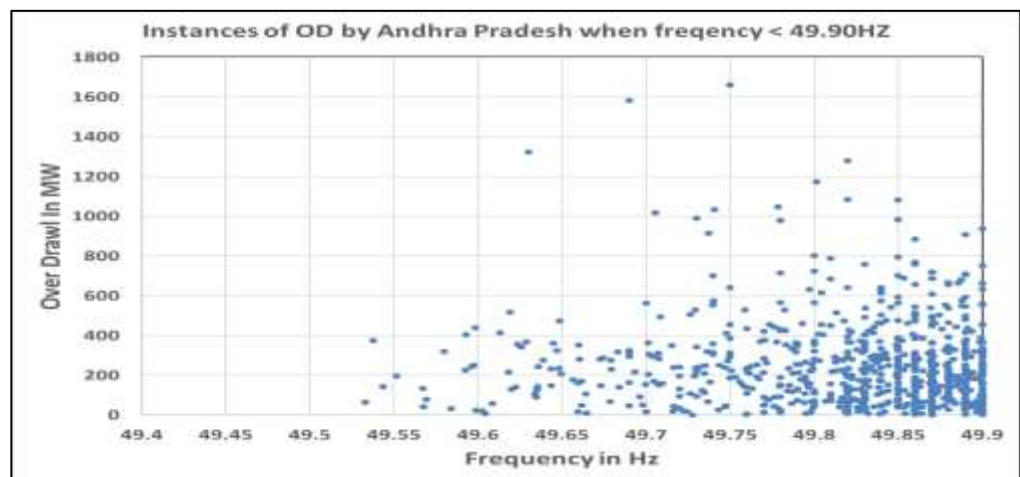


Figure 4: Andhra Pradesh over drawl in MW at frequency < 49.90 Hz during 01.02.22 - 20.04.22

- (h) **Reliance on the Grid for meeting short-term demand:** Andhra Pradesh has met 0.3 % to 5.4% of its daily energy consumption by over drawing from the grid which turns out to be 1 to 9 MUs per day (Figure 5). Andhra Pradesh has met around 2-55% of its schedule by purchase from various segments of the short-term electricity market i.e. STOA-bilateral, day ahead market (DAM) and real time market (RTM) (Figure 6).

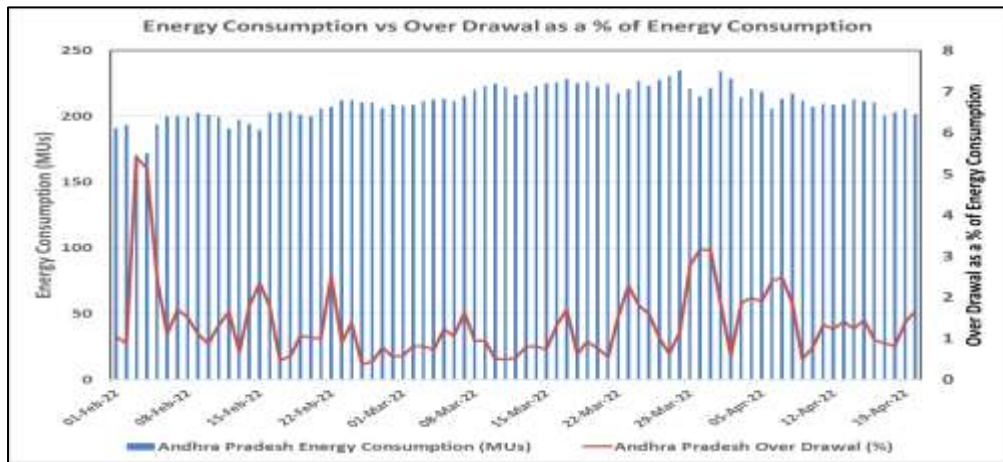


Figure 5: Andhra Pradesh OD energy as a % of daily energy consumption in MUs

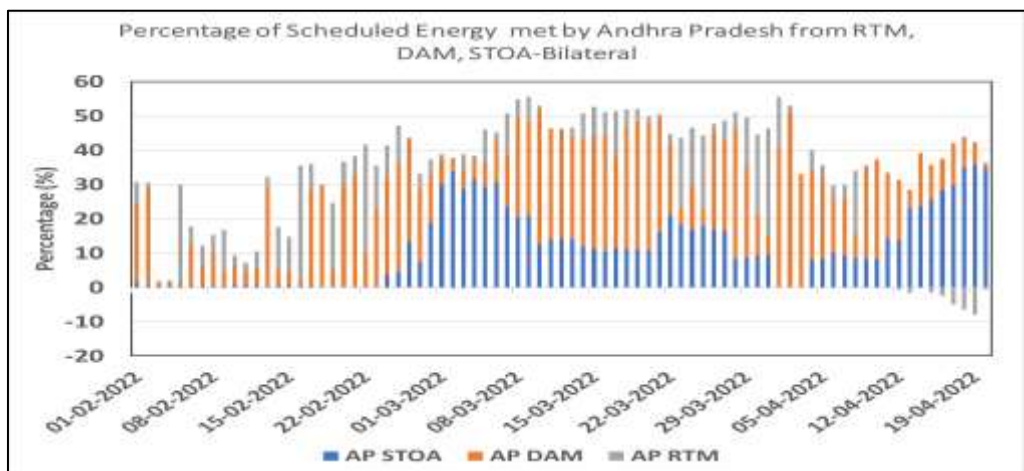


Figure 6: Short term purchase/sale by Andhra Pradesh as % of drawl schedule

### Karnataka

- (i) **Over-drawl:** The time block (15 minute) wise over-drawl (OD) from the grid during the period under consideration (1<sup>st</sup> February 2022 – 20<sup>th</sup> April 2022) for Karnataka is shown in Figure-7. It can be seen in Figure-8 that over-drawl by Karnataka remained in the range of 400 to 1000 MW in several time blocks even at a frequency below 49.90 Hz.

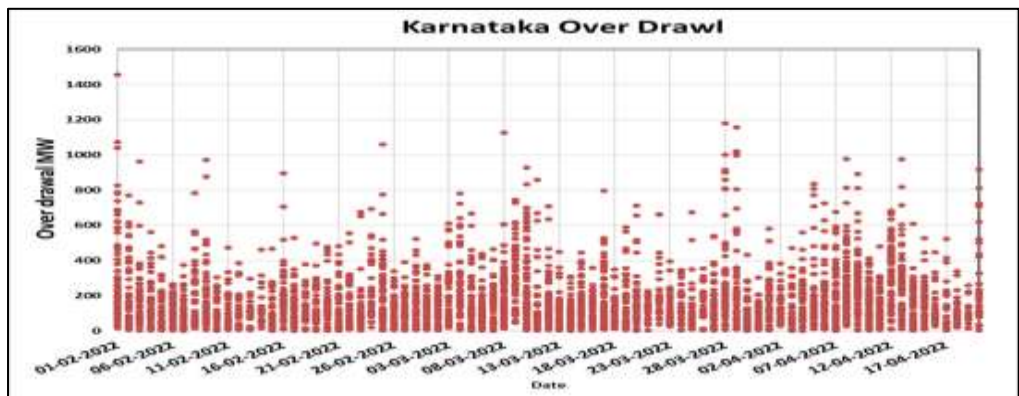


Figure 7: Karnataka Over drawl during 1<sup>st</sup> Feb 2022-20<sup>th</sup> Apr 2022

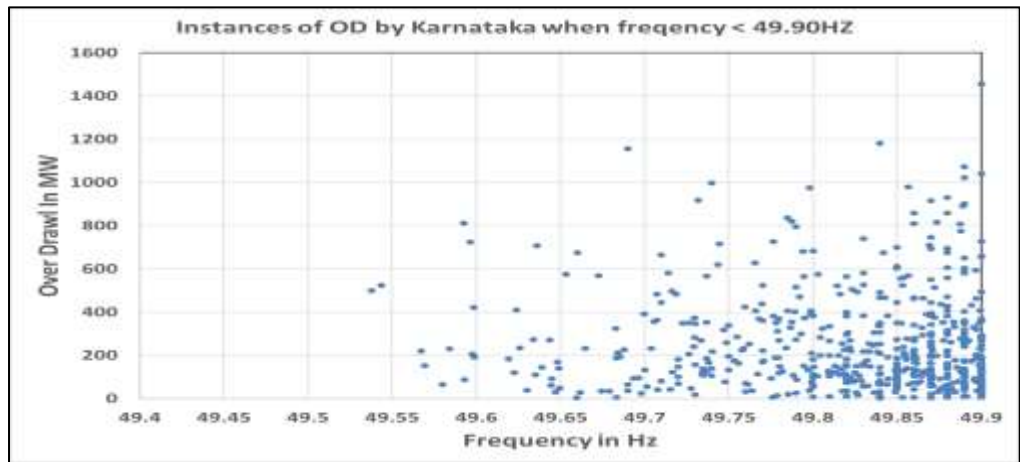


Figure 8: Karnataka Over drawl during 1<sup>st</sup> Feb 2022-20<sup>th</sup> Apr 2022 at frequency < 49.90 Hz

- (j) **Reliance on the Grid for meeting short-term demand:** It can be seen from Figure-9 that Karnataka has over-drawn in the range of 0.5-6.3 MUs per day during the period under consideration. It also illustrates the daily energy overdrawn by Karnataka as a percentage (%) of its daily energy consumption. As seen in Figure-9, Karnataka has met 0.2 % to 2.3% of its daily energy requirement by overdrawing from the grid.

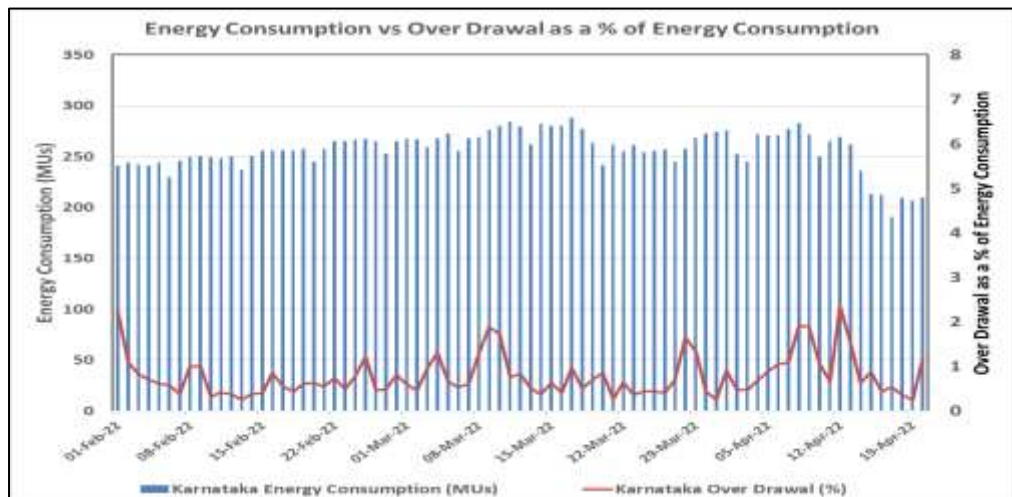


Figure 9: Karnataka OD energy as a % of daily energy consumption in MUs

- (k) **Simultaneous OD and sale in short term market:** Karnataka has also sold in the range of 2% to 48% of its schedule (i.e., 4 to 31 MU per day) in the short-term market (Figure 10). This short-term sale by Karnataka in the range of 0.03 to 4.3 MUs was made in the same period in which Karnataka was significantly overdrawing and the grid frequency was persisting below the lower limit of the IEGC specified band (below 49.9



Hz) (Figure 11). Simultaneous selling in the short-term market while overdrawing from the grid thereby contributing to the deterioration of the frequency, must be avoided by doing proper demand estimation, sale/purchase portfolio management and having the necessary generation reserves.

