SOUTHERN POWER DISTRIBUTION COMPANY OF TELANGANA LIMITED

From
Chief Engineer (IPC),
TGSPDCL,
Mint compound,
Hyderabad.

TGERC HYDERABAD INWARD
15 MAR 2025
No. Sign

To,
The Commission Secretary,
TGERC, Sy. No.145-P,
Vidyuth Niyantran Bhavan,
Kalyan Nagar, GTS Colony,
Hyderabad – 500045.

Lr.No.CE(IPC)/TGSPDCL/SE(IPC)/F.No.NTPC/D.No.1836/24,Dt:15.03.2025

Sir,

Sub: TGSPDCL - IPC – Petition for seeking consent for procurement of power from I unit of 1 x 800 MW of Telangana Super Thermal Power Station stage-II as against power sale offered from 3 units that is 3 x 800 MW for a period of 25 years – Information – Submitted – Reg.

Ref: 1.Lr. No.L-36/13/JD(LAW)-1/D.No.130/2025, Dated:19.02.2025.
2.Lr. No.CE/IPC/TGSPDCL/SE(IPC)/F. No.Singareni/ D.No.1750/24, Dt.28.02.2025

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Kind attention is invited to the letter cited in reference 1st above wherein certain information is sought for in the petition filed by TGDISCOMs seeking consent for procurement of power from one unit of 1 x 800 MW NTPC Telangana Super Thermal Power Station stage-II as against power sale offered from 3 units that is 3 x 800 MW for a period of 25 years.

The information as called for is submitted below:

Query (a): TGDISCOMs to justify that the proposal is in line with the power procurement guidelines issued by the Commission in clause 16.3 of the Regulation No. 2 of 2023.

Reply: The Clause 16.3 of the Regulation No. 2 of 2023 states as below:

"All future procurement of short-term or medium-term or long-term power shall be undertaken only through tariff based competitive bidding in accordance with Guidelines notified by the Government of India under Section 63 of the Act."

However, as per the provisions of Schedule XIII of AP Reorganisation Act 2014, the National Thermal Power Corporation (NTPC) is required to establish a 4000 MW power facility in the successor state of Telangana by obtaining necessary coal linkages.

Accordingly, NTPC has established 1600 MW (2x800 MW) STPP Phase-I for which PPA was signed by TGDISCOMs. Commercial Operation Date (COD) of Unit-I under Phase-I was declared on 28.09.2023 and that of Unit-2 on 01.03.2024 and the provisional tariff claimed by NTPC for FY 2024-25 is FC-Rs.2.266/KWh, VC-Rs.3.599/KWh and total tariff of Rs.5.865/KWh.

Subsequently, NTPC proposed to establish 3x800 MW TSTPP Phase-II and sought TGDISCOMs consent. Considering the thermal requirement as recommended by CEA, availability of alternate RE based options with competitive tariff, their faster commission time and modularity, it is to submit that TGPCC recommended to consider purchasing power from 1 unit i.e., 1x800 MW of Telangana STPP Stage-II as against power sale offered from 3 units (3x800 MW), for ensuring Economic Load Generation Balance, reliability of meeting demand, along with appropriate capacity mix of energy from various Renewable Energy resources.

Accordingly, the Govt. of Telangana vide letter dated 05.10.2024 has issued consent for availing power from 1 unit (1x800 MW) as against power sale offered from 3 units (3x800 MW).

Query (b): Substantiation of the requirement of the proposed power procurement in terms of load generation balance (along with details explanation), financial condition of the DISCOMs.

Reply: The energy requirement, the energy availability and Surplus/Deficit approved by the State Commission vide order dated 29.12.2023 in the Resource Plan and business Plan for 5th & 6th control period is as abstracted below:

FY	Energy requirement at State level (MU)	Energy Availability at State level (MU)	Surplus/ Deficit (MU)
2024-25	83,058	95,753	12,696
2025-26	87,564	1,06,637	19,073
2026-27	92,365	1,06,157	13,793
2027-28	97,482	1,05,506	8,024
2028-29	1,02,942	1,02,784	-158
2029-30	1,07,868	97,429	-10,440
2030-31	1,13,095	96,344	-16,761
2031-32	1,18,632	96,570	-22,062
2032-33	1,24,488	96,334	-28,153
2033-34	1,30,711	96,334	-34,376

It is to submit that TGDISCOMs have catered for a load of 86,823 MU during the FY 2023-24 and for the FY 2024-25 upto 3rd quarter (until 31.12.2024) a demand of 63,148 MU was met. Further, the peak demand met by TGDISCOMs has been increasing viz., 15,499 MW during 2023 (16th March 2023), 15,623 MW during 2024 (on 8th March 2024) and 16,869 MW in 2025 so far (on 7th March 2025). As such, the actual energy requirement of TGDISCOMs for the upcoming financial year is expected to cross the approved figures of the Resource plan.

It is expected that the growth rate of peak load and energy will be more than what has been approved in the Resource Plan, with new loads expected to come from Data Centres, Future City, Moosi River Development Programme, IT offices in Hyderabad and increased Industrial activity in the State. The projections made by CEA in the recent Resource Adequacy Report are as below:

Telangana Energy Requirement (MU)

FY	Telangana Energy Requirement (MU)	Year on Year Growth (%)	Peak Demand Projections (MW)	Year on Year Growth (%)
2025-26	96596	7.51	18138	6.41
2026-27	102732	7.46	19529	6.53
2027-28	108932	7.31	20968	6.38
2028-29	115347	7.23	22488	6.32
2029-30	122627	8.05	24215	6.85
2030-31	128032	5.43	25639	4.58
2031-32	133211	5.38	27059	4.82
2032-33	138600	5.38	28558	4.82
2033-34	144206	5.38	30139	4.82
2034-35	150040	5.38	31809	4.82

Further CEA has given a report on capacity additions required to meet this increase in demand. As per this report, the thermal capacity required by FY 2034-35 is 3890 MW:

FY	Planned Capacity Addition (MW)	Additional Coal requirement (MW)
2024-25		0
2025-26		0
2026-27		0
2027-28		0
2028-29		0
2029-30	1600	0
2030-31	800	0
2031-32		0
2032-33		0
2033-34		842
2034-35		648
Total	**2400**	**1490**

With respect to the financial condition of DISCOMs, it is to submit that TGDISCOMs are facing significant financial challenges, including operational losses, high debt levels, Telangana's power demand has been rising steadily due to rapid

industrialization, urban growth, and increased household electricity consumption.

As per the CEA report, state's power consumption is expected to grow at an annual rate in the range of 5.38% to 8.03% during FY 2025-26 to FY 2034-35, which will continue to put pressure on the existing generation capacity.

It is crucial to highlight that the state government has committed to providing subsidies to key consumer segments, including agriculture and domestic consumers.

Apart from revenue collection on sale of power, DISCOMs are reliant on external borrowings and subsidies from the state government. The state is also considering measures such as restructuring debt to ease the financial burden. This initiative will help improve the liquidity of the DISCOMs and enable them to procure the power necessary to meet demand.

DISCOMs are undertaking measures to improve financial efficiency, including reducing transmission losses, improving billing and collection systems, and reducing operational inefficiencies. These efforts will gradually enhance the financial health of DISCOMs, making power procurement more sustainable in the future.

Despite financial stress, the need for power procurement must be considered a priority to maintain supply and avoid more serious disruptions in service delivery, which could ultimately exacerbate the financial situation.

Failure to procure the required amount of power could result in load shedding or blackouts, which would severely disrupt daily life, particularly for essential services, businesses, and industries. The economic impact of load shedding could be

significant, leading to reduced productivity, loss of business confidence, and ultimately further financial losses for the DISCOMs.

In the event that DISCOMs cannot secure power through long-term procurement agreements, they will be forced to rely on the power exchange or short-term power markets. These sources tend to be more expensive at times than contracted PPAs. Hence, procuring power through more predictable and stable contracts is financially more prudent in the long run.

Therefore, timely procurement is necessary to avoid such disruptions. The proposed power procurement from 1 x 800 MW Telangana STPP Stage-II plant, while mindful of the financial constraints, ensures that the DISCOMs can meet future electricity demand while gradually stabilizing their financial health through government support and efficiency measures.

The Hon'ble Commission is requested to consider the broader context of ensuring electricity supply and the long-term viability of the DISCOMs and approve the proposed power procurement.

Query (c): Load generation balance for ensuing 10 years

Reply: The energy requirement, the energy availability and Surplus/Deficit approved by the State Commission vide order dated 29.12.2023 in the Resource Plan and business Plan for 5th & 6th control period is as abstracted below:

FY	Energy requirement at State level (MU)	Energy Availability at State level (MU)	Surplus/ Deficit (MU)
2024-25	83,058	95,753	12,696
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It is to submit that TGDISCOMs have catered for a load of 86823 MU during the FY 2023-24 and for the FY 2024-25 upto 3rd quarter (until 31.12.2024) a demand of 63148 MU was met. Further, the peak demand met by TGDISCOMs has been increasing viz., 15499 MW during 2023 (16th March 2023), 15623 MW during 2024 (on 8th March 2024) and 16869 MW in 2025 so far (on 7th March 2025). As such, the actual energy requirement of TGDISCOMs for the upcoming financial year is expected to cross the approved figures of the Resource plan.

The estimated energy requirement is expected to enhance further with the advent of new proposals/developments in the State such as-

i) EV policy which requires extending reliable green power supply to EV Charging Stations, thereby promoting adoption of e-mobility in the State;

ii) Establishment of Data Centres;

iii) Extension of Metro Corridor;

Also, CEA in their latest report on Resource Adequacy plan estimated the following energy demand growth of the State of Telangana from FY 2024-25 to FY 2034-35.

FY	Energy Projections (MU)	Growth %
2024-25	90,962	-
2025-26	96,596	7.51
2026-27	1,02,732	7.46
2027-28	1,08,932	7.31
2028-29	1,15,347	7.23
2029-30	1,22,627	8.05
2030-31	1,28,032	5.43

2031-32	1,33,211	5.38
2032-33	1,38,600	5.38
2033-34	1,44,206	5.38
2034-35	1,50,040	5.38

CEA suggested to contract the following additional capacities per year, wherein 3890 MW thermal capacity is proposed till 2034-35 to meet its demand reliably while ensuring fulfilment of RPO obligations

Year wise planned and Year on Year capacity additions for Telangana (MW)				
FY	Coal	Solar	Battery	Wind
2025-26	0	2474	0	0
2026-27	0	0	3973	0
2027-28	0	8700	2026	0
2028-29	0	2000	366	500
2029-30	1600	1841	0	500
2030-31	800	1930	0	500
2031-32	0	1490	0	500
2032-33	0	1319	179	500
2033-34	842	1212	545	500
2034-35	648	1161	493	500

It is to submit the time taken for construction of a 800 MW Thermal Unit will be 50 months for an expansion project and subsequent units will take 6 months time thereafter. As per the information from NTPC, 1st unit (800 MW) of this project will be scheduled to be commissioned during FY 2029-30, if completed as per schedule and by that time, the state of Telangana will be in deficit position with the existing and planned availability of power.