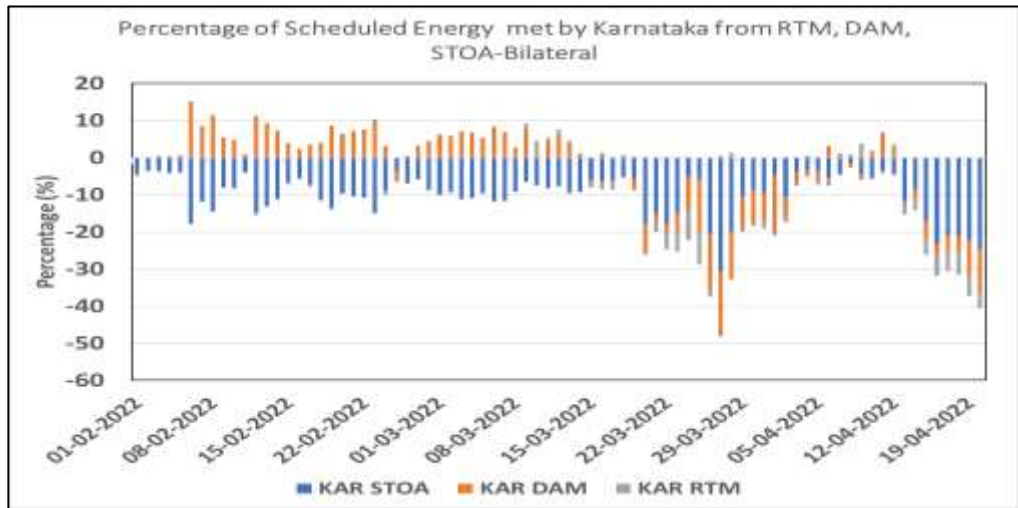


Figure 10: Short term purchase/sale by Karnataka as % of drawl schedule

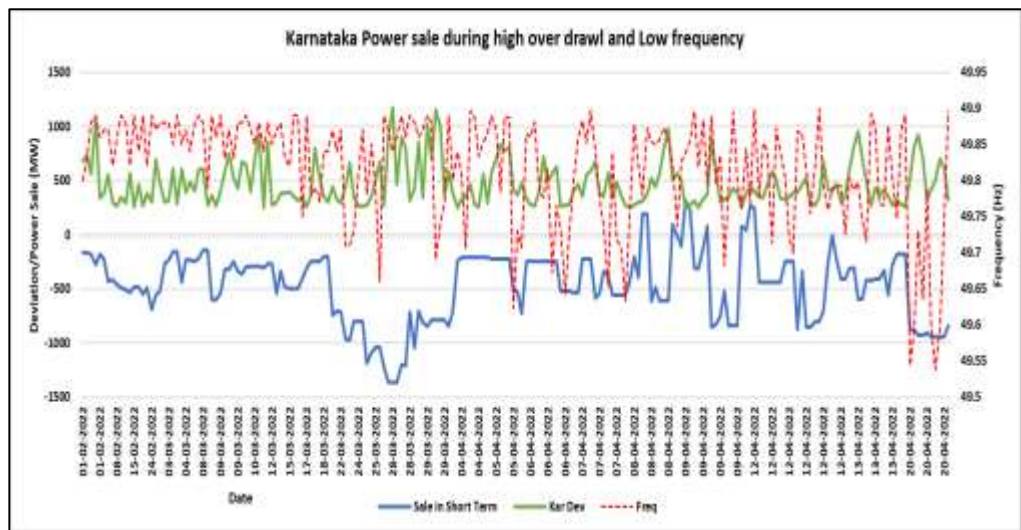


Figure 11: Short-term sale by Karnataka and over drawl from the grid when frequency is less than 49.9Hz

### Tamil Nadu:

- (l) **Over-drawl:** The time block (15 minute) wise over-drawl (OD) from the grid during the period under consideration (1<sup>st</sup> February 2022- 20<sup>th</sup> April 2022) for Tamil Nadu has been shown at Figure-12 and 13. It can be seen that over-drawl by Tamil Nadu (TN) remained in the range of 400-1200 MW in several time blocks even at a frequency below 49.90 Hz. A

higher ACE denotes a higher deviation from Schedules and/or deviation from the nominal frequency.

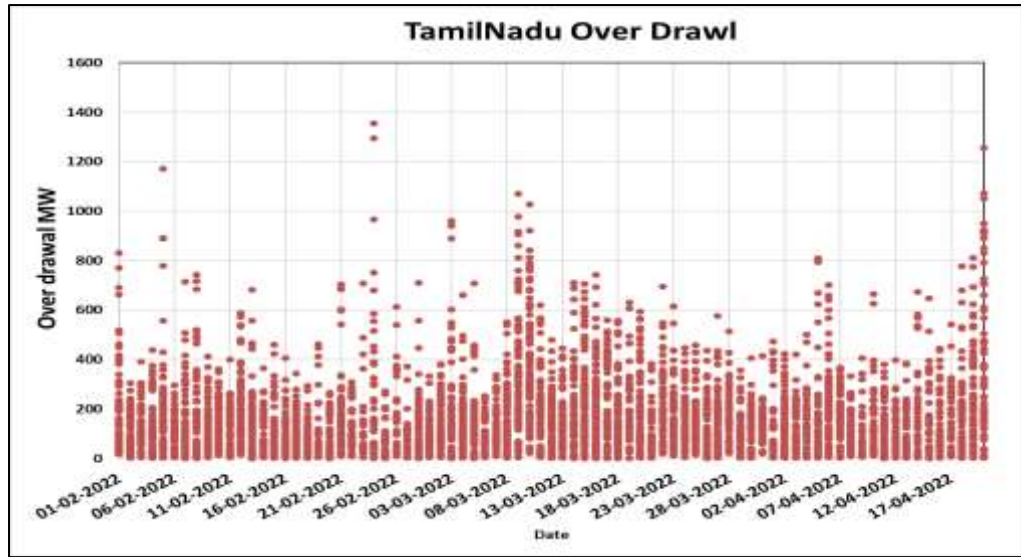


Figure 12: Tamil Nadu Over drawl during 01.02.22-20.04.22

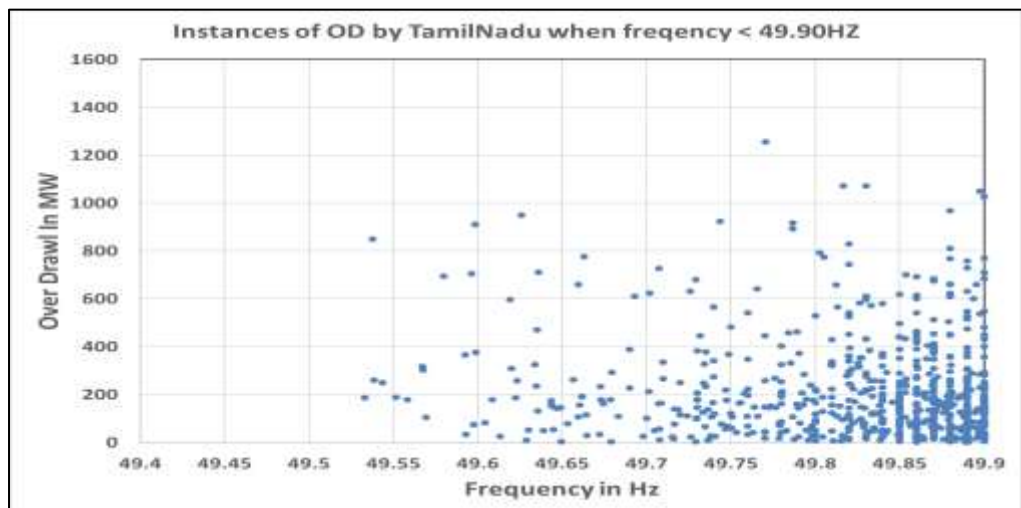


Figure 13: Tamil Nadu over drawl at frequency < 49.90 Hz

- (m) **Reliance on the Grid for meeting short-term demand:** Figure-14 indicates the over-reliance on DSM for meeting its short-term demand for electricity (by way of overdrawing from the Grid) is evident from this figure. It can be seen from Figure-14 that TN has over-drawn in the range of 2 to 9 MUs during the said period.

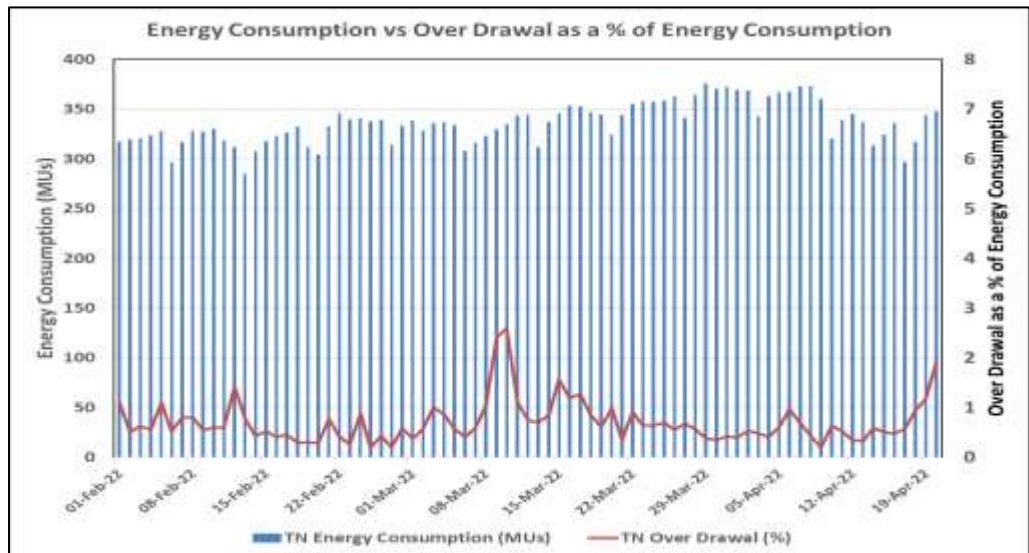


Figure 14: Tamil Nadu over-drawal as % of daily energy consumption

- (n) Tamil Nadu has met around 16-37% of its schedule by purchasing from various segments of the short-term electricity market i.e. STOA-bilateral, day-ahead market (DAM) and real-time market (RTM).

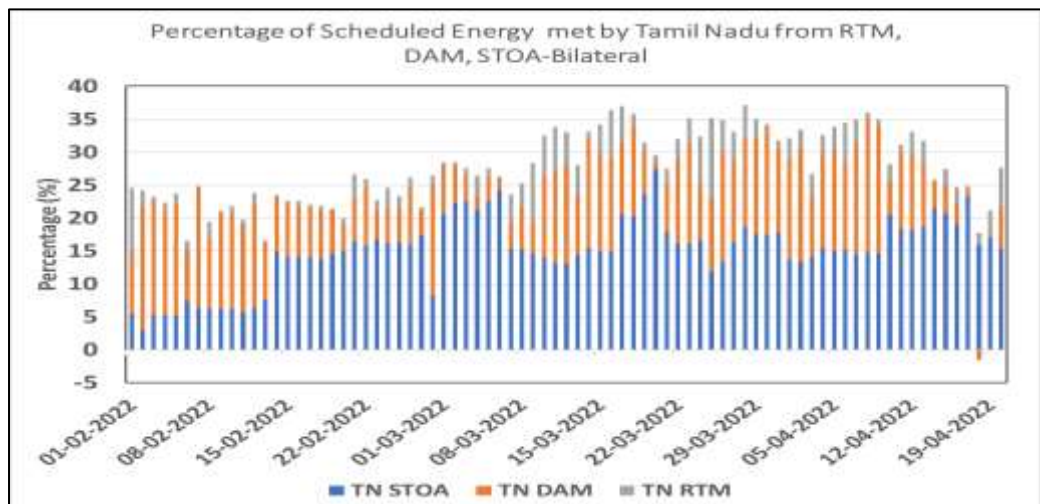


Figure 15: TN short term Purchase/Sale as % draw schedule [(+) buy, (-) sale]

### Ineffectiveness of Operation of Automatic Demand Management Scheme (ADMS)

- (o) ADMS has been implemented by SR constituents in line with clause 5.4.2 (d) of the Grid Code to reduce over-drawl as per the logic below.
  - i. Alarm: Alarm at a frequency of 49.9 Hz and below for over-drawl above 250 MW (Kerala-150 MW) for 10 minutes.

- ii. Trip: Automatic Tripping of identified feeders through ADMS at frequency of 49.85 Hz and below for over-drawl above 250 MW (Kerala-150 MW) for 15 minutes.
  - i. KPTCL and TNEB have implemented ADMS by grouping sets of feeders, which will trip in a cyclical manner.
  - ii. APSLDC, TSSLDC and KSEB are maintaining only one such group

The implementation impact was found to be ineffective. It is pertinent to mention that the number of instances of ADMS from 01-01-2021 to 20-04-2022 is 246, in which load relief was observed only in 145 (59%) instances with an average relief of about 43 MW.

State	No of Instances	Relief Observed Instances	Average Relief (MW)	Expected Relief (MW)
AP	99	59	34	104
TN	78	50	71	202
KAR	69	36	27	250

No. of instances where load relief was observed out of total ADMS instances are shown below.

State	500>OD>=250	700>OD>=500	OD>=700
AP	37/67	13/18	9/14
TN	26/44	6/10	18/24
KAR	15/37	13/19	8/13

At the present level of over-drawls, the implemented logic and the load relief obtained are not giving the desired relief.

- (p) Most of the feeders connected to ADMS are envisaged at the 11kV or 33kV level. Apart from the inadequate load relief obtained through ADMS, SRLDC is not able to verify whether all the 11kV and 33kV feeders earmarked for ADMS are in service or not as feeders at these voltages were not envisaged to be monitored in real-time through the existing SCADA system at SRLDC.
- (q) The over drawl by the states coupled with the ineffectiveness of operation of ADMS is further aggravating the grid security and aiding low frequency.

## Regulatory Provisions for Safe and Reliable Grid Operation

- (r) The Grid Code requires that all entities including states and distribution licensees must initiate requisite action in time to contain their drawl from the grid so that there is no over-drawl. The CERC (Deviation Settlement Mechanism and related matters) Regulations (herein after referred to as 'DSM regulations') provide for inadvertent deviation by regional entities within a defined limit when the grid frequency remains within a specified band.

### Actions Taken by SRLDC/POSOCO:

- (s) **Warning Message:** In compliance to the regulation 5.4.2 of the Grid code, SRLDC regularly issues warning messages to the overdrawing constituents in Southern Regional (SR) grid. Brief summary of the number of such messages from 1st February 2022 -20th April 2022 issued by SRLDC is as under:

Constituent Name	Number of Violation Messages Issued by SRLDC u/s 5.4.2 of IEGC during the said period			Remarks
	Alert	Emergency	Non-Compliance	
Andhra Pradesh	313	291	<b>244</b>	To control deviation
Karnataka	248	208	<b>182</b>	To control deviation
Tamil Nadu	132	175	<b>144</b>	To control deviation

Table : List of warning messages issued by SRLDC under 5.4.2 of IEGC during Feb-Apr 2022

- (t) **Emergency Measures:** The physical regulatory measures have been identified and documented in the Operating Procedure published by SRLDC under section 5.1(f) of Grid Code. SRLDC was constrained to take several emergency physical regulatory measures during the above period by opening identified ICT /radial feeders to contain over drawl and to restore grid frequency within safe operating limits. Summary of emergency measures taken by SRLDC during the said period are listed below:

Constituent Name	Warning	Number of Emergency Measures implemented	Remarks
Andhra Pradesh	52	38	To control OD
Karnataka	32	32	To control OD
Tamil Nadu	22	16	To control OD

Table : Emergency Measure taken by SRLDC to contain Over Drawl during 01.02.2022-20.04.2022

- (u) The matter is regularly taken up by SRLDC in the various Operation Coordination Committee (OCC) meetings of SRPC and with senior-level officials of the respective states.
- (v) **Comprehensive action plan for addressing over drawl in southern region-** SRLDC had proposed a comprehensive action plan for addressing over drawl at low frequency in the southern region. The scheme was approved in 189<sup>th</sup> OCCM. The scheme contains three aspects:
- i. ADMS with revised settings
  - ii. Physical Regulatory Measures
  - iii. Three stage Emergency measures over drawl control.
- (w) **Revised Automatic Demand Management Scheme (ADMS):** Constituents of SR have implemented ADMS. With the present level of over-drawls, the implemented logic is not serving the purpose and the load relief obtained was found to be insufficient. After considering the present levels of Over-Drawls and the need to have a different quantum of load disconnection requirements, the following changes in the scheme have been envisaged:
- i. The revised ADMS should have different stages of load disconnection depending on the frequency and OD quantum.
  - ii. Each state has to identify a different group of load feeders (200 MW each for all states except Kerala, 100MW for Kerala) for use in Stage-1, Stage-2 and Stage-3 of ADMS.
- (x) Accordingly, SRLDC has proposed and constituents have been advised to implement the revised scheme w.e.f 17.04.2022 as per logic shown below based on the decision taken in 189<sup>th</sup> OCCM.

- a. If Frequency < 49.85 Hz and OD>250 (150 MW for Kerala) for more than 15 min then Stage-1 trip signal would be triggered (Expected relief of 200 MW for AP, TS, KAR, TN. 100MW for Kerala).
- b. After 10 minutes, if Frequency < 49.85 Hz and OD>250 MW (150 MW for Kerala), then Stage-2 trip signal would be triggered (Expected relief of 200 MW for AP, TS, KAR, TN. 100MW for Kerala).
- c. After 10 minutes, if Frequency < 49.85 Hz and OD>250 MW (150 MW for Kerala), then Stage-3 trip signal would be triggered (Expected relief of 200 MW for AP, TS, KAR, TN. 100MW for Kerala).

Note: ADMS loads should not be restored until Over drawl and Frequency are restored within IEGC /allowable limits.

- (y) **Three stage Emergency measures over drawl control:** The drop in grid frequency is often sharp and over-drawls are also precipitated by large unfulfilled procurement in RTM. In view of this, there is an urgent need for designing ‘**Emergency** measures for controlling over-drawls under Low-frequency conditions’ to safeguard the grid.

Considering the above, the Emergency control measures are devised newly as a 3-stage action for controlling over-drawl.

Stage	Action	Relief expected
Stage 1: When Freq < 49.7 Hz and over-drawl > 300 MW for more than 5 minutes	Initiation of TK-1 signal for AP, KA, TN and KK-2 signal for TS & KL, as applicable	AP-230MW, KA-250MW, TN-356MW, TS-105MW, KL-152MW
Stage 2: When Freq < 49.7 Hz and over-drawl > 300 MW for more than 15 minutes	Initiation of TK-2 signal for AP, KA, TN &KL and RS-1 signal for TS as applicable	AP-240MW, KA-200MW, TN-220MW, KL-170MW, TS-359MW
Stage 3: When Freq < 49.7 Hz and over-drawl > 300 MW for	Initiation of KK-1 signal for AP, KA, TN &KL and	AP-140MW, KA-193MW, TN-304MW, KL-135MW, TS-181MW

more than 20 minutes	RS-2 signal for TS as applicable	
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AP- Andhra Pradesh, KA-Karnataka, TN-Tamil Nadu, KL-Kerala, TS-Telangana

Table: Stage wise action details for Emergency control measures

### Proposed Measures to avoid the recurrence of such stressed scenario

- (z) The following measures are proposed for immediate implementation to avoid recurrence of such insecure operating conditions in the future:
- i. **Avoiding Heavy reliance on Day-Ahead and Real Time market:** It was seen that although some of the states tried to bank upon the short-term electricity market (DAM & RTM) to meet their rising peak demand, the buy bids in the Power Exchanges significantly out-numbered the sell bids leading to very high prices (~ ₹ 10-19 per kWh) during the said period. Thus, heavy reliance on such last mile avenues for peak power portfolio management has apparently rendered the state utilities helpless and they resorted to overdrawing for meeting the peak demand thereby making the grid vulnerable to disturbance, as considerable time would be lost in carrying out any planned load shedding at last moment to control over drawl. Thus, the states must avoid overreliance on DAM & RTM for peak power.
  - ii. **Demand estimation & management:** The states must ensure proper demand estimation in different time horizons as specified in IEGC and ensure timely implementation of necessary demand management measures (such as automatic demand management scheme (ADMS), load trimming schemes (LTS) etc. in advance as advised by respective SLDCs so as to avoid over drawl during real time operation. Revised ADMS implementation needs to be ensured in line with the decision of SRPC forum.
  - iii. **Better Coordination for ramp management:** It is seen that the deviation during morning and evening peak hours is mainly due to mismatch in generation and load ramps which is more predominant in RE rich states due to higher net-load ramp in evening peak. Hence synchronisation of hydro units and their flexible operation may be properly coordinated to match with load ramping requirements. Further, agricultural load changeover & other load



staggering plans during ramping hour may be coordinated properly to avoid huge deviations during schedule leaps. So proper coordination with hydro generator and agriculture load segregation should be done keeping in view the ramp constraints.

- iv. **Better RE Forecasting & scheduling:** The states must improve their current forecasting infrastructure for better forecasting of demand and renewables. The 3 major states in SR have dedicated REMCs (Renewable Energy Management Centres). These REMCs must be made fully functional with real time RE desks so as to improve the coordination with renewable power stations in improving their forecasts.
- v. **Measure for Addressing Generation Adequacy:** The states must ensure generation adequacy at all times (based on their forecasted demand) by reviving their generating units under outage (viz. reserve shut down) due to economic reasons. The SLDCs must ensure adequacy of reserves at all times through periodic unit commitment over a rolling window basis.
- vi. **Fuel Security and Adequacy statements:** The states may review the supply side issues periodically and take up with appropriate agencies / authorities well in advance to ensure fuel security for their generators. Based on the assessment of fuel supply & other constraints each state may prepare a quarterly generation adequacy statement. This would help in addressing the deficit scenario well in time & thus avoiding last minute distress measures.
- vii. **Augmenting Intra-state transmission system, declaring and monitoring of TTC/ATC violation by SLDCs:** It was seen that during the said period, over-drawl by some of the states (Andhra Pradesh, Karnataka, Tamil Nadu) was causing transmission constraints/N-1 within the state network. Thus, the internal networks within the states need to be adequately planned & augmented to handle such stressed scenarios caused by low internal generation & heavy over-drawl by states. Further only AP has started declaring ATC/TTC w.e.f. March 2022 on their website. However other states Karnataka and Tamil Nadu are yet to publish ATC/TTC on their website. Hence States may be directed to declare ATC/TTC on their website.

- viii. **Reserves and ancillary services at state level:** In line with the intent of the National Electricity Policy and the Tariff Policy, the CERC vide its order dated 13.10.2015, in Petition No. 11/SM/2015 has provided a road map for operationalization of reserves in the country wherein it has been suggested that tertiary reserves should be maintained in a de-centralized fashion by each state control area for at least 50% of the largest generating unit available in the state control area. Hence, the necessary spinning reserves must be maintained at all times by the SLDCs through periodic unit commitment. In Feb 2019, the Forum of Regulators (FOR) technical committee constituted an expert group for suggesting modalities for rolling out a framework for intra-state reserves and ancillary services which submitted its report namely 'SANTULAN' in January 2020. The recommendations of SANTULAN need to be implemented by all the states on priority.
- ix. **Utilizing Pump Hydro Power Stations for peaking and ramping:** Pumped hydro storage units wherever available, can be used as a source for providing peaking reserve and ramping reserve for managing imbalances. The units out / non-operative in pump mode due to various reasons should be made operational for the pump mode at the earliest.

#### **Hearing dated 29.09.2022**

4. The matter was admitted on 29.09.2022. Respondents were directed to provide the information on Resource adequacy and peak demand requirements, how much demand depended on short term and long term, what are the relay settings for frequency and Quantum in ADMS and data of RE tripping related LVRT and HVRT limits.

#### **Submissions of Respondent KPTCL**

5. In compliance to the RoP for the hearing dated 29.09.2022, KPTCL vide affidavit dated 13.10.2022 has mainly submitted as under:

- a. The Resource adequacy and peak demand requirements of KPTCL for the period from 01.04.2022 to 31.03.2023 has been submitted. As per the data, Ex-bus availability (without STOA) for April 2022 was 14608 MW (Ex-Bus availability with STOA was 14608 MW) against which Ex-Bus unrestricted requirement was 14583 MW and hence surplus of 25 MW was there in April 2022.
- b. Karnataka state demand is fully dependant on Long term PPAs with the generators.
- c. ADMS tripping is configured as per the SRPC recommendation in KPTCL in Round robin manner for tripping of 11kV feeders as per the list furnished by ESCOMs. The current relief expected is 2362 MW. The 11kV feeder list is enclosed with affidavit. However, additional feeders list is also being prepared which will be configured in the system at the earliest.
- d. All the LVRT configured are as per the regulatory norms. The same report is being submitted quarterly to CEA through SRPC.

### **Submissions of Respondent TANTRANSCO**

6. In compliance to the RoP for the hearing dated 29.09.2022, TANTRANSCO vide affidavit dated 19.10.2022 has submitted as follows:
  - a. The details of the day wise resource adequacy and peak demand met during the peak periods and dependence on long term and short term for the period from 01.02.2022 to 20.04.2022 were enclosed.
  - b. ADMS – the relay settings for frequency and Quantum are as under:
    - i. For overdrawal >250MW & freq.<49.85 Hz for 15 min., Group 1 feeders will trip. Relief-200MW
    - ii. Next 10 min., if freq.<49.85 Hz & OD >250 MW, Group 2 feeders will trip. Relief-200MW
    - iii. Next 10 min., if the above same condition persists, Group 3 feeders will trip. Relief-200MW.
  - c. RE tripping related LVRT and HVRT limits for the period from 01.02.2022 to 20.04.2022 is NIL.

## **Submissions of Respondent APTRANSCO**

7. In compliance to the RoP for the hearing dated 29.09.2022, APTRANSCO vide affidavit dated 28.10.2022 has submitted as follows:

a. Availability of Generation: The installed capacity in the State of Andhra Pradesh is as shown below:

<b>S. No.</b>	<b>Source</b>	<b>Installed Capacity – AP Share (MW)</b>
1.	AP GENCO Thermal	4850
2.	APGENCO Hydel	1798
3.	CGS Share	1981
4.	Solar	3755
5.	Wind	3768
6.	IPP Thermal	1270
7.	IPP Gas	690
8.	Godavari Gas Power Plant	217
9.	Others	279
	<b>Total</b>	<b>18608</b>

b. The evening peak demand during February 2022 varied from 7400 to 8400 MW, while during March 2022 it varied from 9000 to 9500 MW. In April 2022, the evening peak demand varied from 8500 to 9000 MW.

c. During the aforesaid period, the generation availability from state thermal plants was not in line with forecasted availability due to various factors like coal quality, coal availability etc. Due to this, the resource availability in the State came down and it became necessary to depend on power exchanges in both Day-Ahead-Market and Real-Time-Market in order to meet the state grid demand.

d. During February 2022, the distribution companies of Andhra Pradesh (APDISCOMs) were barred from trading in power exchange for a few days, due to non-maintenance of credit margin.

- e. Thereafter, for the months of March 2022 and April 2022, the APDISCOMs tied up power of 521 MU and 546 MU respectively through DEEP (Discovery of Efficient Electricity Price) e-bidding portal.
- f. There has been a sharp rise economic activity post the Covid-19 pandemic. Consequently, the electricity demand across the country shot up more than anticipated. This caused States over the country, including Andhra Pradesh, to flock to power exchanges to meet their demand.
- g. Respondent was constrained to implement load reliefs across the State during February, March and April 2022 to the tune of 71.23MU, 64.645MU and 366.49MU respectively. Measures of restrictions and control were also implemented in the State in April 2022 and May 2022 in order to maintain load generation balance.
- h. The following table lists the details of dependency on long term and short term sources of energy/ power:

Energy forecast in MU/day for 2022-23

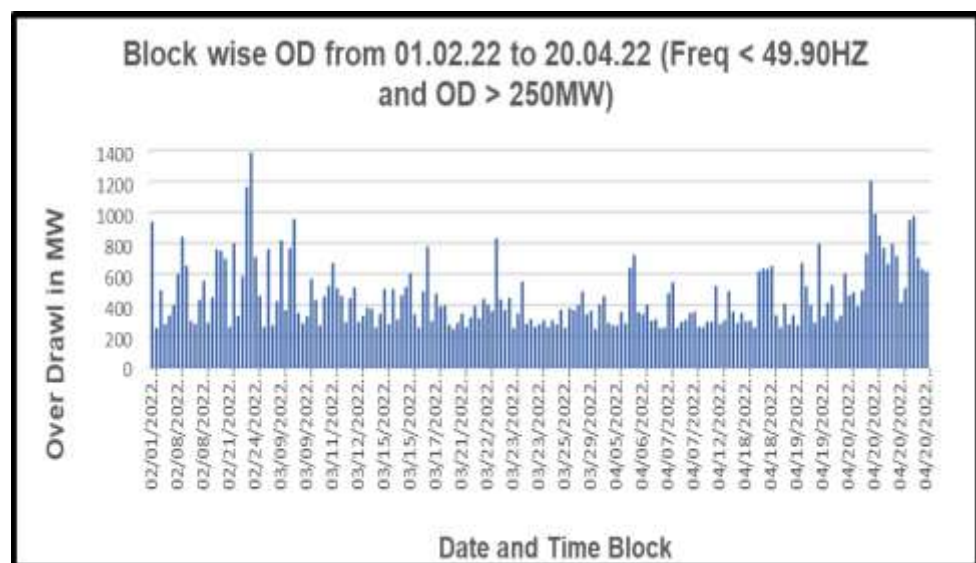
<b>Source</b>	<b>Oct-22</b>	<b>Nov-22</b>	<b>Dec-22</b>	<b>Jan-23</b>	<b>Feb-23</b>	<b>Mar-23</b>
Long term expected	188.05	185.20	190.90	208.64	221.95	221.12
Short term expected	10.80	0.00	0.00	0.00	2.80	2.80
Total expected availability	198.85	185.20	190.90	208.64	224.75	223.92
Expected demand	200.00	168.00	174.00	192.00	214.00	240.00

- i. At present, the ADMS logic implemented and in force for Frequency less than or equal to 49.85 and over drawal greater than or equal to 250 MW condition persists for 15 minutes, then ADMS relief envisaged for 100 MW.
- j. The settings of LVRT and HVRT operated by the Answering Respondent are in accordance with the standards published by the Central Electricity Authority in the Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 as amended on 06.02.2019.