Further it is to submit that CEA made the following observations based on the Resources Adequacy study results.

1. The study was carried for assessing the resource adequacy of Telangana based on the demand projections by Telangana;

2. The study is carried based on the hourly load pattern for the FY 2023-24. The peak demand month is March;

3. Telangana is likely to witness energy deficit throughout the period of study with the existing, planned capacity including the capacity required to meet Renewable Purchase Obligations. It was observed that the total unserved energy in the year 2034-35 is likely to be around 16684 MU. Further, it is expected that the shortfall would be maximum during the non solar hours in the months of February and March;

4. To meet the projected demand reliably, additional 3890 MW from Coal for the period from 2028-29 to FY 2034-35 and 7582 MW from Storage may be required with a planning reserve margin of 18%. Further, study suggests year wise short term/medium term/bilateral requirements to meet the demand optimally;

Query (d): Station wise availability for ensuing 10 years.

Reply: Station wise availability for ensuing 10 years as on February 2025 is enclosed as Annexure-I

Query (e): Present status of the proposed project.

Reply: Limited Letter of Intent (LOI) was issued on 07.11.2024 to BHEL to proceed and BHEL has started the basic engineering.

Public hearing was conducted on 28.01.2025 and minutes issued on 18.02.2025. Environment Clearance (EC) for the project is expected by April 25.

Query (f): Expected COD of the proposed project.

Reply: As informed by NTPC Unit#1 COD is scheduled for 52 months from the date of availability of 100% PPA and grant of EC. COD of the subsequent units is scheduled at an interval of 6 months.

Query (g): Whether there are any new proposal including Renewable Energy and BESS

Reply: The total RE capacity under PPAs for sale of power to TGDISCOMs as on 28.02.2025 is 8402.3 MW which includes installed capacity of 6034.38 MW and upcoming capacity of 2367.92 MW.

MNRE, Govt., of India has sanctioned allocation of 4000 MW to the State of Telangana for implementation under Component-A of PM KUSUM scheme. TGDISCOMs are planning for procurement of 4000 MW (inclusive of 1000 MW capacity for Women Self Help Groups (SHGs) under INDIRA MAHILA SHAKTI SCHEME) under Component-A of PM KUSUM scheme. The details of proposed procurement are yet to be finalized.

MNRE, Govt. of India allocated 500 MWh BESS capacity under the "State Component Scheme for Viability Gap Funding (VGF) for development of BESS" to the State of Telangana. Thereafter, Govt. of Telangana appointed TGGENCO as the implementing Agency. TGDISCOMs conveyed acceptance for establishment of 250 MW/500 MWh Battery Energy Storage System (BESS) by TGGENCO.

Yours faithfully,

Chief Engineer (IPC)/TGSPDCL

Copy to:

1. The Executive Director (Comml.)/TGPCC/Vidyut Soudha/Hyderabad.
2. The Chief Engineer (IPC&RAC)/TGNPDCL/Hanamkonda.

Annexure-I

Query (d): Station wise availability for ensuing 10 years

Sl. No	Name of the Station	FY 2024-25	FY 2025-26	FY 2026-27	FY 2027-28	FY 2028-29	FY 2029-30	FY 2030-31	FY 2031-32	FY 2032-33	FY 2033-34
A	**TSGENCO-Thermal**										
1	KTPS-V	3141.08	3141.08	3141.08	3149.68	3141.08	3141.08	3141.08	3149.68	3141.08	3141.08
2	KTPS-VI	3141.08	3141.08	3141.08	3149.68	3141.08	3141.08	3141.08	3149.68	3141.08	3141.08
3	KTPS-VII	4136.30	4136.30	4136.30	4147.64	4136.30	4136.30	4136.30	4147.64	4136.30	4136.30
4	RTS-B	285.63	285.63	285.63	286.41	285.63	285.63	285.63	286.41	285.63	285.63
5	KTPP-I	3067.21	3067.21	3067.21	3075.61	3067.21	3067.21	3067.21	3075.61	3067.21	3067.21
6	KTPP-II	3680.65	3680.65	3680.65	3690.73	3680.65	3680.65	3680.65	3690.73	3680.65	3680.65
7	BTPS	7317.93	7317.93	7317.93	7322.94	7317.93	7317.93	7317.93	7322.94	7317.93	7317.93
8	YTPS	16846.16	27783.75	27891.00	27964.00	27891.00	27891.00	27891.00	27964.00	27891.00	27891.00
	Sub-Total	**41616.03**	**52553.62**	**52660.87**	**52786.70**	**52660.87**	**52660.87**	**52660.87**	**52786.70**	**52660.87**	**52660.87**
B	**TSGENCO- Inter State**										
1	PJHES	241.67	243.88	265.40	271.17	277.00	277.00	277.00	277.00	277.00	277.00
	Sub-Total	**241.67**	**243.88**	**265.40**	**271.17**	**277.00**	**277.00**	**277.00**	**277.00**	**277.00**	**277.00**
C	**TSGENCO- Hydel**										
1	NagarjunaSagar complex	1024.75	1020.72	1107.75	1193.75	1290.69	1290.69	1290.69	1290.69	1290.69	1290.69
2	SLBHES	1123.94	1123.94	1123.94	1123.94	1123.94	1123.94	1123.94	1123.94	1123.94	1123.94
3	LJHES	242.90	242.90	242.90	242.90	242.90	242.90	242.90	242.90	242.90	242.90
4	PCHES	255.60	287.46	322.30	359.13	397.95	397.95	397.95	397.95	397.95	397.95
5	Pochampad-II	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Small Hydel (Singur, Nizam, Pochampad-I, Paliar)	107.63	107.71	107.80	107.89	107.90	107.90	107.90	107.90	107.90	107.90
7	Mini Hydel (Peddapalli)	2.42	2.79	2.30	2.44	2.44	2.44	2.44	2.44	2.44	2.44
	Sub-Total	**2757.24**	**2785.52**	**2906.99**	**3030.05**	**3165.82**	**3165.82**	**3165.82**	**3165.82**	**3165.82**	**3165.82**
	Total TSGENCO	**44614.94**	**55583.02**	**55833.26**	**56087.92**	**56103.69**	**56103.69**	**56103.69**	**56229.52**	**56103.69**	**56103.69**
A	**CGS-Thermal**										

Sl. No	Name of the Station	FY 2024-25	FY 2025-26	FY 2026-27	FY 2027-28	FY 2028-29	FY 2029-30	FY 2030-31	FY 2031-32	FY 2032-33	FY 2033-34
1	NTPC Ramagundam Stage I&II	2220.90	2220.90	2220.90	2226.99	2220.90	2220.90	2220.90	2226.99	2220.90	2220.90
2	NTPC Ramagundam Stage III	523.67	439.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	NTPC Talcher TPS II	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	NTPC Simhadri stage-I	2852.52	2852.52	2852.52	2610.25	0.00	0.00	0.00	0.00	0.00	0.00
5	NTPC Simhadri stage-II	1359.30	1359.30	1359.30	1363.03	1359.30	1359.30	1359.30	1363.03	1359.30	1359.30
6	NTPC Kudgi	805.42	805.42	805.42	807.63	805.42	805.42	805.42	807.63	805.42	805.42
7	NLC TPS-II Stage-I	28.69	28.69	28.69	28.76	28.69	25.62	0.00	0.00	0.00	0.00
8	NLC TPS-II Stage-II	39.54	39.54	39.54	39.65	39.54	35.32	39.54	39.65	39.54	39.54
9	NNTPP	376.28	376.28	376.28	377.31	376.28	376.28	376.28	377.31	376.28	376.28
10	Neyveli new Unit-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	Neyveli new Unit-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	TSTPP Unit-1	6054.29	6054.29	6054.29	6070.88	6054.29	6054.29	6054.29	6070.88	6054.29	6054.29
13	NTECL Vallur TPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	NLC Tamil Nadu Power Ltd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Sub-Total	**14260.61**	**14175.96**	**13736.94**	**13524.49**	**10884.42**	**10877.13**	**10855.73**	**10885.48**	**10855.73**	**10855.73**
B.	**CGS-Nuclear**										
1	NPC Madra APS	67.95	67.95	49.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	NPC Kaiga APS Units 1&2	491.43	491.43	359.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	NPC Kaiga APS Units 3&4	522.72	522.72	382.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	NPC Kudankulam	161.02	161.02	161.02	161.46	161.02	161.02	161.02	161.46	161.02	161.02
5	NPC Kudankulam NPP Unit-2	161.02	161.02	161.02	161.46	161.02	161.02	161.02	161.46	161.02	161.02