- k. The LVRT/HVRT trippings data of the power plants for the period 01-01-2022 to 31-07-2022 was enclosed. As per these data no any LVRT/HVRT operation was recorded at the generator, where LVRT/HVRT was located, during the period of 01-01-2022 o 31-07-2022.

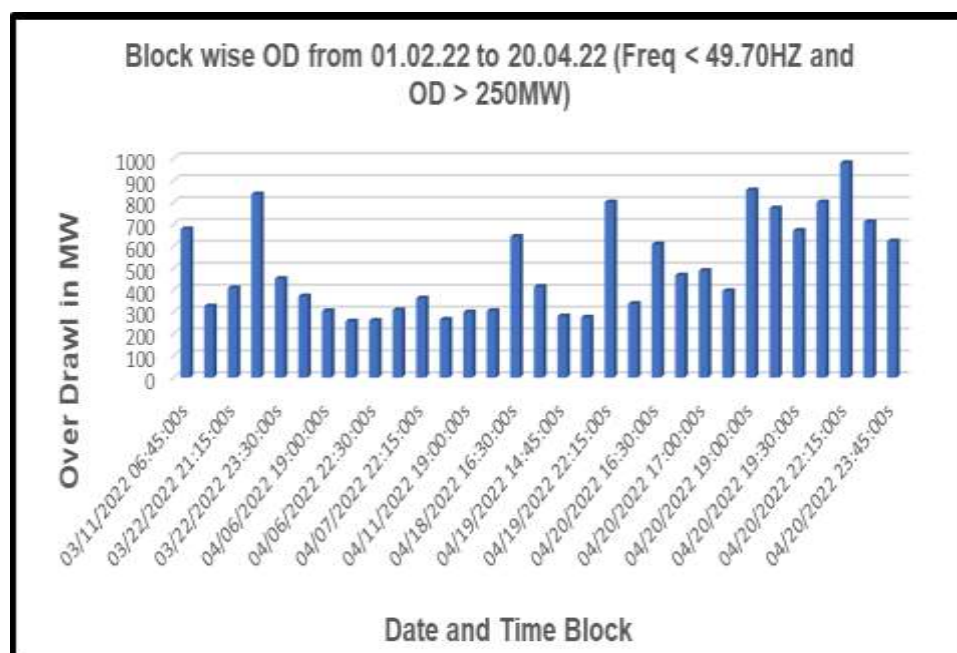
### **Submission of Tamil Nadu State Load Despatch Centre, TANTRANSCO**

8. TANTRANSCO vide affidavit dated 28.10.2022 has mainly submitted as follows:
- a. Due to the formation of ONE GRID in India, the frequency is common for all the States/Regions in India; the contribution of other regions in the country should be taken into account for the low-frequency operation of the grid. The details pertaining to TNSLDC is furnished below:
- i. TNSLDC had overdrawn above 250 MW at frequency less than 49.90 HZ in 181 blocks for 45:15 hrs. which works out to 17.9%, during the period from 01.02.2022 to 20.04.2022. (shown in Fig. below). At the same period, TNSLDC had under drawn less than 0 MW at frequency less than 49.90 HZ in 414 blocks for 103 hrs. which works out to 41%.



- ii. Similarly, at frequency less than 49.70 HZ, TNSLDC had overdrawn more than 250 MW from grid in 31 blocks for 7:45 hrs. which works out to 28.18%, during the period from 01.02.2022 to 20.04.2022. (As shown in

Fig. below). During the same period, TNSLDC had under drawn less than 0 MW at frequency less than 49.70 HZ in 35 blocks for 8:45 hrs. which works out to 31.82%.



b. SRLDC has the power to open the ICT at the State periphery in the event of any disturbance to the Gird frequency i.e., 49.90 to 50.05 by any individual State. During the over drawl by TN State, the petitioner has opened the ICT at State periphery on sixteen instances. There was no danger to the Grid Security i.e., disturbance to 49.40 to 50.05 Hz. The TANGEDCO has paid the DSM charges in time to SRLDC for any deviation as per the prevailing Regulations.

- TNSLDC had overdrawn during critical grid conditions for 3 days (09.03.2022, 10.03.2022 and 20.04.2022) only during the period from 01.02.2022 to 20.04.2022.
- The number of instances where Tamil Nadu had over-drawl of 500 MW and above in the month of February 2022 was 21 instances, in the month of March 2022 was 29 instances, in the month of April 2022 (Up to 20th) was 24 instances and by the swift action of TNSLDC the over drawl was reduced to below 250 MW by purchasing power in Real Time Market.

- c. Out of 32 number of instances notified by SRLDC through e-mails for the period from 01.02.2022 to 20.04.2022, the ADMS tripping of TNSLDC was on 26 instances. In the remaining six instances, there was some technical problem. Further, it is submitted that, the ADMS tripping implemented in Tamil Nadu is on 110kV level only. Hence, the ADMS implementation is effective in Tamil Nadu.
- d. The ATC/TTC declaration will be made available in TNSLDC website during the month of November 2022.
- e. Towards maintaining grid security, Compliance has been ensured by TNSLDC as per the directions of SRLDC in the event of inadvertent deviation/Over drawl and adhering to schedule by taking suitable action and reporting to SRLDC.
- f. RE forecast is being carried out by REMC wing of TNSLDC. Proactive measures have been taken by TNSLDC for addressing generation adequacy based on the forecasted demand.
- g. TNSLDC is utilizing the Kadamparai Hydro Pumped storage station in generator/Pump mode for providing peaking reserve and ramping reserve for managing imbalances. It has been operated as a generator mode for the period from 01.02.2022 to 20.04.2022 for 740.32 hours and 89.01 MU generated. It has been operated as a pump mode for the period from 01.02.2022 to 20.04.2022 for 769:56 hours and 101.755 MU consumed.
- h. In order to reduce the overdraw in the real time grid operation and to comply the Grid Code/Regulations towards maintain the grid security, TNSLDC has taken possible steps as follows:
  - i. The installed capacity of non-irrigation hydro station is 1430 MW, available capacity is in the range of 1000 to 1200 MW and has to be operated during peak hours. However, most of the times, these generating stations were operated to meet the peak demand as well as to control the over drawl from the grid.



- ii. Generation has been picked up wherever possible from Hydro, Gas, Thermal and IPPs including the high-cost power of Basin Bridge Gas Power House units.
- iii. Appropriate load shedding/regulation was resorted.
- iv. In order to maintain the Demand-Supply gap, TANGEDCO has bidding power through Power Exchanges under DAM & RTM even if the market price is higher.
- v. In order to meet the summer demand, power SWAP and short-term tender of 525 MW for March 2022 totaling to 1110 MW had been arranged by TANGEDCO. Similarly, for April 2022 power SWAP and short-term tender of 490 MW for March 2022 totaling to 750 MW had been arranged by TANGEDCO.
- vi. Generators had been addressed to maintain adequate fuel stock for generation availability.
- vii. As Tamil Nadu being the RE Rich State, possible steps have been taken to improve the RE forecasting accuracy.
- viii. The healthiness of the Under Frequency Relay (UFR) has been ensured by the concerned protection wings and acted as per the settings.
- i. Even after taking all the possible steps, the following constrains are faced in the operation of real time grid management for maintaining the permissible DSM Limits:
  - i. Volatile Generation availability due to sudden outage of higher capacity units.
  - ii. Reduced generation by CGS, State owned and Private generators due to coal shortage.
  - iii. Sudden Demand variation.
  - iv. The available hydro & gas stations having small capacities are not adequate to meet the sudden increase of demand

- v. Power through RTM was not available on bidding even after quoting a higher cost in addition to the DAM purchase.
- vi. Due to increase in coal price, CPP generators located in Tamil Nadu, supplying power to the HT consumers within Tamil Nadu under open access (MTOA/STOA) had been stopped which also causes some reduction in generation availability.
- j. During the real time grid operation, any deviation for OD beyond the prescribed limit, is being penalized as per the CERC Deviation Settlement Mechanism Regulation. The penalty sought by the petitioner is a double penalty which is not acceptable as per law.

### **Submission of Karnataka State Load Despatch Centre, KPTCL**

9. KPTCL vide affidavit dated 28.10.2022 has mainly submitted as under:
- a. Karnataka is one of the largest producers of green energy mainly from Solar and Wind sources. The state has 7859MW of Solar and 5223MW of Wind power besides 2774MW of other RE Sources. The total installed capacity of RE is 15855MW out of 31447MW of overall capacity generation marking RE Power at 51 % of capacity.
  - b. To contain the variability, thermal generators are kept on bar at technical minimum to operate flexibly. Further, the absorption of "must run" energy from RE along with available TPS on bar will result in availability of energy over and above the State demand. In such circumstances, to avoid deviation and to maintain grid security, the State is forced to trade the surplus power at market clearing price as low as 2 paisa per unit in certain time blocks. It is submitted that, State have not sold power during shortfall of generation as stated by the petitioner.
  - c. The forecasting tool is not matured enough to reduce the forecast error as minimum as possible both in load and RE generation (Wind and Solar), the variations in the forecast for RE to meet the demand is the challenge faced by the system operators. Keeping such variability in mind, if the state is keeping firm resources as reserves to compensate for the variability of RE, then in case of

RE generation exceeding the forecast, the state will be under drawing which is also a threat to grid.

d. The frequency profile of national grid is as shown below:

Frequency of profile (% time)				
Months	<49.70	<49.70-49.90	49.90-50.05	>50.05- 50.20
Jan-22	0.02	5.84	75.66	
Feb-22	0.07	5.90	76.89	
Mar-22	0.46	14.50	73.42	12.09
Apr-22	0.09	27.04	36.62	8.70

Inferring from the above data, frequency was below the limit for a lesser duration when compared to the frequency above the limit. The petitioner has drawn the attention of the Commission w.r.t overdrawal situations only and has ignored the underdrawal situations in the petition (which is also a cause for the instability in the grid). Thus, the petitioner is not giving complete picture of the grid situation.

- e. During Irrigation period, hydel generation attached to this are uncontrollable and aggravates the prevailing situations of high underdrawal and will not assist in controlling the variations of variable renewable generation and demand. Hence the flexibility in system operation reduced considerably in the last couple of years. If VRE must run generation is high, then it will force high frequency & under drawl operation and if VRE generation is lower than the forecasted, it causes low frequency & over drawl operation. Certain times, load shedding is a mandatory option for system operator.
- f. In our power system, primary response is moderate due to various reasons like compatibility to RGMO, coal quality problems, constrains in Dam power houses etc, secondary response is absent and tertiary response is meagre with unscheduled energy of CGS stations if available.
- g. Variations in fifteen-minute time block will be more in number hence month wise time block figures are considered. Below mentioned figures are month as a time block

MONTH	TOTAL BLOCKS in Month	No of blocks deviation limit within 250MW	No of blocks deviation More than 250MW when the frequency within the operating range	No of blocks deviation More than 250MW when the frequency out of operating range
Feb-22	2688	2413	229	19
Mar-22	2976	2649	247	63
Apr-22	2880	2503	193	153

From the above table, 89% blocks of the deviation limit is within 250 MW, 2% of the time blocks state has overdrawn from the grid due to tripping of bigger size State thermal units and reduction of Declared Capacity (DC) due to coal shortage.

- h. State has supported the grid to a larger extent by injecting the internal generation into the grid on several occasions when the system frequency is below the operating range during the period of contention. The State has kept adequate reserves during the period to meet any contingencies to achieve the status.
- i. State has made concerted efforts to maintain grid discipline by purchasing the power from the market at the rate of Rs 20/unit during this overdrawal periods, however due to acute shortage of power in the country, requested quantum of power couldn't be obtained from the market (DAM/RTM) during this overdrawal period.
- j. Apart from above, the State has taken various other measures to control the deviation such as monitoring the healthiness and effective operation of the ADMS, AUFR & df/dt relays for immediate load relief during critical conditions of the grid.
- k. The State has also empowered SRLDC, POSOCO to operate the identified 400kV ICTs for load relief during extreme emergency conditions as per the regulatory provisions.

- I. The conventional generation has its limitations in ramping up the generation to the desired level. In fact, 0.6% ramp up or ramp down is the capability of conventional generation. With these slow ramp up/down rates sudden fall/rise of solar or wind generation cannot be compensated, as it takes around 1 hour to bridge the deficit power despite keeping the coal plants operating in minimum technical condition. This is also causing over draw situations some times.
- m. It is alleged that the State has overdrawn from the grid to an extent of 0.2 % to 2.3% to meet its daily demand. It is to be mentioned here that such variations are common in a RE rich State like Karnataka. The daily average consumption handled during this period is 249 MU, 0.2% of the same is 0.5 MU which is negligible considering the large RE power integrated into the grid.
- n. It is said that Karnataka has overdrawn from the grid and at the same time has sold power in the market. This is not the correct position. The SLDC decides the quantum of sale based on the day ahead forecast of RE generators provided by Generators and the DISCOMs. However, if the RE generators fail to generate, to meet the loads OD becomes inevitable, considering the prevailing situations in the state like exam periods, Government of Karnataka (GoK) mandated power supply to farmers and other contingencies. At the same time, the commitments to obligated sale as per the transaction in Day ahead market, also have to be met. This is a real time operational issue.

### **Submissions of Petitioner**

10. The petitioner in its Rejoinder vide affidavit dated 18.11.2022 to the reply filed by TANTRANSCO (Respondent No. 3) has mainly submitted the following:
  - a. The respondent has submitted that it has supported the grid by under-drawl in the events at a frequency less than 49.90 Hz. It is pertinent to mention that the UI regime is dispensed with the notification of CERC (Deviation Settlement Mechanism and Related Matters) Regulations, 2014). Only inadvertent deviations are allowed within limits in a specified frequency band. The respondent has the option of supporting the grid in the form of scheduled export to deficit entities through bilateral or through the market and minimizing the deviation. Further, the under-drawl during certain blocks does not provide the

right to over-draw during low frequencies, as there is no concept of netting off or banking facility with the grid in the form of deviation.

- b. Tamil Nadu has met around 16-37% of its schedule by purchasing from various segments of the short-term electricity market i.e. STOA-bilateral, day-ahead market (DAM) and real-time market (RTM).
- c. It is pertinent to mention that over drawl by Tamil Nadu when frequency was less than 49.85 Hz is observed for 45 days. The deviation in terms of time blocks is 328 time blocks. The maximum OD is seen as high as 1257 MW. The number of blocks in a single day is as high as 32 on 07.04.2022.
- d. The respondent No. 3 has submitted that only few instances over drawl of significant has occurred. The instance of OD above 500 MW is shown in the below table:

Month	OD > 500 MW	OD >500 & F < 49.9 Hz	Continuous OD > 500 MW
February 2022	43 Blocks	9 Blocks	6 Blocks (5 <sup>th</sup> Feb [38-43])
March 2022	110 Blocks	25 Blocks	8 Blocks (15 <sup>th</sup> Mar [81-88])
April 2022 (Upto 20 <sup>th</sup> )	56 Blocks	11 Blocks	11 Blocks (20 <sup>th</sup> Apr [72-82])

It can be clearly seen from the above table that OD above 500 MW is for significant number of blocks. It is also noted that a maximum of 11 continuous time blocks of OD above 500 MW is also observed in April 2022.

- e. A total of 32 instances of ADMS have been observed during the petition period in which only 26 instances relief was observed, the relief observed was in range as low as 8 MW to 409 MW with an average of 144 MW.
- f. TNSLDC was computing the ATC/TTC while the same was not declared on its website until 27.10.2022. However, it is noted that TNSLDC has started declaring TTC/ATC on the website w.e.f. 28.10.2022.
- g. The respondent has submitted that the ADMS was implemented w.e.f. 17.04.2022. However, from the perusal of paragraph 13.1(iv)(d) of the minutes of the 190th Meeting held on 09.05.2022, TN has submitted that the

Identification of feeders are being carried out, challenge is due to more RE feeders.

*"Identification of feeders are being carried out, challenge is due to more RE feeders. It was suggested that feeders may be taken from outskirts of Chennai. ED SRLDC informed after implementation a mock exercise may be carried out without actual tripping of loads. A quarterly mock test may be arranged to check the effectiveness of the scheme"*

The above clearly indicates that revised ADMS scheme was not implemented during the period viz 17.04.2022 as claimed by the respondent. TNSLDC has confirmed the implementation in the subsequent 191st OCCM held on 10.06.2022.

11. The petitioner in its Rejoinder vide affidavit dated 18.11.2022 to the reply filed by KPTCL (Respondent No. 2) has mainly submitted the following:
  - a. It is difficult to understand when the maximum generation during the said period is 2269 MW how the generation varied up to 3000 MW as indicated by the respondent No. 2. The Maximum Solar generation varied per block (15 min) is 543 MW on 24-03-2022 (07:30 to 07:45 hrs) during the said period.
  - b. Regulation 4.7 of KERC code provides the provision of engaging a forecasting agency if required by SLDC. Currently SLDCs are using the services of REMC which has certain contractual limitations. Nothing prevents SLDC from engaging an additional suitable forecasting agency with more stringent commercial conditions in addition to existing REMC.
  - c. Petitioner has given the complete details of the frequency profile both above and below IEGC band for the period from 01.02.2022 to 20.04.2022 at figure 1 and figure 2 of the instant petition. This petitioner has taken up issues of both Over drawl during under frequency and Under drawal during over frequency in various forum based on the seriousness.
  - d. Over drawl by Karnataka when frequency was less than 49.85 Hz is observed for 44 days. The deviation in terms of time blocks is 279 time blocks. The maximum OD is seen as high as 1180 MW. The number of blocks in a single day is as high as 31 on 07.04.2022.

- e. The expected relief is shown as 2362 MW exorbitantly by simply adding all the MWs of individual feeders. The respondent No. 2 is also mentioning that it is operating on round robin manner. In such a case, the effective relief applied in real time at a given point of time is very less. Further if ADMS would have given necessary reliefs, OD of such quantum would not be expected. A total of 38 instances of ADMS have been observed during the petition period in which only 26 instances relief was observed, the relief observed was in range as low as 2 MW to 216 MW with an average of 55 MW which is very less as compared to 250 MW expected relief.
- f. Karnataka SLDC has confirmed the implementation of only the first stage (3362 MW -2937 feeders-33 kV and 66 kV on rotational basis) of the revised ADMS scheme in the 195th OCC meeting held on 12-09-2022. Respondent No 2 had submitted that feeders for Stage-II (200 MW) were identified 2360 MW on rotational basis, however, there were some issues with SCADA integration and not getting populated which is resolved. For Stage-III list of loads amounting to 300 MW had been obtained from ESCOMs.
- g. The respondent No. 2 has submitted that it has supported the grid by injecting into the grid on many instances showing the DSM accounts. It is pertinent to mention that the UI regime is dispensed with the notification of CERC (Deviation Settlement Mechanism and Related Matters) Regulations, 2014). Only inadvertent deviations are allowed within limits in a specified frequency band. The respondent No. 2 has the option of supporting the grid in the form of scheduled export to deficit entities through bilateral or through the market and minimizing the deviation. Further, the under-drawl during certain blocks does not provide the right to over-draw during low frequencies, as there is no concept of netting off or banking facility with the grid in the form of deviation.

#### **Submission of Andhra Pradesh State Load Despatch Centre (APSLDC)**

- 12. APSLDC vide affidavit dated 22.11.2022 has mainly submitted as under:
  - a. The Respondent prepared for scheduling power during the alleged period February 2022- April 2022, on the basis of the forecasts provided by the solar and wind generators and distribution companies. However, there was shortfall to the tune of 1700MW (700MW in solar power 1000MW wind power of solar





(shortfall of 700MW) and wind power (shortfall of 1000MW) during the relevant period. In the absence of adequate tools available, errors in forecast are inevitable. These variations are the primary cause for low frequency and over drawl operation of the grid.

- b. For Renewable Rich States, overdrawl/ underdrawl of electricity during time block is permitted upto +/- 250MW even when grid frequency is within the range of 49.90 Hz to 50.05 Hz. The object of permitting such deviation, particularly for Renewable Rich States, is to ensure management of grid operations considering the variable nature of renewable power. This becomes clear from the Statement of Reasons dated 06.05.2016 issued by this Commission in respect of the third amendment proposed to be made in the DSM Regulations. Andhra Pradesh having 8400MW installed capacity of solar and wind power is a Renewable Rich State and therefore the answering respondent is permitted for over-drawal to the tune of 250MW additional power from the grid. This means that deviation allowed for the state of Andhra Pradesh in a day of 96 time-blocks is 6 MU.
- c. Low frequency of grid and over-drawal are due to the following reasons:
  - i. Variable nature of renewable power- No systems or measures have been implemented to control and manage sharp variations in generation of renewable power. There is no reserve ancillary support like innovative technology battery storage system at the state, regional or national level.
  - ii. Compliance with must-run status of Renewable Power - All SLDCs/ RLDCs are obligated to treat evacuation from such generators as must-run the distribution companies and the Answering Respondent are constrained and liable from both ends. If no action is taken to meet the shortfall in power by purchasing power from the exchange, the Answering Respondent is liable for disturbing the frequency of the grid and failing to manage power supply in the State. On the other hand, if due to purchase of such power and increase in generation of renewable power, there is surplus, back down instructions will have to be issued to solar/ wind generators. This inevitably leads to disputes between the distribution companies, Answering Respondent and the solar/ wind generators.

- iii. Central and State Government policies to ensure 24\*7 supply of power and consequent limitations of curtailment of power supply - The State of Andhra Pradesh has issued a direction dated 15.02.2019 to increase supply of free power from seven hours to nine hours for the farming/ agricultural sector. This has also increased the pressure on the Answering Respondent to ensure continuous supply of power for the agricultural sector, causing low frequency in the grid and over-drawal.
  - iv. Ramp rate limitations - The conventional/ thermal generation has its limitations in ramping up generation instantaneously to the desired level. The average ramp up/ ramp down rate of such convention generation is 0.67%. This means that the generators will take at least around 1 hour to bridge the deficit power despite keeping the coal plants operating at the minimum technically feasible level. On account of these slow ramp up/down rates, variation in shortfall/ rise of power cannot be controlled instantaneously in real time, and therefore leads to over-drawal from the grid.
  - v. Limitations on injection of power - Prior to the 6th Amendment dated 12.12.2019 of the Grid Code, revision in the injection schedule depending upon variation in actual power generation was effective from the 4th time block. However, as per the said amendment, this has now increased to 7th time block and 8th time block, if revision is made in the odd and even time blocks respectively. This means that from the earlier duration of 1 hour, scheduling power as per the revised instruction has been further delayed to 1.5 hours, thereby inviting forecasting errors due to variable nature of renewable power. Therefore, for the said 1.5 hours, over injection by any grid user has been prohibited even if the grid is at low frequency. Therefore, the remedy of injection of power to compensate over-drawal by SLDCs, now stands prohibited by the said amendment.
- d. To ensure grid security and prevent low grid frequency as well as over/under-drawal, the Answering Respondent and the distribution companies of Andhra Pradesh have taken the following measures:
- i. Curtailment of power supply: In order to maintain grid security, the Answering Respondent has resorted to curtailment of power supply in the State. In April

2022 itself, an average of 12.2MU of power was curtailed per day. The months of March and April 2022 are the penultimate period of harvesting for farmers. Any curtailment of free power supply for the agricultural sector would be catastrophic and severely affect the produce.

- ii. Swapping Arrangement. The distribution companies of Andhra Pradesh have also undertaken efforts to procure firm power through swap arrangements with neighbouring States. This arrangement enables the distribution companies to export power to other States during high wind season in Andhra Pradesh and similarly, import power from them during low wind season.
- iii. Load Relief - To prevent over-drawal beyond permitted deviation limits, in the months of February 2022, March 2022 and April 2022, 71.23 MU, 64.64 MU and 366.49MU load relief was given respectively.
- iv. Other measures - Various other measures are being undertaken by the Answering Respondent. These include admitted declaration and continued maintenance of TTC /ATC data from January 2022 onwards. ADMS schemes have also been implemented by the Answering Respondent as per Clause 5.4.2(d) of the Grid Code. In accordance with the same, the Answering Respondent has ensured that automatic demand management in respect of 450MW will be undertaken in the form of load disconnection or load relief, to reduce over-drawal from the grid. LVRT and HVRT settings are maintained by the Answering Respondent as per the Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 (as amended on 06.02.2019).
- e. Physical regulations scheme is not an appropriate solution for load relief the State of Andhra Pradesh, which is situated as intermediate control area between ER and SR-II having around eighty boundary points with central grid including downstream network with inter regional links. At times, these measures result in further deterioration of the grid system parameters instead of reducing over-drawal.

**Hearing dated 29.11.2022**

13. The matter was reserved for order on 29.11.2022 Petitioner was directed to convene a meeting with the SLDCs of the concerned region and to prepare a State-wise report inter-alia including the actions/measures to be taken by the concerned SLDCs at the State level in the event of over-drawal at the lower frequencies after having the detailed discussions/consultations in this regard and file a report within fifteen days thereafter and a meeting with the staff of the Commission, if required, be also convened subsequently.