Sl. No	Name of the Station	FY 2024-25	FY 2025-26	FY 2026-27	FY 2027-28	FY 2028-29	FY 2029-30	FY 2030-31	FY 2031-32	FY 2032-33	FY 2033-34
	Sub-Total	**1404.15**	**1404.15**	**1113.61**	**322.93**	**322.04**	**322.04**	**322.04**	**322.93**	**322.04**	**322.04**
B.	**Bundled Power (Coal)**										
1	JNNSM Phase-1	45.43	45.43	45.43	45.56	45.43	45.43	45.43	45.56	45.43	45.43
2	NTPC	805.11	805.11	805.11	807.32	805.11	805.11	805.11	807.32	805.11	805.11
	Sub-Total	**850.55**	**850.55**	**850.55**	**852.88**	**850.55**	**850.55**	**850.55**	**852.88**	**850.55**	**850.55**
	Total CGS	**16515.31**	**16430.66**	**15701.10**	**14700.29**	**12057.01**	**12049.72**	**12028.32**	**12061.28**	**12028.32**	**12028.32**
A	**Others**										
1	SEIL (LT-1)	1957.46	1957.46	1957.46	1962.83	1957.46	1957.46	1957.46	1962.83	1957.46	1957.46
2	SEIL (LT-2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	STPP	8739.33	8739.33	8739.33	8763.28	8739.33	8739.33	8739.33	8763.28	8739.33	8739.33
4	CSPDCL	0.00	5349.16	6420.74	6438.33	6420.74	1073.06	0.00	0.00	0.00	0.00
5	PTC (MT)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total Others	**10696.79**	**16045.95**	**17117.54**	**17164.43**	**17117.54**	**11769.85**	**10696.80**	**10726.10**	**10696.80**	**10696.80**
C	**NCE**										
1	Biomass	38.26	38.26	38.26	38.37	38.26	38.26	38.26	38.37	38.26	38.26
2	Bagasse	296.98	296.98	296.98	297.80	296.98	296.98	296.98	297.80	296.98	296.98
3	Municipal Waste	392.94	392.94	392.94	394.02	392.94	392.94	392.94	394.02	392.94	392.94
4	Industrial Waste	121.17	121.17	121.17	121.50	121.17	121.17	121.17	121.50	121.17	121.17
5	Wind	277.52	277.52	277.52	278.28	277.52	277.52	277.52	278.28	277.52	277.52
6	Mini Hydel	11.71	11.71	11.71	11.74	11.71	11.71	11.71	11.74	11.71	11.71
7	Solar	6222.13	6222.13	6222.13	6239.18	6222.13	6222.13	6222.13	6239.18	6222.13	6222.13
8	Solar (JNNSM Phase-I)	5988.04	5988.04	5988.04	6004.44	5988.04	5988.04	5988.04	6004.44	5988.04	5988.04
9	Solar (NTPC)	1093.91	1093.91	1093.91	1096.90	1093.91	1093.91	1093.91	1096.90	1093.91	1093.91
10	Solar (SECI)	3062.93	3062.93	3062.93	3071.33	3062.93	3062.93	3062.93	3071.33	3062.93	3062.93
11	Solar (NTPC,NHPC, CPSU) Tr-III 1545 MW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	Solar (PM KUSUSM)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	Solar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Sl. No	Name of the Station	FY 2024-25	FY 2025-26	FY 2026-27	FY 2027-28	FY 2028-29	FY 2029-30	FY 2030-31	FY 2031-32	FY 2032-33	FY 2033-34
	(NTPC CPSU) Tr-I&II 1692 MW										
14	Solar (SECI ISTS-IX)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total NCE	**17505.58**	**17505.58**	**17505.58**	**17553.54**	**17505.58**	**17505.58**	**17505.58**	**17553.54**	**17505.58**	**17505.58**
	Grand Total	**89332.62**	**105565.2**	**106157.48**	**105506.19**	**102783.82**	**97428.84**	**96334.39**	**96570.44**	**96334.39**	**96334.39**

Report On
Resource Adequacy Plan
For the State of
Telangana
(2024-25 to 2034-35)

Government of India
Ministry of Power
Central Electricity Authority

Contents

Executive Summary

As per Rule 16 of the Electricity (Amendment) Rules 2022, Ministry of Power has notified Resource Adequacy guidelines. As per the Resource Adequacy (RA) Guidelines, Central Electricity Authority is entrusted to prepare Long Term-National Resource Adequacy Plan (LT-NRAP). Further Distribution Utility need to carry out LT-DRAP (Long-term Distribution Licensee Resource Adequacy Plan) to meet the utility peak and energy requirement reliably.

As per the Resource Adequacy Guidelines, each Distribution licensee shall undertake a Resource Adequacy Plan (RAP) for a 10-year horizon (Long-term Distribution Licensee Resource Adequacy Plan (LT-DRAP)) to meet their own peak and electrical energy requirement. The plan shall be vetted/validated by Central Electricity Authority for leveraging the benefit of national level optimization for the Distribution licensees. The LT-DRAP shall be carried out by the distribution licensees on an annual rolling basis considering the contracted capacity as a part of the system and shall optimize for additional capacity required.

Generation Capacity expansion study have been carried out considering existing capacity, planned capacity & capacity required to fulfil the Renewable Purchase Obligations (RPO) as per the MoP order issued in Oct 2023. It was observed that the total unserved energy in the year 2034-35 is expected to be about 16,684 MU which is about 11.12% of annual energy during the year 2034-35 and primarily observed in the months of February and March.

Therefore, to meet the demand in least cost , generation capacity expansion studies for the period 2025-26 to 2034-35, for the State of Telangana have been carried with an objective to minimize the total system cost of generation including the cost of anticipated future investments while fulfilling all the technical/financial constraints associated with various power generation technologies to meet the demand reliably. Then, Reliability study has been carried out to determine the probability of Unmet demand and hours by implementing the variation in demand, RE (Solar, Wind) and forced outage of thermal generators (Coal, gas) etc. Thus, the Resource adequacy studies have projected likely optimal capacity mix for future years till 2034-35 which is able to meet anticipated demand reliably at every instance while meeting Renewable Purchase Obligations (RPO).

1.0 Introduction

Ministry of Power has notified Electricity (Amendment) Rules, 2022 in December 2022. Rule 16 (I) of the said rules stipulates that "A guideline for assessment of resource adequacy during the generation planning stage (one year or beyond) as well as during the operational planning stage (up to one year) shall be issued by the Central Government in consultation with the Authority". Accordingly, the Resource Adequacy Guidelines were notified in June 2023 by the Ministry of Power in consultation with Central Electricity Authority.

Resource Adequacy is generally defined as a mechanism to ensure that there is an adequate supply of generation resources to serve expected demand reliably at the least cost. A key aspect of resource adequacy planning is to ensure that adequate generation capacities are available round-the-clock to reliably serve demand under various scenarios. This naturally translates into the need for ensuring adequate reserve margin, which could cater to varying levels of demand and supply conditions in the grid. In the wake of high RE generation, it is important to understand demand-supply situation in the grid precisely due to high seasonality and intermittency in RE generation. Resource Adequacy exercise may also help in assessment of capacity requirement to be tied up or contracted on long term, medium term, and short-term basis.

Further, Ministry of Power vide notification dated 20th October 2023 had notified the RPO trajectory for the states. Based on the trajectory specified the hydro, wind and other (solar, biomass etc.) RPO quantum in million units (MUs) has been calculated to find additional quantum of renewable capacity that the states have to contract in addition to its existing/planned capacity to meet their RPO targets.

Resource Adequacy studies has been carried out for Telangana based on the inputs received from SLDC (Telangana) while fulfilling RPO trajectory. The study suggests the optimal resource mix till 2034-35 taking into account all technical and financial parameters associated with capacities. The study optimizes power purchase on a long-term basis while evaluating resource adequacy for meeting the demand 24 X 7 considering variation in demand, RE generation and forced outages of thermal capacities. The study has also assessed the requirement of Planning Reserve margin for Telangana for catering to above highlighted uncertainties so that demand can be met reliably throughout the year.

2.0 Telangana RA Study

2.1 Present Power Scenario in Telangana

The current Power Supply Position for Telangana is shown in the Table 1 below:

Table 1 Power Supply Position

Power Supply Position						
Year	**Energy required (MU)**	**Energy Supplied (MU)**	**Gap(MU)**	**Peak Demand (MW)**	**Peak Met (MW)**	**Demand Not Met (MW)**
2021-22	70,539	70,523	16	14,163	14,160	3
2022-23	77,832	77,799	34	15,497	15,497	0
2023-24	84,623	84,613	9	15,622	15,622	0

As of March 2024, the total contracted capacity for Telangana is 18958 MW. Out of the total contracted capacity (CC), the share of non-fossil fuel-based CC is 46%.

The fuel-wise contracted capacity as on March 2024 is given in Table 2 and Figure 1 below:

Table 2 Fuel-wise Contracted Capacity as on March 2024

Technology	**Contracted Capacity**	**%**
COAL	9791	52%
GAS	474	2%
NUCLEAR	214	1%
HYDRO	2518	13%
WIND	128	1%
SOLAR	4974	26%
NON-CONVENTIONAL ENERGY SOURCE (NCES)	121	1%
DRE	738	4%
Total	**18958**	**100%**

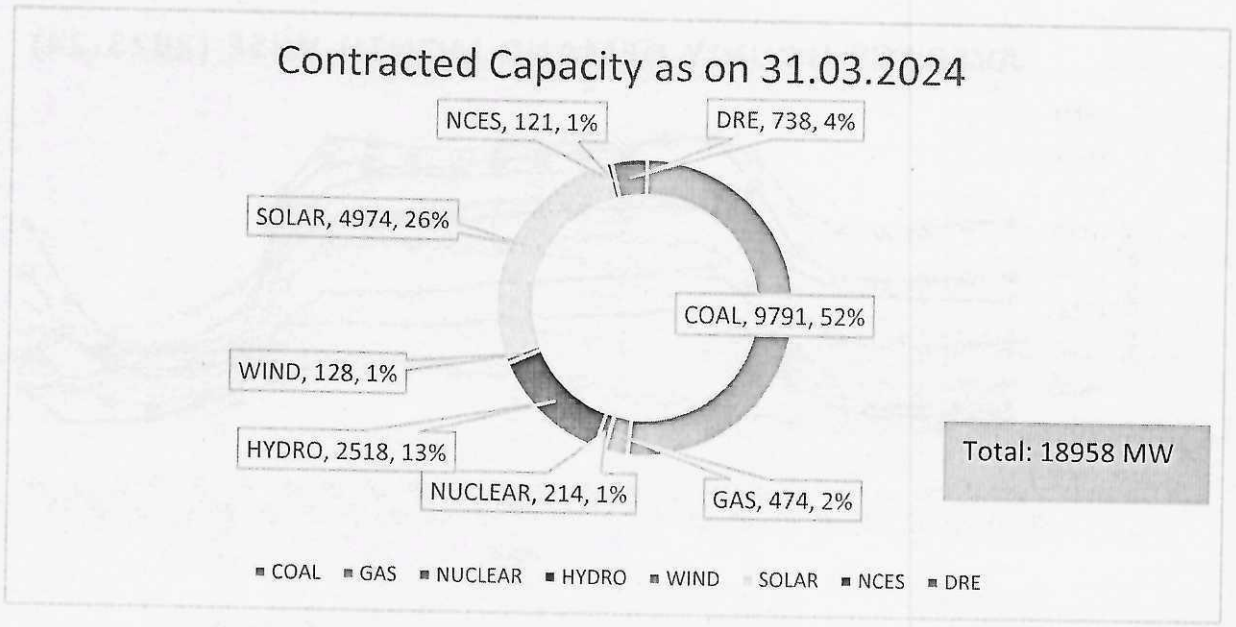


Figure 1 Fuel-wise Contracted Capacity (in MW) as of Mar 2024

2.2 Present Demand Analysis (2023-24)

The hourly demand pattern of 2023-24 was analyzed (as shown in Figure 2 and Figure 3), and it was observed that the peak demand for Telangana occurs in the months of February and March. The Demand Pattern of Telangana indicates that the state has a higher Day peak in comparison to its Night Peak, with the daily peak mostly occurring during the 11:00 Hrs to 15:00 Hrs. Further, the demand pattern remains almost flat during the noon hours.