### **Submissions of Petitioner**

14. In compliance with the RoP of hearing dated 29.11.2022, Petitioner vide affidavit dated 10.02.2023 has submitted as follows:

- a. SRLDC convened separate meetings with the three SLDCs of the Southern Region as below:

S. No.	Date	Meeting conducted with	Mode of Meeting
1	17-Jan-2023	SLDC Karnataka	Offline
2	18-Jan-2023	SLDC Andhra Pradesh	Online
3	20-Jan-2023	SLDC Tamil Nadu	Online

- b. During the meetings & subsequent interaction, SLDC representatives shared the existing control mechanism as well as their action plan for future to ensure compliance to the extant regulatory provisions on containing over-drawal from the grid.
- c. The action plan for implementation by all the Respondent SLDCs, which was discussed during the meeting conducted by the SRLDC and recorded under the Report are summarized as follows:
- i. **Demand Estimation** - Regulation 5.3(c) of Indian Electricity Grid Code (IEGC) requires that each SLDC shall develop methodologies/mechanisms for daily/weekly/monthly/yearly demand estimation (MW, MVAR and MWh) for operational purposes.

### **Action Plan –**

- Timely estimation of demand on daily/ weekly/ monthly/ yearly basis and submission of the same to SRLDC.
  - Timely communication of demand estimates and resource adequacy to DISCOMs for necessary tie ups for purchase of power to meet the anticipated demand.
  - Forecast to be shared with SRLDC on daily basis to aid better regional level forecast. SLDC is requested to divide the state load in to area-wise (district-wise/Substation wise) while carrying out the forecasting incorporating weather conditions etc to improve the forecast.
  - SLDCs to share the day-ahead forecast by 12:00 hrs every day to SRLDC, for the subsequent day
  - SLDCs to furnish the load forecast error (forecast Vs actual demand) on monthly basis to SRLDC along with reasons for sustained deviation.
- ii. **Generation Resource Adequacy** - It is desirable that based on the estimated demand the States ensure generation resource adequacy at all times, by various actions such as reviving the State generating units under outage (viz. reserve shut down etc.) due to economic reasons, availing power from costlier thermal and gas units (of both intra-state and inter-state generators) etc. Such costly generators should be committed in advance & scheduled by the over-drawing states. SLDC was asked to share their action plan for ensuring resource adequacy over different time horizons (daily/weekly/monthly/yearly) to meet the estimated demand.
- iii. **Fuel Security and Adequacy statements** - it is desirable that SLDCs may review the supply side issues (coal shortage) periodically and take up with appropriate agencies / authorities well in advance to ensure fuel security for their intra-state generators. Based on the assessment of fuel supply & other constraints each state may prepare a quarterly generation adequacy statement.

### **Action Plan -**

- SLDCs with mutual coordination with GENCOs need to ensure coal availability as per requirement. Coal adequacy plan may be framed according to MoP direction dated 09.01.2023.

- Periodic meetings may be kept with the concerned entities w.r.t. fuel stock position and ensure the fuel stock through the respective agencies for meeting the resource adequacy. In addition, SLDCs are advised to prepare a resource adequacy statement for the state on a quarterly basis in consultation with SRLDC.
- iv. **Demand Management Measures** - IEGC Reg.5.3.c requires that SLDC shall plan demand management measures like load shedding, power cuts, etc. and shall ensure that the same is implemented by the SEB/distribution licensees. IEGC Reg. 5.3.c further requires that all SEBs/distribution licensees shall abide by the demand management measures prepared by the SLDCs and shall also maintain historical database for demand estimation.

**Action Plan -**

- Compliance statements may be taken from DISCOMS on periodic basis.
  - Revision of feeder list if any to be communicated to SRLDC.
- v. **Improving Demand & RE Forecast** - IEGC 5.3.(g) requires that the SLDC shall take into account the Wind Energy forecasting to meet the active and reactive power requirement. Poor forecasting of demand & renewables is a major cause of deviations in real time operation.

**Action Plan -**

- SLDCs to also take measures to reduce RE forecast errors and demand forecast errors for extreme weather conditions/rainy days. Further SLDCs are advised to call regular meetings with their QCA to get a better forecast.
- SLDCs to furnish the implemented forecast, day ahead forecast & actual (before 5<sup>th</sup> of every month). SLDCs to carry out the analysis and present the observations of RE forecast, issues faced etc in the OCC meeting.
- Apart from REMC, SLDC, KPTCL to appraise the progress of developing forecasting model in collaboration with Denmark team and submit the progress w.r.t. reduction in forecasting errors. At its option, SLDC may also explore another RE forecasting agency with

stringent forecast error limits. This is in lieu of the contractual limitations in REMC.

- Apart from REMC, APSLDC and TNSLDC may explore the possibility of developing an In-house AI Based model similar to load forecast or engage another RE forecasting agency with stringent forecast error limits. This is in lieu of the contractual limitations in REMC.

- vi. **Demand Disconnection Measures as per 5.4.2 of IEGC** - IEGC 5.4.2(a) requires initiation of action by SLDC to restrict drawal within its schedule, IEGC 5.4.2(b) requires that requisite load shedding be carried out by the SLDC (in the state control area) so that there is no over-drawal, IEGC 5.4.2(c) requires that each SLDC shall formulate contingency procedures and make arrangements that will enable demand disconnection to take place, as instructed by the RLDC under normal and/or contingent conditions and IEGC 5.4.2(d) requires that the SLDC through respective SEBs/Distribution Licensees shall formulate and implement state-of-the-art demand management schemes for automatic demand management like rotational load shedding, demand response.

#### **Action Plan -**

- SLDCs may devise standard message to be issued to DISCOMS/state entities for deviation. SLDC may advise DISCOM/state entities to submit the compliance message to the SLDC instruction in Realtime after taking necessary action.
- ADMS feeders to be mapped for enhanced visualization and analysis of ADMS operation. Any load tripped under ADMS should be brought back only under the directions of SLDC keeping in view of the frequency, over drawal etc.
- SLDCs to identify the reasons for lesser relief from ADMS. Accordingly, feeders maybe added to the scheme or feeders with greater load may be considered to be considered to get the desired relief.
- SRLDC would share the details of incidents which warranted ADMS operation during the previous month. SLDCs to respond to the list of instances, enclosing SoE to confirm if ADMS acted.

- SLDCs to present the details of major ADMS operations during the previous month in OCC forum every month. SLDCs to share the details before hand to SRLDC so that there would be enough time for SRLDC to analyse the same.
- vii. **Maintaining Generation Reserves (Spinning Reserves) in state in compliance of the CERC suo-moto order dated 13.10.2015 in Pet No. 11/SM/2015** - CERC vide its order dated 13.10.2015, in Petition No. 11/SM/2015 has provided a road map for operationalization of reserves in the country wherein it has been suggested that tertiary reserves should be maintained in a de-centralized fashion by each state control area for at least 50% of the largest generating unit available in the state control area.

#### **Action Plan**

- SLDCs to furnish the data as contained in the procedure for computation of reserves (i.e. SRAS and TRAS) required to be maintained in the state control area on different time horizons (viz. year ahead, quarter ahead basis). The reserve requirement as computed by NLDC to be conveyed to each Intra State Beneficiaries.
  - SLDCs may plan their reserves accordingly. SLDCs to explore the possibility of preparing Draft Reserves Estimation Procedure for Intra State Entities and take up with the State Commission for further guidance.
- viii. **Ramp Management, Deviation at hourly boundaries** - It is seen that the deviation during morning and evening peak hours is mainly due to mismatch in generation and load ramps which is more predominant in renewable (RE) rich states due to higher net-load ramp in evening peak hours. This is further aggravated due to poor generation ramp management at those hourly boundaries. It is worth mentioning here that Regulation 5.2(j) of IEGC requires that no user / SEB shall cause a sudden variation in its load by more than one hundred (100 MW) without prior intimation to and consent of the RLDC.

#### **Action Plan**



- SLDCs to study the current pattern and further stagger the existing loads.
- In addition, SLDC may explore giving instructions of picking up / backing down to multiple state generators simultaneously considering their ramp capability to minimize deviation in very short duration.

**Analysis and Decision:**

15. We have considered the submissions of the Petitioner as well as Respondents and perused all relevant documents on record and the regulations of the Commission.
16. The Petitioner has mainly submitted that due to over drawl by some of the state control areas, the frequency went below the lower limit (49.90 Hz) on multiple occasions during the 1st February 2022 to 20th April 2022. The frequency remained below 49.90 Hz and below 49.7 Hz on 103342 instances for a cumulative duration of 290 hours and on 9613 instances for a cumulative duration of 27 hours respectively during the said period. On a few occasions, the grid frequency touched very low values ranging from 49.4 to 49.7 Hz.
17. Petitioner has submitted that during the said period, several factors such as high irrigation load, rise in ambient temperature etc. contributed to a sharp rise in electricity demand viz. peak demand season of Southern Region. At the same time, supply-side constraints viz. lower fuel supply for coal-fired power plants, together with lower hydro reservoir levels, planned & forced generation outages, expected low wind season during this period, low reserve under RRAS etc. further stressed the load generation balance. Under such stressed conditions, massive over-drawl from the grid by several constituents

aggravated the situation further and led to prolonged periods of low-frequency operation.

18. Petitioner has submitted that the impact of Automatic Demand Management Scheme (ADMS) was found to be ineffective. Number of instances of ADMS from 01-01-2021 to 20-04-2022 is 246, in which load relief was observed only in 145 (59%) instances with an average relief of about 43 MW.
19. Petitioner has submitted that SRLDC was constrained to take several emergency physical regulatory measures during the above period by opening identified ICT /radial feeders to contain over drawl and to restore grid frequency within safe operating limits.
20. Petitioner has sent directions to the Respondents APTRANSCO, KPTCL and TANTRANSCO to maintain actual drawl from the grid as per drawl schedule, to implement a comprehensive action plan for operationalizing the revised ADMS, to take necessary actions for augmentation of intra-state transmission system.
21. The Respondent States have submitted as follows
  - a. Tamil Nadu State Load Despatch Centre, TANTRANSCO has submitted that in order to reduce the overdraw in the real time grid operation and to comply the Grid Code/Regulations, TNSLDC has taken several steps like (i) Generation has been picked up wherever possible from Hydro, Gas, Thermal and IPPs including the high-cost power of Basin Bridge Gas Power House units, (ii) Appropriate load shedding/regulation, (iii) Bidding power through Power Exchanges under DAM & RTM even if the market price is higher to maintain the Demand-Supply gap, (iv) Power SWAP and short-term tender, (v) Generators had been addressed to maintain adequate fuel stock, (vi) Possible steps have been taken to improve the RE forecasting accuracy and (vii) Healthiness of the Under Frequency

Relay (UFR) has been ensured. Further, revised scheme of ADMS has been implemented and in force in Tamil Nadu from 17.04.2022 and TNSLDC has already implemented ADMS, Load trimming schemes. Furthermore, TNSLDC is utilizing the Kadamparai Hydro Pumped storage station in generator/Pump mode for providing peaking reserve and ramping reserve for managing imbalances.

- b. Karnataka State Load Despatch Centre, KPTCL has submitted that the State being RE rich state, with 50% of the demand met by RE sources, the variations in the forecast for RE to meet the demand is the challenge faced by the system operators. During Irrigation period, hydel generation attached to this are uncontrollable and aggravates the prevailing situations of high under-drawal and will not assist in controlling the variations of variable renewable generation and demand. State has taken various measures to control the deviation such as monitoring the healthiness and effective operation of the ADMS, AUFR & df/dt relays for immediate load relief during critical conditions of the grid
- c. Andhra Pradesh State Load Despatch Centre (APSLDC) has submitted that it has taken several steps to ensure grid security and prevent low grid frequency as well as over/under drawal, such as Curtailment of power supply, swapping arrangement with neighbouring States, load relief, declaration and continued maintenance of TTC /ATC and implementation of ADMS schemes as per clause 5.4.2(d) of the Grid Code.

22. We have considered the submissions made by the Petitioner and the Respondents.

23. Let us peruse various provisions under the Electricity Act, 2003 and the various regulatory provisions.

24. The Relevant extract of Section 28 of Electricity Act, 2003, provides as follows:

*28. (1) The Regional Load Despatch Centre shall be the apex body to ensure integrated operation of the power system in the concerned region.*

.....  
*(3) The Regional Load Despatch Centre shall -*

*(a) be responsible for optimum scheduling and despatch of electricity within the region, in accordance with the contracts entered into with the licensees or the generating companies operating in the region;*  
*(b) monitor grid operations;*  
*(c) keep accounts of quantity of electricity transmitted through the regional grid;*  
*(d) exercise supervision and control over the inter-State transmission system; and*  
*(e) be responsible for carrying out real time operations for grid control and despatch of electricity within the region through secure and economic operation of the regional grid in accordance with the Grid Standards and the Grid Code.*  
.....”

As per above, RLDC is responsible for optimum scheduling and despatch of electricity, supervision & control over the inter-State transmission system, monitoring of grid operation and carrying out real time operations in accordance with Grid Standards and the Grid Code.

25. The Relevant extract of Section 29 of Electricity Act, 2003, provides as follows:

*“29. (1) The Regional Load Despatch Centre may give such directions and exercise such supervision and control as may be required for ensuring stability of grid operations and for achieving the maximum economy and efficiency in the operation of the power system in the region under its control.*

*(2) Every licensee, generating company, generating station, sub-station and any other person connected with the operation of the power system shall comply with the direction issued by the Regional Load Despatch Centres under sub-section (1).*

*(3) All directions issued by the Regional Load Despatch Centres to any transmission licensee of State transmission lines or any other licensee of the State or generating company (other than those connected to inter State transmission system) or sub-station in the State shall be issued through the State Load Despatch Centre and the State Load Despatch Centres shall ensure that such directions are duly complied with the licensee or generating company or sub-station.*

.....

*(6) If any licensee, generating company or any other person fails to comply with the directions issued under sub-section (2) or sub-section (3), he shall be liable to penalty not exceeding rupees fifteen lacs.”*

As per above if any licensee, generating company or any other person fails to comply with the directions issued by RLDC under sub-section (2) or sub-section (3) of Section 29 of the Act, he shall be liable to penalty not exceeding rupees fifteen lacs.

26. Relevant provisions of IEGC 2010 Regulations are extracted as follows:

**Regulation 1.5 (i) of the IEGC:**

*“(i) RLDCs shall report to the Commission instances of serious or repeated violation of any of the provisions of the IEGC and incidences of persistent non-compliance of the directions of the RLDCs issued in order to exercise supervision and control required for ensuring stability of grid operations and for achieving the maximum economy and efficiency in the operation of the power system in the region under its control.*

.....  
**Regulation 1.5 (i) of the IEGC:**

**“2.3 Role of RLDC**

**2.3.1 According to sections 28 and 29 of Electricity Act, 2003, the functions of RLDCs are as follows:**

- (1) The Regional Load Despatch Centre shall be the apex body to ensure integrated operation of the power system in the concerned region.*
- (2) The Regional Load Despatch Centre shall comply with such principles, guidelines and methodologies in respect of wheeling and optimum scheduling and despatch of electricity as may be specified in the Grid Code.*
- (3) The Regional Load Despatch Centre shall-*
  - (a) be responsible for optimum scheduling and despatch of electricity within the region, in accordance with the contracts entered into with the licensees or the generating companies operating in the region;*
  - (b) monitor grid operations;*
  - (c) keep accounts of quantity of electricity transmitted through the regional grid;*
  - (d) exercise supervision and control over the Inter-State transmission system; and*
  - (e) be responsible for carrying out real time operations for grid control and despatch of electricity within the region through secure and economic operation of the regional grid in accordance with the Grid Standards and the Grid Code.*
- (4) The Regional Load Despatch Centre may give such directions and exercise such supervision and control as may be required for ensuring stability of grid operations and for achieving the maximum economy and efficiency in the operation of the power system in the region under its control.*
- (5) Every licensee, generating company, generating station, sub-station and any other person connected with the operation of the power system shall comply with the directions issued by the Regional Load Despatch Centers.*
- (6) All directions issued by the Regional Load Despatch Centers to any transmission licensee of State transmission lines or any other licensee of the State or generating company (other than those connected to inter-State transmission system) or sub-station in the State shall be issued through the State Load Despatch Centre and the State Load Despatch Centers shall ensure that such directions are duly complied with by the licensee or generating company or sub-station.*
- (7) If any dispute arises with reference to the quality of electricity or safe, secure and integrated operation of the regional grid or in relation to any direction given by the Regional Load Despatch Centre, it shall be referred to Central Commission for decision. However, pending the decision of the Central Commission, the directions of the Regional Load Despatch Centre shall be complied with by the State Load Despatch Centre or the licensee or the generating company, as the case may be.*

.....”

**Regulation 5.2(m) and 5.2(n) of IEGC: (System Security Aspects)**

*“(m) All Users, SEB, SLDCs, RLDCs, and NLDC shall take all possible measures to ensure that the grid frequency always remains within the 49.9-50.05 Hz band.”*

*“(n) All SEBS, distribution licensees / STUs shall provide automatic under-frequency and df/dt relays for load shedding in their respective systems, to arrest frequency decline that could result in a collapse/disintegration of the grid, as per the plan separately finalized by the concerned RPC and shall ensure its effective application to prevent cascade tripping of generating units in case of any contingency. All, SEBs, distribution licensees, CTU STUs and SLDCs shall ensure that the above under-frequency and df/dt load shedding/islanding schemes are always functional.....”*

.....

**Regulation 5.3(c) of IEGC: (Demand Estimation by states)**

*“(c) Each SLDC shall develop methodologies/mechanisms for daily/ weekly/monthly/yearly demand estimation (MW, MVAR and MWh) for operational purposes. Based on this demand estimate and the estimated availability from different sources, SLDC shall plan demand management measures like load shedding, power cuts, etc. and shall ensure that the same is implemented by the SEB/distribution licensees. All SEBs/distribution licensees shall abide by the demand management measures of the SLDCs and shall also maintain historical database for demand estimation.*

*“(d) Each SLDC shall carry out its own demand estimation from the historical data and weather forecast data from time to time. All distribution licensees and other concerned persons shall provide relevant data and other information as required by SLDC for demand estimate.”*

.....

**Regulation 5.4.1 and 5.4.2 of IEGC: (Demand Management)**

*“5.4.1 This section is concerned with the provisions to be made by SLDCs to effect a reduction of demand in the event of insufficient generating capacity, and inadequate transfers from external interconnections to meet demand, or in the event of breakdown or congestion in intra-state or inter-state transmission system or other operating problems (such as frequency, voltage levels beyond normal operating limit, or thermal overloads, etc.) or overdrawal of power vis-à-vis of the regional entities beyond the limits mentioned in UI regulation of CERC”*

**5.4.2 Demand Disconnection**

- a) SLDC/ SEB/distribution licensee and bulk consumer shall initiate action to restrict the drawal of its control area, from the grid, within the net drawal schedule.*
- b) The SLDC/SEB/distribution licensee and bulk consumer shall ensure that requisite load shedding is carried out in its control area so that there is no Over drawal.*
- c) Each User/STU/SLDC shall formulate contingency procedures and make arrangements that will enable demand disconnection to take place, as instructed by the RLDC/SLDC, under normal and/or contingent conditions. These contingency procedures and arrangements shall regularly be / updated by User/STU and monitored by RLDC/SLDC. RLDC/SLDC may direct any User/STU to modify the above procedures/arrangement, if required, in the interest of grid security and the concerned User/STU shall abide by these directions.*
- d) The SLDC through respective State Electricity Boards/Distribution Licensees shall also formulate and implement state-of-the-art demand management schemes for automatic demand management like rotational load shedding, demand response (which may include lower tariff for interruptible loads) etc.*

before 01.01.2011 to reduce overdrawal in order to comply para 5.4.2 (a) and (b). A Report detailing the scheme and periodic reports on progress of implementation of the schemes shall be sent to the Central Commission by the concerned SLDC.

- e) In order to maintain the frequency within the stipulated band and maintaining the network security, the interruptible loads shall be arranged in four groups of loads, for scheduled power cuts/load shedding, loads for unscheduled load shedding, loads to be shed through under frequency relays/ df/dt relays and loads to be shed under any System Protection Scheme identified at the RPC level. These loads shall be grouped in such a manner, that there is no overlapping between different Groups of loads. In case of certain contingencies and/or threat to system security, the RLDC may direct any SLDC/ SEB/distribution licensee or bulk consumer connected to the ISTS to decrease drawal of its control area by a certain quantum. Such directions shall immediately be acted upon. SLDC shall send compliance report immediately after compliance of these directions to RLDC.
- f) To comply with the direction by RLDC, SLDC may direct any SEB/ distribution licensee/bulk consumer connected to the STU to curtail drawal from grid. SLDC shall monitor the action taken by the concerned entity and ensure the reduction of drawal from the grid as directed by RLDC.
- g) RLDCs shall devise standard instantaneous message formats in order to give directions in case of contingencies and/or threat to the system security to reduce deviation from schedule by the bulk consumer, SLDC/State Utility/ ISGS/Regional Entity/Injecting Utility at different overdrawal / underdrawal / over-injection/under-injection condition depending upon the severity. The concerned SLDC/other regional entity shall ensure immediate compliance with these directions of RLDC and send a compliance report to the concerned RLDC.
- h) All Users, SLDC/SEB distribution licensee or bulk consumer shall comply with direction of RLDC/SLDC and carry out requisite load shedding or backing down of generation in case of congestion in transmission system to ensure safety and reliability of the system.....
- i) The measures taken by the User's, SLDC SEB/distribution licensee or bulk consumer shall not be withdrawn as long as the frequency remains at a level lower than the limits specified in para 5.2 or congestion continues, unless specifically permitted by the RLDC/SLDC"

.....

**Regulation 6.4.7, 6.4.8 and 6.4.12 of IEGC:**

*"6.4.7. The SLDC, SEB / distribution licensee shall always restrict the net drawal of the state from the grid within the drawal schedules keeping the deviations from the schedule within the limits specified in the Deviation Settlement Mechanism Regulations. The concerned SEB/distribution licensee/User, SLDC shall ensure that their automatic demand management scheme mentioned in clause 5.4.2 acts to ensure that there is no over-drawal. If the automatic demand management scheme has not yet been commissioned, then action shall be taken as per manual demand management scheme to restrict the net drawal from grid to within schedules and all actions for early commissioning of Automatic Demand Management Scheme (ADMS) shall be initiated.*

*6.4.8. The SLDCs/STUs /Distribution Licensees shall regularly carry out the necessary exercises regarding short-term demand estimation for their respective States/area, to enable them to plan in advance as to how they would meet their consumers' load without overdrawing from the grid.*

.....

6.4.12 Notwithstanding the above, the RLDC may direct the SLDCs/ISGS/ other regional entities to increase/decrease their drawal/generation in case of contingencies e.g. overloading of lines/transformers, abnormal voltages, threat to system security. Such directions shall immediately be acted upon. In case the situation does not call for very urgent action, and RLDC has some time for analysis, it shall be checked whether the situation has arisen due to deviations from schedules. These shall be got terminated first, through appropriate measure like opening of feeders , if considered necessary by SLDC/RLDC, before an action, which would affect the scheduled supplies to the long term, medium term customers or short term customers is initiated in accordance with Central Electricity Regulatory Commission (Grant of Connectivity, Long-term Access and Medium-term Open Access in Inter- State Transmission and Related matters) Regulations, 2009 and Central Electricity Regulatory Commission (Open Access in Inter-State Transmission) Regulations, 2008.

.....”

Thus, in accordance with the IEGC, 2010, RLDC is responsible for optimum scheduling and despatch of electricity, supervision & control over the inter-State transmission system, monitoring of grid operation and carrying out real time operations in accordance with Grid Standards and the Grid Code and every licensee, generating company, generating station, substation and any other person connected with the power system are mandated to comply with the directions issued by the RLDC. Further, all users, SEB, SLDCs, RLDCs, and NLDC are mandated to implement the measures as provisioned under IEGC and operate in such a manner to ensure that the grid frequency always remains within the 49.9-50.05 Hz band. Further, the concerned SLDC/other regional entity are to ensure immediate compliance with the directions issued by RLDC to reduce deviation from schedule in case of contingencies and/or threat to the system security and send a compliance report to the concerned RLDC.

27. Relevant provisions of the DSM Regulations are extracted as follows:

**Regulation 7 (1) of DSM Regulations:**

*“The overdrawal/underdrawal of electricity by any buyer (except Renewable Rich States) during the time block shall not exceed 12% of its scheduled drawal or 150 MW, whichever is lower, when grid frequency is “49.85 Hz and above and below 50.05 Hz.*

*Provided that over-drawal/under-drawal of electricity by any Renewable Rich State*





during the time block shall not exceed limits as specified in Annexure-III, when grid frequency is “49.85 Hz and above and below 50.05 Hz”

.....

Provided that no over-drawal of electricity by any buyer shall be permissible when grid frequency is ‘below 49.85 Hz” and no under-drawal of electricity by any buyer shall be permissible when grid frequency is ‘50.05 Hz and above’.

.....

**Annexure-III**

**Deviation Limits for Renewable Rich States**

S. No.	States having combined installed capacity of Wind and Solar projects	Deviation Limits (MW) – “L”
1	1000 – 3000 MW	200
2	> 3000 MW	250

..”

Thus, Renewable rich State (>3000 MW of combined installed capacity of Wind and Solar projects) can deviate maximum upto 250 MW when grid frequency is between 49.85 Hz to 50.05 Hz. However, over-drawal and under-drawal of electricity by any buyer are not permissible when grid frequency is below 49.85 Hz and above 50.05 Hz respectively.

28. The relevant extract of the Operating Procedure for Southern Region 2021 (taken out from SRLDC website) are as under:

**2.3 Frequency Violation Type / Category / Message consideration**

.....As frequency is one of the critical indicator that represent system state, deviation of frequency has been classified into the following categories for the purpose of issuing messages by SRLDC and taking corrective actions by the respective Regional Entities / SLDC / RLDC.

Violation Type	Range / Condition	Category
Frequency Violation	>50.1 Hz or <49.7 Hz	Emergency
	50.05-50.1 Hz or 49.9 Hz -49.7 Hz	Alert
Nominal Operating Range	49.9 Hz -50.05 Hz	Normal

**2.4 Deviation Violation Type and Category**

..... However, any deviation beyond the prescribed limit of CERC Deviation Settlement Regulation construed as violation and thereby to avert such situation, SRLDC will issue Alert, Emergency (Violation) and noncompliance messages as listed below:

Type	Violation Type	Range / Condition for issuing message	Category
Non Renewable Rich State	Deviation Violation	(20% of sch or 80 MW whichever is higher)— (I) or 250 MW -- (II)	Emergency



		<i>When drawl is &gt; (lower of (I) and (II))</i> <i>Drawl is between (48 MW or 80 MW) when 12% of sch is less than 48MW</i> <b>or</b> <i>Drawl is between (12% of sch or 20% of sch) when 12% of sch is more than 48MW but less than 150 MW</i> <b>or</b> <i>Drawl is between 150 MW to 250 MW when 12% of sch is more than 150 MW</i>	Alert
	Nominal Operating Range	<i>(12% or 48 MW whichever is higher)-(I) or 150 MW -- (II)</i> <i>When drawl is &lt; (lower of (I) and (II))</i>	Normal
Renewable Rich State Whose RE Installed Capacity $\geq 1000$ MW and $\leq 3000$ MW	Deviation Violation	> 250 MW	Emergency
		200 MW to 250 MW	Alert
	Nominal Operating Range	<200 MW	Normal
Renewable Rich State Whose RE Installed Capacity > 3000 MW	Deviation Violation	> 300 MW	Emergency
		250 MW to 300 MW	Alert
	Nominal Operating Range	<250 MW	Normal

.....”