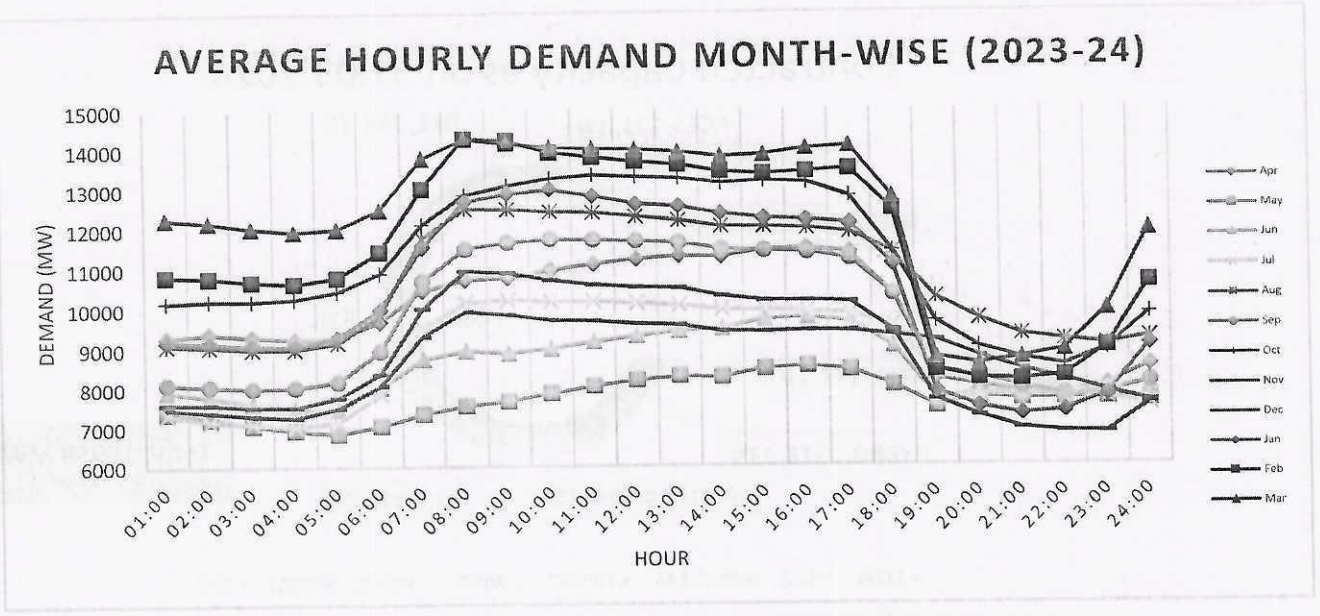


Figure 2 Average Hourly Demand Variation (Month-wise) of Telangana for 2023-24

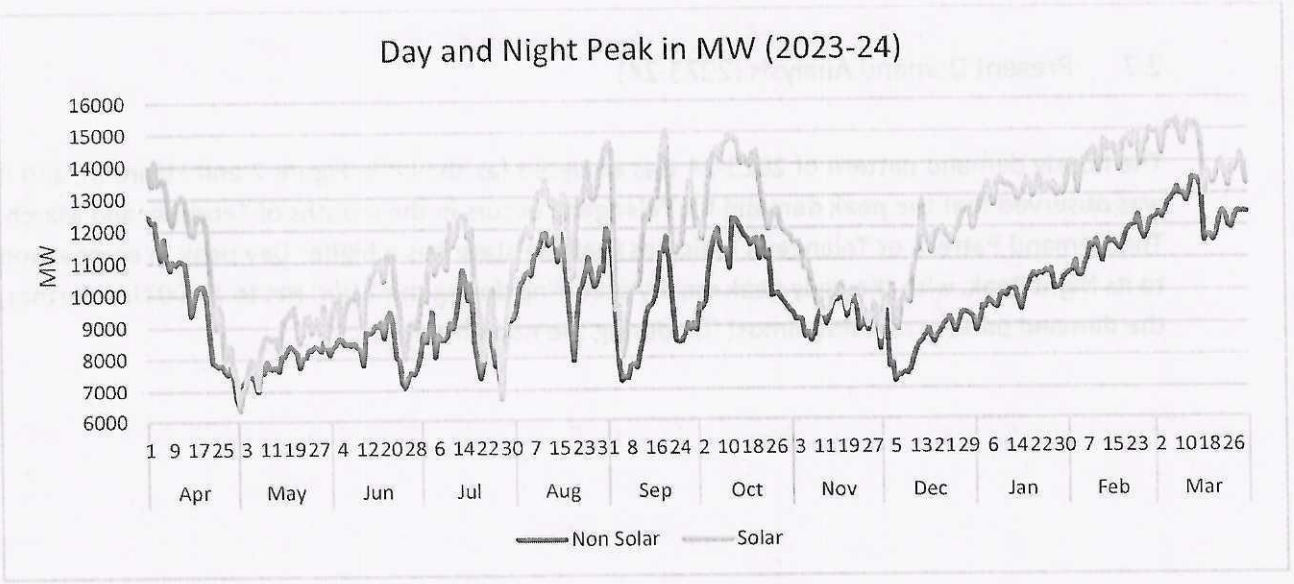


Figure 3 Day and Night Peak in MW of Telangana (2023-24)

The hourly demand pattern of 2023-24 was analysed (Figure 4) for finding out the number of occurrences of the peak and near peak demand. Such instances are critical for study purpose as it is necessary to ensure resource adequacy during such instances with an optimal mix of long-term, medium-term and short-term contracts.

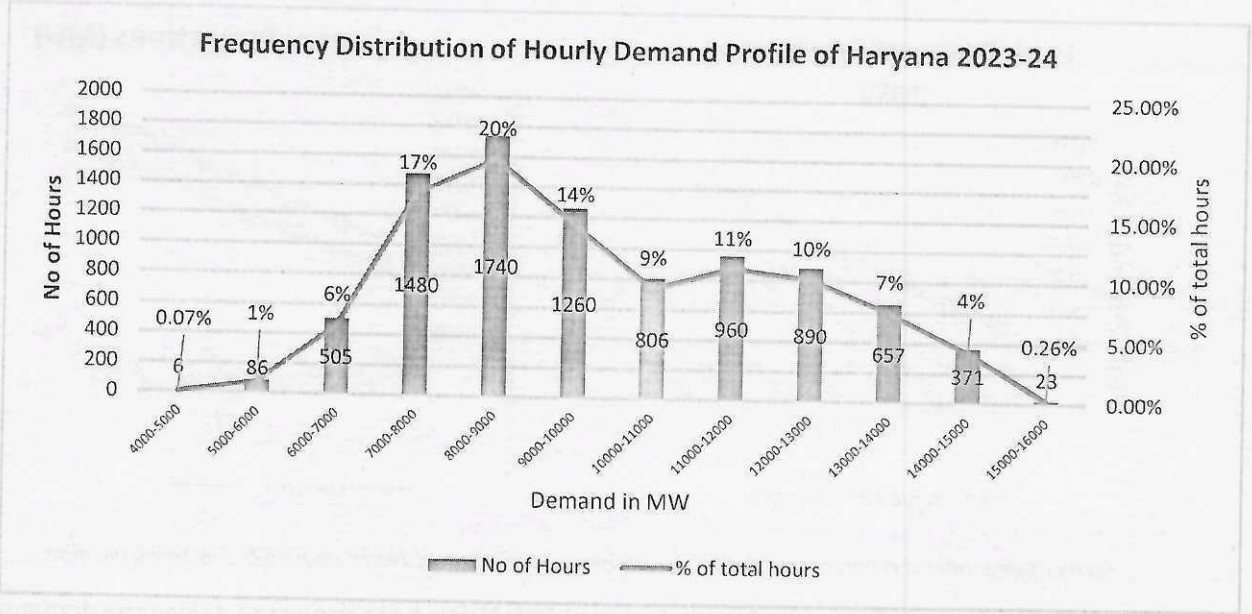


Figure 4 Frequency Distribution of Hourly Demand Profile of Telangana 2023-24

3.0 Inputs/Assumptions for the Study

i) Peak and Energy Demand for the State of Telangana, as furnished by the utility, were compared with the 20th EPS (Electric Power Survey) projections (Table 3). The Demand estimation by 20th EPS was found to be lower than projected by Telangana as shown in Figure 5. Therefore, the Studies have been carried out using the projections received from Telangana.

Table 3 Future Demand Projection by Telangana

	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34	2034-35
Energy Projections (MU)	85644 (84623*)	90962	96596	102732	108932	115347	122627	128032	133211	138600	144206	150040
Year on Year Growth			7.51%	7.46%	7.31%	7.23%	8.05%	5.43%	5.38%	5.38%	5.38%	5.38%
Peak Demand Projections (MW)	15623 (15622*)	16877	18138	19529	20968	22488	24215	25639	27059	28558	30139	31809
Year on Year Growth			6.41%	6.53%	6.38%	6.32%	6.85%	4.58%	4.82%	4.82%	4.82%	4.82%

**Actual Demand Observed in FY 2023-24*

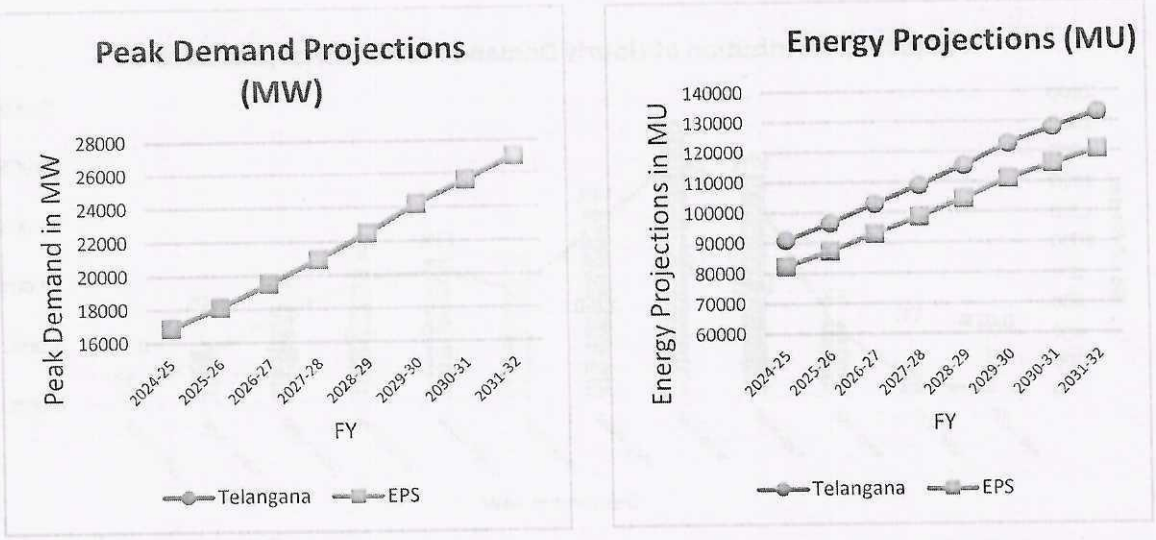


Figure 5 Comparison of Energy Requirement and peak Demand Projections of 20th EPS vs furnished by Telangana state

ii) Future hourly demand profile till the year 2034-35 has been projected, taking the demand profile of FY 2023-24 as a base profile.

iii) The actual hourly solar and wind generation profiles have been referred to as per the inputs received from SLDC, Telangana.

iv) Capital cost of candidate plants for Coal, Wind, Solar, Battery and PSP, considered as investment options for the studies, have been referred from National Electricity Plan 2022-32(Vol-I generation).

v) Existing, Planned, and Expiring Capacity Due to PPA Termination/Retirement: As per the information received from Telangana as shown in Table 2, Table 4(a) and Table 4(b) respectively.

Table 4(a) Year on Year source wise planned capacity addition

FY	COAL	SOLAR	DRE	Total
2024/25	2284	2281	82	**4646**
2025/26	2400	619	96	**3115**
2026/27	0	0	116	**116**
2027/28	0	0	139	**139**
2028/29	0	0	166	**166**
2029/30	0	0	200	**200**
2030/31	0	0	240	**240**
2031/32	0	0	287	**287**
2032/33	0	0	345	**345**
2033/34	0	0	414	**414**
2034/35	0	0	497	**497**
TOTAL	**4684**	**2899**	**2581**	**10164**

Table 4(b) Year on Year source wise capacity expiration

FY	COAL	GAS	NUCLEAR	DRE	NCES	Total
2024/25	0	358	0	0	0	**358**
2025/26	0	250	0	1	0	**251**
2026/27	88	0	0	0	0	**88**
2027/28	0	0	160	2	0	**162**
2028/29	539	0	0	0	6	**545**
2029/30	1063	199	0	0	38	**1299**
2030/31	227	0	0	0	0	**227**
2031/32	0	0	0	0	0	**0**
2032/33	0	0	0	0	8	**8**
2033/34	0	0	0	0	0	**0**
2034/35	0	0	0	0	0	**0**
TOTAL	**1916**	**807**	**160**	**3**	**51**	**2938**

vi) **Renewable Purchase Obligation (RPO) trajectory**: Ministry of Power gazette notification dated 20th October 2023 had notified the source-wise minimum share of consumption of non-fossil sources (renewable energy) by designated consumers till the year 2029-30. In view of the country's energy transition goals as well as the long-term net zero target of 2070, it is estimated that the share of RE generation in the generation mix will continue to increase beyond 2029-30. Therefore, the RPO trajectory is assumed to rise steadily beyond 2029-30, and hence, RPO targets till 2034-35 are considered as given below in Table 5:

*Table 5 Renewable Purchase Obligation (RPO) trajectory as per MoP order**

Sl. No.	Year	Wind renewable energy	Hydro renewable energy	Other renewable energy	Distributed renewable energy	Total renewable energy
(1)	(2)	(3)	(4)	(6)	(5)	(7)
1.	2024-25	0.67%	0.38%	27.35%	1.5%	29.91%
2.	2025-26	1.45%	1.22%	28.24%	2.1%	33.01%
3.	2026-27	1.97%	1.34%	29.94%	2.7%	35.95%
4.	2027-28	2.45%	1.42%	31.64%	3.3%	38.81%
5.	2028-29	2.95%	1.42%	33.10%	3.9%	41.36%
6.	2029-30	3.48%	1.33%	34.02%	4.5%	43.33%
7.	2030-31	40.50%			5.0%	45.50%
8.	2031-32	41.50%			5.5%	47.00%
9.	2032-33	42.30%			6.0%	48.30%
10.	2033-34	43.00%			6.5%	49.50%
11.	2034-35	43.50%			7.0%	50.50%

*Trajectory for RPO till 2029-30 as per MoP RPO order notified in October,2023. After 2029-30, RPO targets assumed based on anticipated RE capacity requirement on national level given in National Electricity Plan 2022-32, (Vol-I Generation)

Based on the trajectory specified, RPO quantum in million units (MUs) from hydro, wind, other (solar, biomass etc.) and distributed renewable energy (DRE) is calculated and tabulated below in Table 6:

*Table 6 Total Energy required to meet RPO (MU)**

Sl. No.	Year	Wind renewable energy (MU)	Hydro renewable energy	Other renewable energy	Distributed renewable energy	Total renewable energy
(1)	(2)	(3)	(4)	(6)	(5)	(7)
1	**2024-25**	609	346	24878	1364	27207
2	**2025-26**	1401	1178	27279	2029	31886
3	**2026-27**	2024	1377	30758	2774	36932
4	**2027-28**	2669	1547	34466	3595	42277
5	**2028-29**	3403	1638	38180	4499	47707
6	**2029-30**	4267	1631	41718	5518	53134
7	**2030-31**	51853			6402	58254
8	**2031-32**	55283			7327	62609
9	**2032-33**	58628			8316	66944
10	**2033-34**	62009			9373	71382
11	**2034-35**	65267			10503	75770

*Considering the fungibility aspect of RPO targets among Wind, Hydro and other RE generation

The year-wise total renewable energy met with the existing and planned capacity along with the deficit is shown in Table 7 below:

Table 7 Renewable Energy Deficit

FY	Renewable energy required to meet RPO	Renewable energy required to meet RPO	Renewable energy available	Renewable energy available	Surplus(+)/ Deficit (-)
	(MU)	(%)	(MU)	(%)	(%)
2024/25	27207	29.91%	20227	22.24%	-7.67%
2025/26	31886	33.01%	21627	22.39%	-10.62%
2026/27	36932	35.95%	21764	21.19%	-14.76%
2027/28	42277	38.81%	21877	20.08%	-18.73%
2028/29	47707	41.36%	22030	19.10%	-22.26%
2029/30	53134	43.33%	22189	18.09%	-25.24%
2030/31	58254	45.50%	22481	17.56%	-27.94%
2031/32	62609	47.00%	22835	17.14%	-29.86%
2032/33	66944	48.30%	23255	16.78%	-31.52%
2033/34	71382	49.50%	23779	16.49%	-33.01%
2034/35	75770	50.50%	24406	16.27%	-34.23%

Accordingly, the additional source wise MW requirement considering the fungibility aspects in the RPO has been estimated by the model as tabulated below in Table 8:

Table 8 As per RPO trajectory, Telangana needs to add/contract following additional capacity (MW).

FY	WIND	SOLAR	DRE	TOTAL
2024/25	400	3000	331	**3731**
2025/26	400	1500	425	**2325**
2026/27	400	1500	469	**2369**
2027/28	400	2000	506	**2906**
2028/29	400	2000	543	**2943**
2029/30	400	2000	601	**3001**
2030/31	400	2000	454	**2854**
2031/32	400	1000	438	**1838**
2032/33	400	1000	431	**1831**
2033/34	400	1000	416	**1816**
2034/35	400	1500	390	**2290**
TOTAL	**4400**	**18500**	**5004**	**27904**

Thus, the future RE capacity tie-ups planned by the state are 5480 MW (2899 MW Solar and 2581 MW DRE). In order to meet the RPO trajectory, the study suggests addition of 27904 MW (4400 MW Wind, 18500 MW Solar and 5004 MW DRE).

4.0 Reliability Analysis

One of the main criteria of resource adequacy studies is to determine the reliability of the system to meet the demand adequately at instance of time. This reliability is measured via two indices (i.e.) LOLP (Loss of Load Probability) and EENS (Expected Energy Not Served). These indices have been defined in resource adequacy guidelines as below:

- **Loss of Load Probability (LOLP)**: Measure of the probability that a system's load may exceed the generation and firm power contracts available to meet that load in a year. For the purpose of this study, 0.2% LOLP has been considered.
- **Expected Energy Not Served (EENS):** Expected amount of energy (MWh) that may not be served for each year within the planning period under study. It is a summation of the expected number of megawatt hours of demand that may not be served for the year. This is an energy-centric metric that considers the magnitude and duration of energy being not served, calculated in Mega Watt hours (MWh). The metric can be normalized (i.e., divided by total system load) to create a Normalized Energy Not Served (NENS) metric. For the purpose of this study, 0.05% EENS has been considered.

Monte Carlo /Stochastic simulation has been used to factor-in the uncertainty associated with various generation resources and demand. It is an approach which is used to predict the probability of a variety of outcomes when the potential for random variables is present as compared to deterministic modelling of economic dispatch model. Monte Carlo simulation helps in analysing the randomness associated with RE energy resource, demand pattern changes and forced outages of plant. A large no of random samples of these variables are simultaneously simulated to ascertain system reliability indices (i.e. Loss of load probability LOLP & Energy Not Served (ENS)) & the system robustness in case of above variation of system parameters.

Planning Reserve Margin (PRM): To meet the prescribed standard of LOLP / NENS conditions, sufficient reserve margins need to be maintained in the system for adequately addressing the demand and supply variations. Planning Reserve Margin (PRM) is the predominant metric used to ensure adequacy of generation resources in the system. PRM in a power system is expressed as a certain % of peak load forecast of the system.

4.1 Demand variation:

The hourly demand variation for consecutive years (i.e., 2022-23 and 2023-24) has been analyzed. The Demand pattern variation of 2022-23 and 2023-24 is shown below in Figure 6.