We observe that the logic of issuance of Emergency and Alert messages are provided in the Operating Procedure for Southern Region 2021 dated 20.07.2021.

29. We observe from the list of overdrawl messages issued by SRLDC that the continuous overdrawal from the grid by the respective States led to issuance of total 693 number of alert messages, 674 number of emergency messages and 570 number of non-compliance messages by the SRLDC during the period from 01.02.2022 to 20.04.2022 to the overdrawing States, Tamil Nadu, Karnataka and Andhra Pradesh to control their overdrawal as per regulation 5.4.2 of the Grid code. SRLDC, on several occasions, was constrained to take several emergency physical regulatory measures during the above period by opening identified ICT /radial feeders to contain over drawl and to restore grid

frequency within safe operating limits. We are of the view that such continuous over-drawal from the Grid by the respective States could have been detrimental for the security and reliability of the Grid. This is a matter of concern for all the respective States and such kind of act is undesirable for the secured operation of grid.

30. Respondent States have submitted that during the subject period, there were several factors such as large variation in RE Generation, deviation in generation and demand forecast in the absence of adequate forecast tools, un-anticipated incremental increase in the total energy consumption, shortfall in supply of power owing to the outage of the various generators due to shortage of coal & other reasons, non-availability of adequate power at Power Exchange under DAM & RTM even at high rate, non-availability of spinning reserves and ancillary services and fall in generation of thermal power plants of Central/State Sector due to low fuel supply /non- availability of sufficient Domestic Coal and high gas prices which have resulted in over-drawal by the States on number of instances. We observe that the over-drawal by the States takes the grid to a stressed situation. In order to avoid such a situation, it is necessary that reserves are maintained by the States on day to day basis so that over-drawal is minimized. The States should plan to have adequate resources to meet demand in such adverse situations and comply with the directions of RLDC as the Grid cannot be left in vulnerable condition.

31. On the direction from the Commission, SRLDC convened meetings with all respondent SLDCs in January 2023. During the meeting SRLDC asked the SLDCs to update on the measures undertaken or proposed to be undertaken by SLDCs to ensure compliance with the provisions of IEGC, 2010 and based

on the deliberations in the meetings, Action plan has been finalised on following points:

- i. Demand Estimation
- ii. Generation Resource Adequacy
- iii. Fuel Security and Adequacy statements
- iv. Demand Management Measures
- v. Improving Demand & RE Forecast
- vi. Demand Disconnection Measures
- vii. Maintaining Generation Reserves (Spinning Reserves) in state in compliance of the CERC suo-moto order dated 13.10.2015 in Pet No. 11/SM/2015
- viii. Ramp Management, Deviation at hourly boundaries

32. The submission made by the State SLDCs were discussed during the above said meetings with SRLDC in January 2023. Subsequent to the meetings, Action Plan has been finalized. Considering the submissions of the Petitioner, Respondents and the detailed action plan as submitted by the Petitioner based on the deliberation with the Respondents, we direct as follows:

- (a) All the SLDCs shall ensure timely estimation of demand on daily/ weekly/ monthly/ yearly basis as provisioned under Grid Code. Further, SLDCs shall ensure to have better demand forecasting/ estimation systems in place so that there shall be minimum deviation from the schedule allocated to each drawing entity. SLDCs shall plan demand management measures like load shedding, power cuts, etc. in accordance with the Grid Code and shall ensure that the same is implemented by the SEB/distribution licensees
- (b) Due to the intermittent nature of renewable sources, accurate forecasting and scheduling of Renewable Energy is required. Therefore, SLDCs needs to improve its current forecasting infrastructure for accurate

forecasting of renewable generation. REMCs must be made fully functional with real time RE desks so as to improve the coordination with renewable power stations in improving the forecasts. Further, State may also explore more specialized RE forecasting tools for accurate RE forecasting & Scheduling with stringent forecast error limits, if there is any contractual limitation in REMC.

- (c) States shall ensure generation resource adequacy for all time horizons based on the estimated demand & to maintain balanced portfolio at all the times to avoid over drawl.
- (d) SLDCs shall coordinate with Generating companies so that generating companies maintain adequate coal availability as per the requirement. Coal adequacy plan may be framed according to MoP direction dated 09.01.2023. Periodic meetings shall be convened with the concerned entities to ensure the fuel stock through the respective agencies for meeting the resource adequacy and if required, the matter shall be taken up with appropriate agencies or authorities well in advance to ensure fuel security for generators.
- (e) SLDCs to ensure Automatic Demand Management System (ADMS) is in place in accordance with the Grid Code with appropriate feeders mapping to get the desired load relief. If the ADMS is in implementation stage in any State then till the time of implementation of ADMS manual load shedding of radial feeders identified by SLDCs which shall be done with concerned SLDCs instructions without any delay during emergency conditions shall be shared with SRLDC. The Status of the implementation of ADMS shall be updated to the SRLDC on quarterly basis by the respective SLDC.
- (f) SLDCs shall be maintained reserves in a decentralized fashion by each state control area for a quantum as assigned by NLDC or SRLDC.
- (g) SLDCs shall explore giving instructions of picking up / backing down to multiple state generators simultaneously considering their ramp capability to minimize deviation in very short duration.

- (h) Management of the load shall be done in such a manner that the demand ramp should be limited to not more than 100 MW as per Grid Code. SLDCs shall ensure efficient coordination with generators and staggering of power supply plan of agriculture feeders to be done on regular basis keeping in view the ramp constraints.
- (i) SLDCs shall take advance action for managing their demand portfolio and make prior arrangements for procurement of power and ensure portfolio balancing at all times without overdrawing power from the grid.
- (j) SLDCs shall adequately plan and augment the internal networks within the States to handle the over-drawl and to mitigate congestion in the system.
- (k) SLDCs shall timely declare their ATC/TTC and upload it on their website.
- (l) To take prompt action to control overdrawal on receipt of the Non-Compliance, Alert and Emergency messages from the SRLDC in proper coordination (using advanced technology) with Discoms for ensuring immediate compliance of warning messages issued by SRLDC and send a compliance report to SRLDC. SLDCs shall prepare a standard operating procedure/protocol to be followed by SLDC & Discoms to control the overdrawal immediately.
- (m) In case grid frequency fall below the band, all the SLDCs shall always be ready for initiating emergency measures for controlling over-drawls under Low frequency conditions to safeguard the grid. In this regard healthiness and availability of AUFLS (Automatic Under Frequency Load Shedding) and df/dt load shedding scheme must be ensured.
- (n) Strictly adhere to the provisions envisaged under the Grid Code for safe, reliable and economical operation of the grid and maintain drawal from the grid as per drawal schedule to avoid overdrawing from the grid in compliance with provisions under the Grid Code and DSM Regulations

so as to ensure safety & security of the grid and obviate any possibility of a grid disturbance.

We direct the respondents to strictly adhere to the Action plan as above. SLDCs are directed to submit the quarterly report to the SRLDC on status of implementation of the action plan. Any modification in action plan keeping in view issues arising while implementation, may be discussed and finalised at RPC forum.

33. We further observe that SRLDC has issued Alert, Emergency and Non-compliance messages to Respondent States. Some of the messages issued by SRLDC are extracted as below:

Summary of OD Messages

Date	Time	Msg No.	Constituent	Type
06-02-2022	07:05:00	SRLDC/D/Feb/2022/169	APTRANSCO	Non-compliance
06-02-2022	07:14:00	SRLDC/D/Feb/2022/170	APTRANSCO	Non-compliance
06-02-2022	08:12:00	SRLDC/D/Feb/2022/171	APTRANSCO	Emergency
06-02-2022	08:21:00	SRLDC/D/Feb/2022/172	APTRANSCO	Non-compliance
06-02-2022	09:36:00	SRLDC/D/Feb/2022/173	APTRANSCO	Emergency
06-02-2022	18:04:00	SRLDC/F/Feb/2022/174	APTRANSCO	Alert
06-02-2022	22:07:00	SRLDC/D/Feb/2022/176	APTRANSCO	Emergency
07-02-2022	06:13:00	SRLDC/D/Feb/2022/178	APTRANSCO	Alert
07-02-2022	06:22:00	SRLDC/D/Feb/2022/179	APTRANSCO	Emergency
07-02-2022	06:48:00	SRLDC/D/Feb/2022/180	APTRANSCO	Non-compliance
07-02-2022	08:39:00	SRLDC/D/Feb/2022/181	APTRANSCO	Emergency
07-02-2022	08:39:00	SRLDC/D/Feb/2022/181	TANTRANSCO	Emergency
07-02-2022	08:42:00	SRLDC/D/Feb/2022/182	TANTRANSCO	Emergency
07-02-2022	08:45:00	SRLDC/D/Feb/2022/183	TANTRANSCO	Non-compliance
07-02-2022	09:33:00	SRLDC/D/Feb/2022/184	APTRANSCO	Alert
07-02-2022	09:33:00	SRLDC/D/Feb/2022/184	TANTRANSCO	Alert
07-02-2022	09:39:00	SRLDC/D/Feb/2022/185	TANTRANSCO	Emergency
07-02-2022	14:09:00	SRLDC/D/Feb/2022/186	TANTRANSCO	Emergency
07-02-2022	14:27:00	SRLDC/F/Feb/2022/187	KPTCL	Alert
07-02-2022	15:01:00	SRLDC/D/Feb/2022/188	APTRANSCO	Alert
07-02-2022	15:15:00	SRLDC/D/Feb/2022/189	APTRANSCO	Emergency
07-02-2022	15:56:00	SRLDC/D/Feb/2022/190	KPTCL	Emergency
07-02-2022	16:00:00	SRLDC/D/Feb/2022/191	KPTCL	Non-compliance
07-02-2022	16:58:00	SRLDC/F/Feb/2022/192	APTRANSCO	Alert
07-02-2022	16:58:00	SRLDC/F/Feb/2022/192	KPTCL	Alert
07-02-2022	17:20:00	SRLDC/D/Feb/2022/193	APTRANSCO	Emergency
07-02-2022	17:28:00	SRLDC/D/Feb/2022/194	APTRANSCO	Non-compliance
07-02-2022	17:50:00	SRLDC/F/Feb/2022/195	APTRANSCO	Alert
07-02-2022	18:42:00	SRLDC/D/Feb/2022/196	APTRANSCO	Emergency
08-02-2022	03:00:00	SRLDC/D/Feb/2022/197	KPTCL	Alert
08-02-2022	06:58:00	SRLDC/D/Feb/2022/198	TANTRANSCO	Emergency
08-02-2022	07:11:00	SRLDC/D/Feb/2022/199	KPTCL	Emergency
08-02-2022	07:11:00	SRLDC/D/Feb/2022/199	TANTRANSCO	Non-compliance
08-02-2022	07:19:00	SRLDC/D/Feb/2022/200	KPTCL	Non-compliance
08-02-2022	07:19:00	SRLDC/D/Feb/2022/200	TANTRANSCO	Non-compliance
08-02-2022	07:26:00	SRLDC/D/Feb/2022/201	KPTCL	Non-compliance
08-02-2022	07:26:00	SRLDC/D/Feb/2022/201	TANTRANSCO	Non-compliance
08-02-2022	08:08:00	SRLDC/D/Feb/2022/202	TANTRANSCO	Emergency
08-02-2022	09:06:00	SRLDC/D/Feb/2022/203	APTRANSCO	Alert
08-02-2022	09:12:00	SRLDC/D/Feb/2022/204	APTRANSCO	Emergency
08-02-2022	09:13:00	SRLDC/D/Feb/2022/205	KPTCL	Emergency
08-02-2022	09:17:00	SRLDC/D/Feb/2022/206	APTRANSCO	Non-compliance
08-02-2022	09:17:00	SRLDC/D/Feb/2022/206	KPTCL	Non-compliance
08-02-2022	14:15:00	SRLDC/D/Feb/2022/207	APTRANSCO	Alert
08-02-2022	14:46:00	SRLDC/D/Feb/2022/208	KPTCL	Emergency

We observe that the logic for issuance of Alert and Emergency message are covered under the SRLDC Operating Procedure for Southern Region 2021 dated 20.07.2021. However, the logic for issuance of Non-compliance is not provided for in the Operating Procedure. The abovesaid non-compliance messages issued by SRLDC do not specify the activities/directions not complied with. We are of the view that the communication sent by the SRLDC should be sufficiently clear so that the responding entity would understand the emergency stage, the breach of the clause, and the RLDC's direction. At the



same time, it is necessary that State SLDC should itself monitor its overdrawl rather than waiting for message from RLDC. The SLDCs should be proactive in controlling their over-drawl based on grid parameters of frequency and voltage.

34. We have also perused the message formats provided under the Operating Procedure for Southern Region 2021 dated 20.07.2021. From these formats, it is observed that the format does not include grid frequency which is necessary to understand the gravity of situation. As such, we suggest that the prevailing Grid Frequency should also be mentioned in the messages so that severity of the message should be clear to the overdrawing entity.
35. In light of above discussions and an action plan finalized in consultation with States, at present we are not inclined to levy penalty at this stage. In case, the Petitioner faces any issues regarding implementation of action plan or non-compliance of directions issued by the Petitioner, it may approach the Commission as per law.
36. The Petition no. 132/MP/2022 is disposed of in terms of the above.

Sd/  
**(P. K. Singh)**  
**Member**

Sd/  
**(Arun Goyal)**  
**Member**

Sd/  
**(I. S. Jha)**  
**Member**