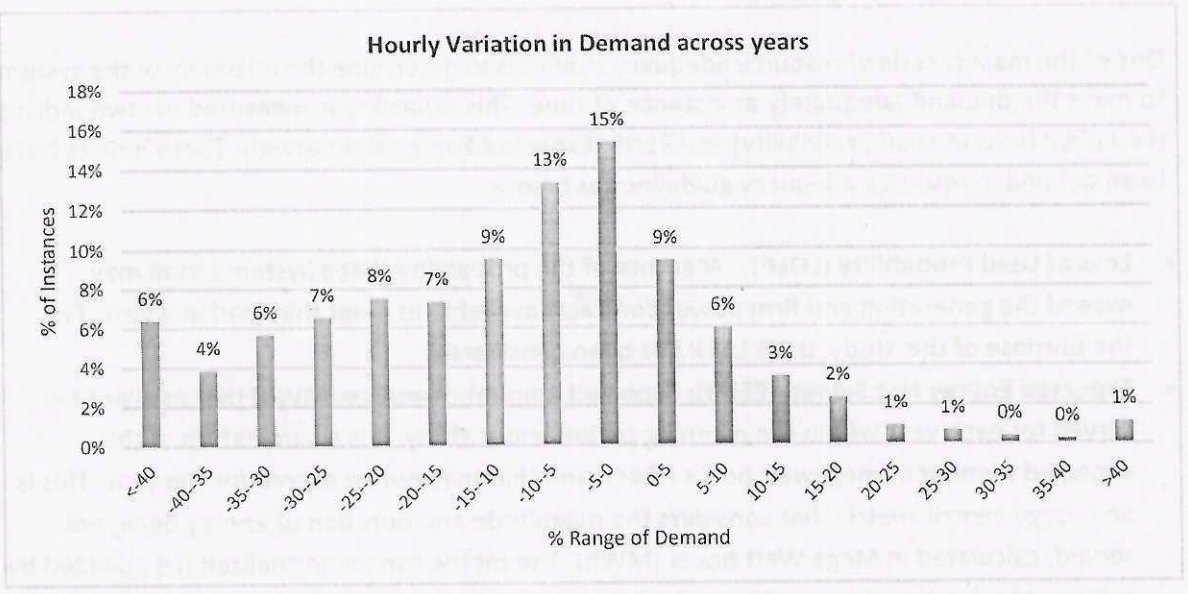


Figure 6 Hourly Variation in Demand across years

It can be observed that the hourly demand typically varies ±25% for 75% of instances. This variation is primarily due to temperature, weather parameter or any random outages of

transmission line and generation units etc. This variation has been captured in the reliability study by varying the projected hourly demand for the future years by varying ±25% by introducing a random variable (with normal distribution) for demand as per observed behavior over the years.

4.2 RE variation

In the Long-term capacity expansion planning studies, a particular profile for Solar and Wind Plants are considered based on the observed solar and wind generation data to determine the optimal capacity mix. However, due to intermittent nature of these sources the generation from these non-dispatchable sources may vary across years. As per the analyses carried out based on historical generation data, solar generation and wind generation has been varied by 10 % and 50% respectively to incorporate the variation in these generation sources and plan for requisite measures to mitigate such behavior.

4.3 Forced Outage of Thermal Generators

The average forced outage rate of thermal generators is typically at 10% with ±5% variation. The same has been incorporated in the model.

Based on these variations, reliability studies are carried out to ascertain robustness of the system. The LOLP & EENS of the system is within specified range.

5.0 Results of the study

5.1 Unserved Demand Projections

The study was carried out considering existing capacity and planned capacity only while meeting the annual RPO obligations. It was observed that the total unserved energy in the year 2034-35 is about 16684 MU. The yearly likely unserved energy with the planned capacities is given below in Figure 7.

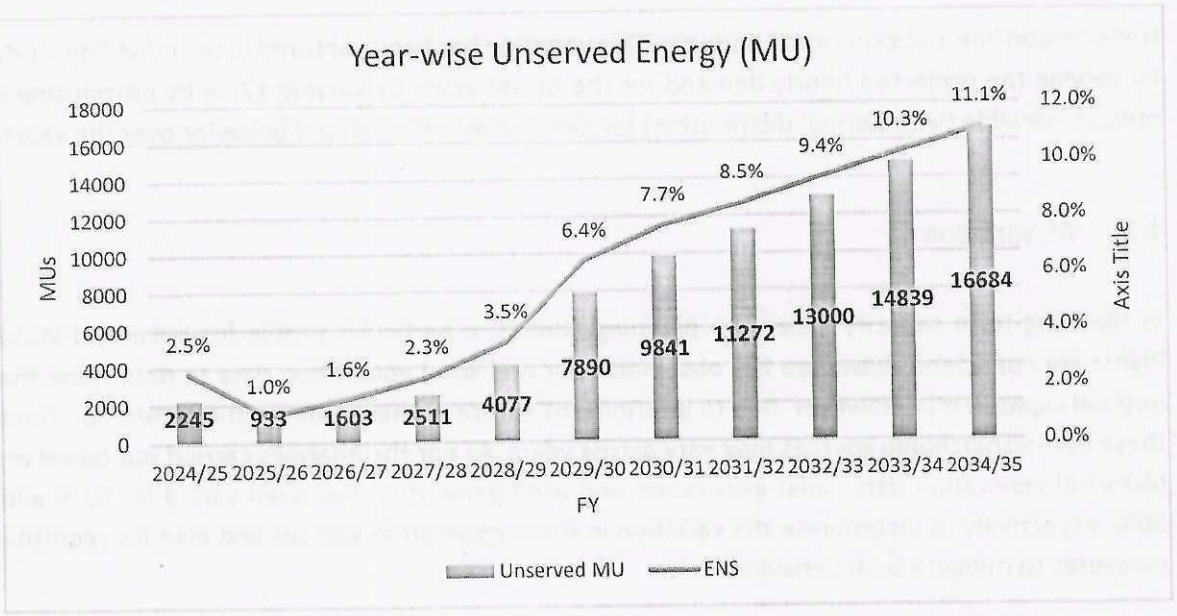


Figure 7 Yearly likely unserved energy with the planned capacities for Telangana (in MU)

The study has also analyzed the Aggregated Hourly Unserved Energy for Telangana in the year 2034-35, it can be seen from Figure 8 that the unserved energy coincides with peak demand months when the contracted capacity (present, planned and additional RE for RPO) is unable to meet the demand.

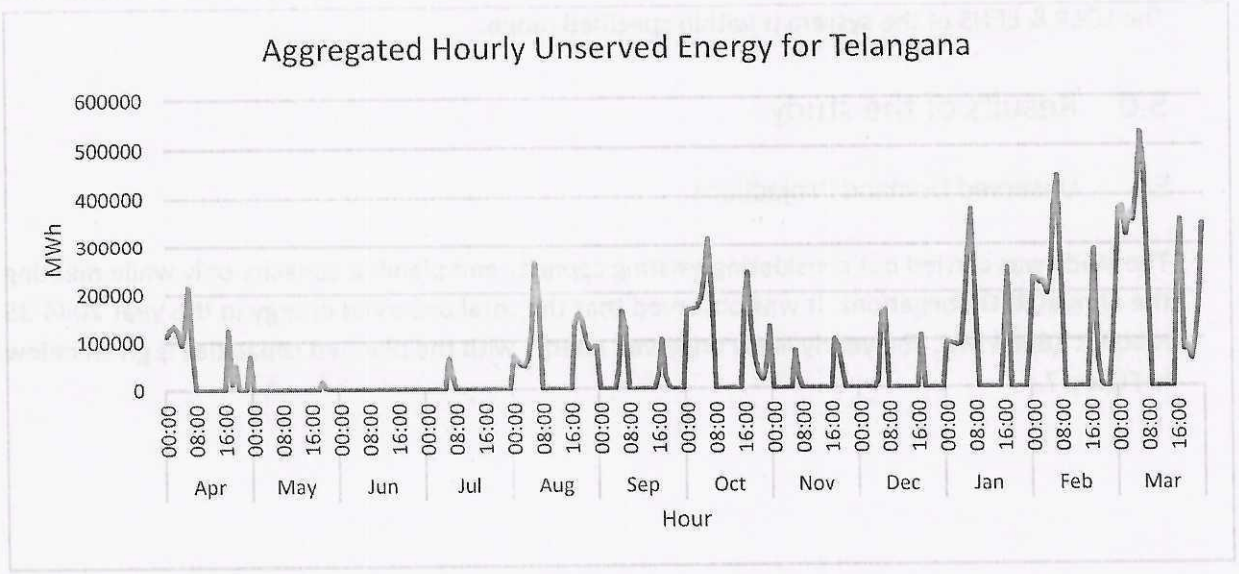


Figure 8 Aggregated Hourly Unserved Energy MWh (2034-35)

5.2 Capacity Mix Projection

The study was carried out considering existing capacity, planned capacity and additional capacity required to fulfil the RPO obligations.

The year wise capacity projections for Telangana are given below in Table 9 and Figure 9:

Table 9 Year-wise contracted capacity projections (in MW)

Year	COAL	GAS	NUCLEAR	HYDRO	WIND	SOLAR	STORAGE	DRE	NCES	STOA
2024/25	11391	474	214	2518	528	10255	0	1073	121	4219
2025/26	13791	224	214	2518	928	12374	0	1594	121	4535
2026/27	13703	224	214	2518	1328	13874	1979	2179	121	3906
2027/28	13703	224	54	2518	1728	15874	2548	2821	121	4607
2028/29	15366	224	54	2518	2128	17874	3326	3530	115	3787
2029/30	15893	25	54	2518	2528	19874	3805	4330	77	4449
2030/31	15849	25	54	2518	2928	21874	4378	5024	77	5062
2031/32	15928	25	54	2518	3328	22874	5400	5749	77	5346
2032/33	16349	25	54	2518	3728	23874	6566	6526	70	5299
2033/34	16783	25	54	2518	4128	24874	7918	7356	70	5147
2034/35	16966	25	54	2518	4528	26374	7918	8242	70	6500

The projected contracted capacity mix, year-wise is given below in the Figure 9:

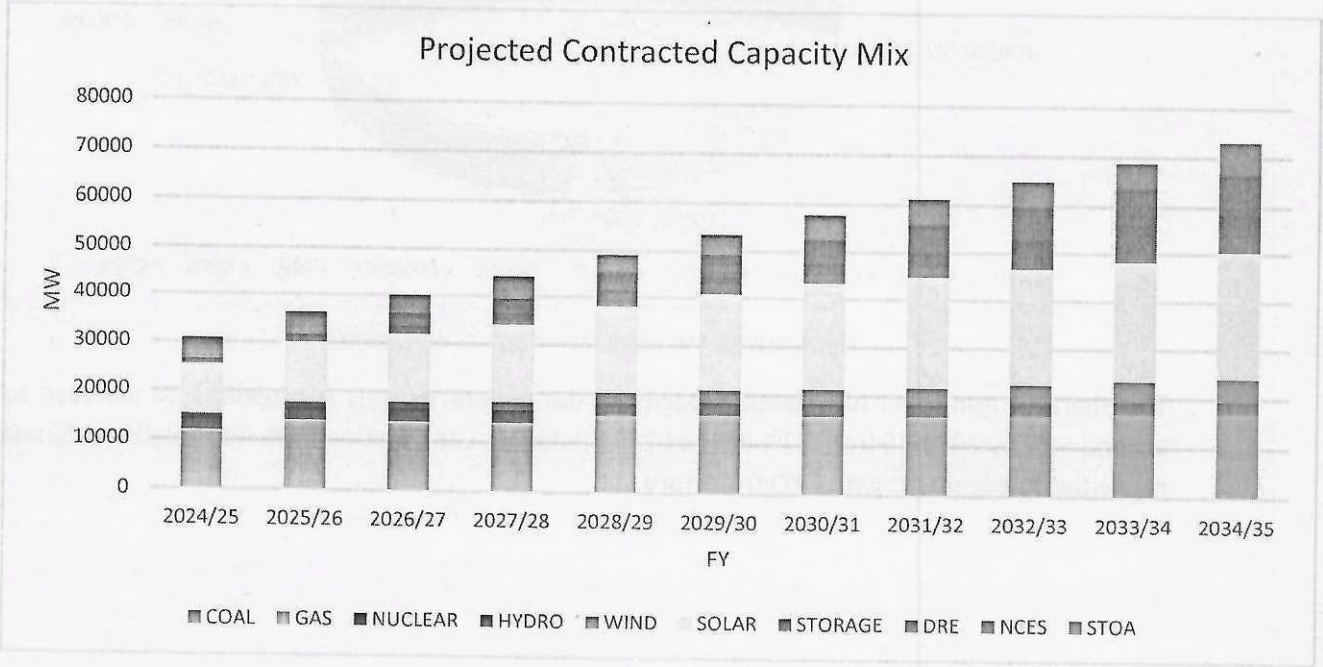


Figure 9 Projected Contracted Capacity Mix Year-wise (MW) for Telangana

As per the Resource Adequacy studies, the total projected contracted Capacity for the year 2034-35 is 58,776 MW (as shown in Figure 10) which consists of 16966 MW from Coal, 25 MW from Gas, 54 MW from Nuclear, 70 MW from NCES, 2518 MW from Hydro, 26374 MW from Solar, 4528 MW from Wind and 8242 MW from DRE. Additionally, 7918 MW/ 38,432 MWh of Storage and 6500 MW from short term/medium term/bilateral arrangements would be required to meet the state demand reliably. This capacity shall be able to meet the projected demand with prescribed reliability criteria.

The Reliability studies have been carried out to adhere to the reliability criteria of LoLP and NENS as provided in NEP (0.2% and 0.05% respectively). The PRM for the state of Telangana has been assessed as 18% for the year 2034-35. In addition, the projected/contracted capacity fulfils the stipulated Renewable Purchase Obligation and aforementioned reliability criteria.

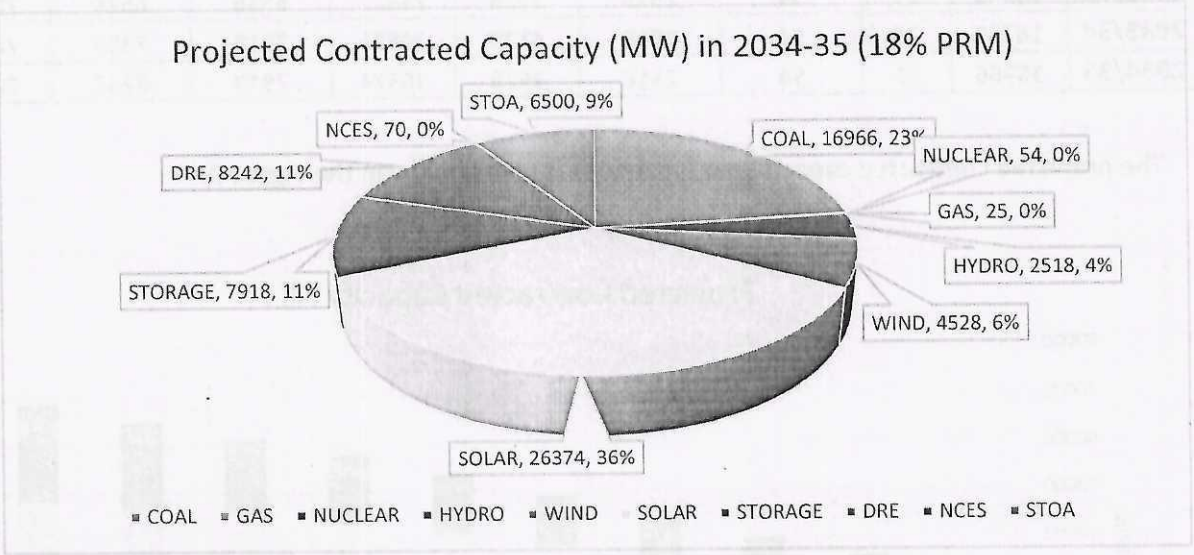


Figure 10 Projected Capacity Mix in 2034-35 with 18% PRM

The share of non-fossil fuel-based capacity in the generation mix is projected to increase to around 51% by 2034-35 from 32% in 2024-25 with higher contribution from non-fossil fuel-based capacities in alignment with RPO trajectory.

The projected generation mix for the state is shown in Figure 11 & 12 below:-

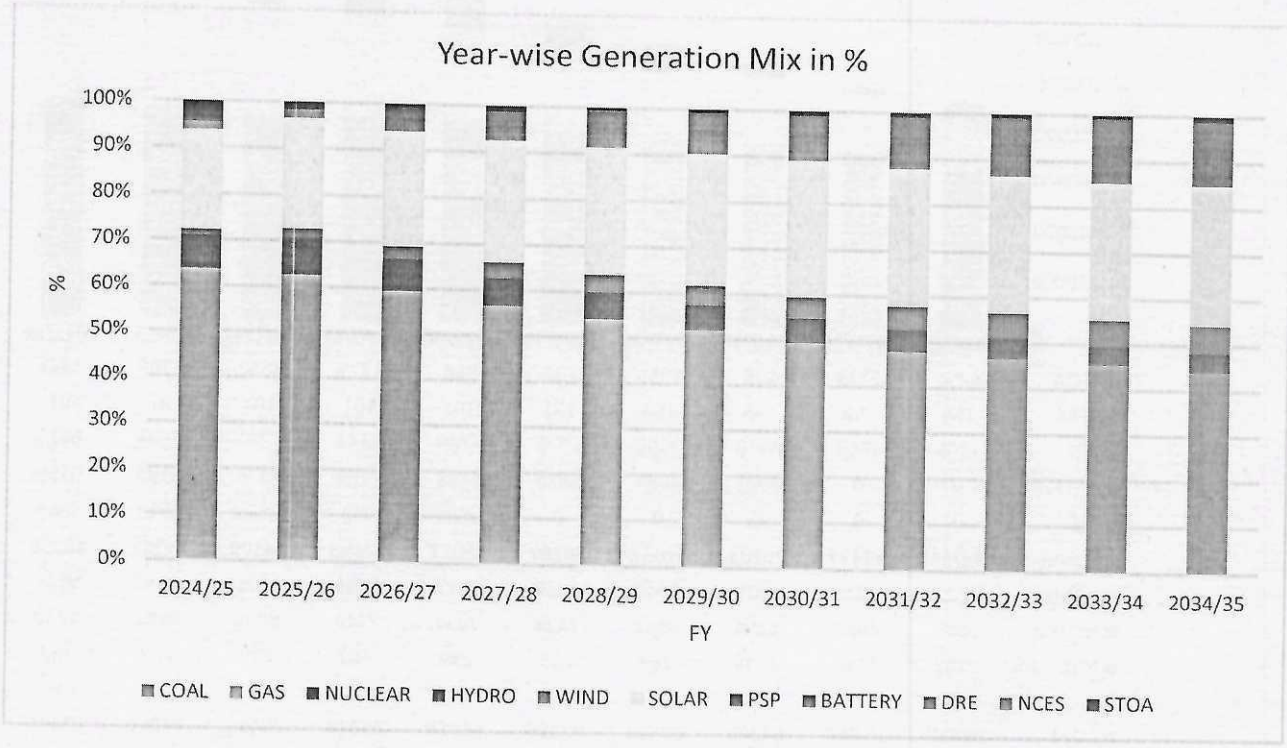
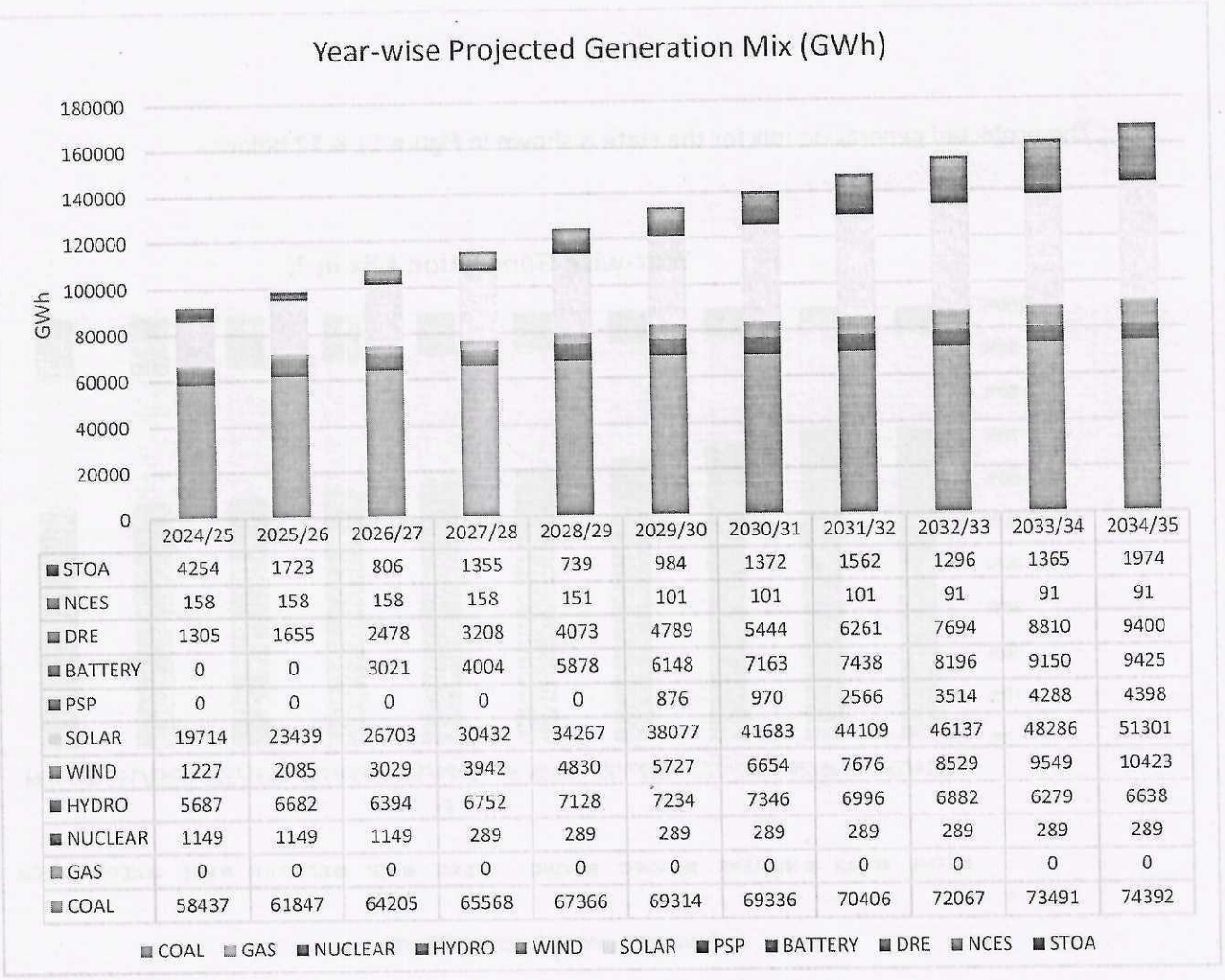


Figure 11 Projected Generation Mix (%)



	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35
STOA	4254	1723	806	1355	739	984	1372	1562	1296	1365	1974
NCES	158	158	158	158	151	101	101	101	91	91	91
DRE	1305	1655	2478	3208	4073	4789	5444	6261	7694	8810	9400
BATTERY	0	0	3021	4004	5878	6148	7163	7438	8196	9150	9425
PSP	0	0	0	0	0	876	970	2566	3514	4288	4398
SOLAR	19714	23439	26703	30432	34267	38077	41683	44109	46137	48286	51301
WIND	1227	2085	3029	3942	4830	5727	6654	7676	8529	9549	10423
HYDRO	5687	6682	6394	6752	7128	7234	7346	6996	6882	6279	6638
NUCLEAR	1149	1149	1149	289	289	289	289	289	289	289	289
GAS	0	0	0	0	0	0	0	0	0	0	0
COAL	58437	61847	64205	65568	67366	69314	69336	70406	72067	73491	74392

Figure 12 Year-wise projected net generation mix (in GWh)

5.3 Capacity contract requirement for future

It has been found out in the studies that Telangana needs to contract following capacities (planned and additional) per year till 2034-35 to meet its demand reliably while ensuring fulfilment of its RPO obligations as tabulated in Table 10.

Table 10 Year wise Capacity Addition for Telangana (in MW)

FY	COAL		DRE		SOLAR		Storage		Wind		Yearly STOA
	Planned	Additional	Planned	Additional	Planned	Additional	Planned	Additional	Planned	Additional	Additional
2024/25	2284	0	82	331	2281	3000		0		400	4219
2025/26	2400	0	96	425	619	1500		0		400	4535
2026/27		0	116	469		1500		1979		400	3906
2027/28		0	139	506		2000		569		400	4607
2028/29		2202	166	543		2000		777		400	3787
2029/30		1590	200	601		2000		479		400	4449
2030/31		183	240	454		2000		574		400	5062
2031-32		79	287	438		1000		1022		400	5346
2032/33		421	345	431		1000		1167		400	5299
2033/34		434	414	416		1000		1352		400	5147
2034/35		184	497	390		1500		0		400	6500

5.4 Projected Coal Capacity utilization

The coal capacity PLF is expected to remain in the range of 50%-59 % as shown below in Figure 13 for the years till 2034 ensuring higher absorption of higher renewable energy.

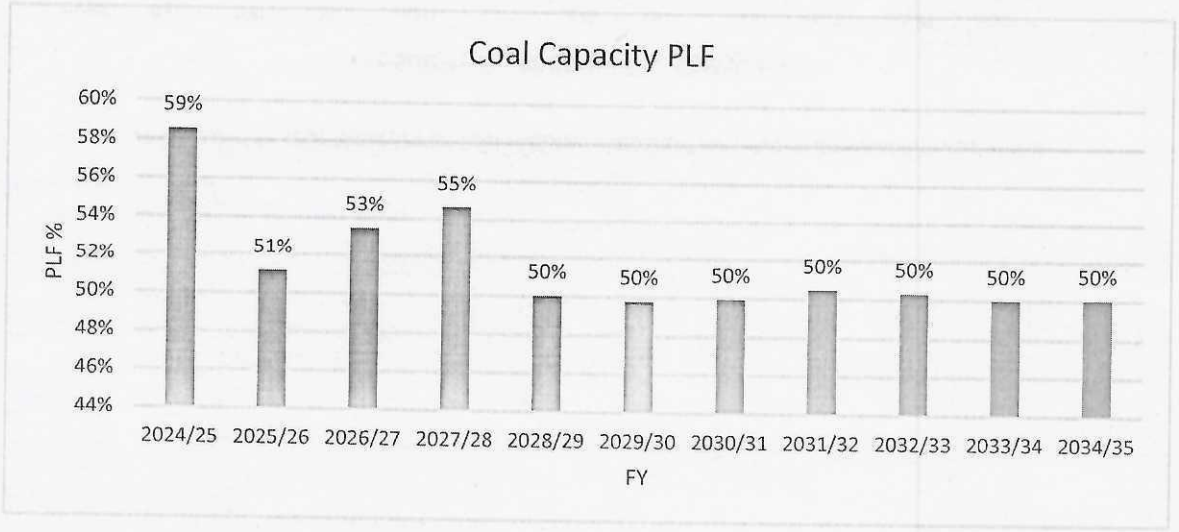


Figure 13 Year-wise coal capacity PLF for Telangana (in %)

5.5 Projected Aggregate Surplus generation for Telangana (MW)

Surplus generation is likely to be available with the state due to RE availability, Demand variation etc. The pattern of surplus capacities for Telangana has been observed as shown below in Figure 14. This capacity can be shared with other states and reduce the fixed cost burden on the utilities resulting in reduction in the cost for consumer. Telangana has likely average hourly surplus capacity available in the range of 3000-6000 MW in the month of November and December in FY 2026-27. This indicates that the state may look for banking / medium term bilateral agreements with other states to optimize utilization of these likely surpluses.

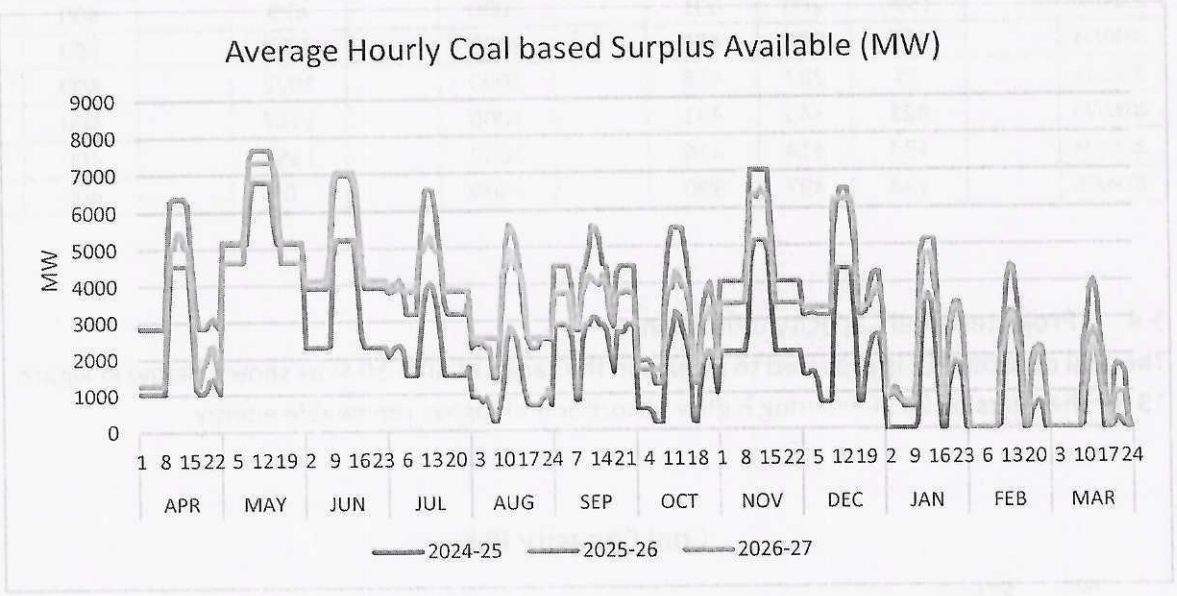


Figure 14 Average hourly Surplus Coal generation (MW) for the years 2024-25, 2025-26 and 2026-27

6.0 Conclusion

Based on the RA study results, the following observations are made:-

1. The study was carried for assessing the resource adequacy of Telangana based on the demand projections by Telangana (The demand projections by 20th Electric Power Survey (EPS) are lower compared to the demand projections by Telangana).
2. The study is carried based on the hourly load pattern of the FY 2023-24. The peak demand month is March.
3. Telangana is likely to witness energy deficit throughout the period of study i.e. from 2024-25 to 2034-35 with the existing, planned capacity including the capacity required to meet Renewable Purchase Obligations (RPO). It was observed that the total unserved energy in the year 2034-35 is likely to be around 16684 MU. Further, it is expected that the shortfall would be maximum during the non-solar hours in the months of February and March.
4. To meet the projected demand reliably, additional 5092 MW from Coal and 7918 MW /38,432 MWh from Storage may be required with a planning reserve margin of 18%. Further, study suggests year wise short term/medium term/bilateral requirements to meet the demand optimally.
5. The coal capacity PLF is projected to range between 51% and 59% until FY 2028-29. After that, it is expected to stabilize around 50% from FY 2028-29 to FY 2034-35, ensuring greater integration of renewable energy sources
6. Further, Telangana has likely surplus capacity available in the range of 3000-6000 MW in the month of November and December in FY 2026-27 as shown below which can be shared with other states / utilities.
7. The State is likely to meet the RPO targets from the projected capacity mix starting FY 2024-25.

Annexure-I

Future Contracted/Approved Capacity Expansion and Termination (MW)

SR. NO	TIED CAPACITY NAME	TELANGANA'S SHARE (MW)	TYPE OF GENERATION	EXPECTED COD
1	Telangana Ph-I/NTPC U-2	683.635	COAL	2024-25
2	YADADRI TPS UNIT 1	800	COAL	2024-25
3	YADADRI TPS UNIT 2	800	COAL	2024-25
4	YADADRI TPS UNIT 3	800	COAL	2025-26
5	YADADRI TPS UNIT 4	800	COAL	2025-26
6	YADADRI TPS UNIT 5	800	COAL	2025-26

SR. NO	TIED CAPACITY NAME	TELANGANA'S SHARE (MW)	TYPE OF GENERATION	EXPECTED Year of PPA Termination/Retirement
1.	Ramagundem STPS Unit 7	87.76	COAL	2026-27
2.	Simhadri Stage-I	538.9	COAL	2028-29
3.	Marwa TPS	1000	COAL	2029-30
4.	Ramagundem - B TPS	62.5	COAL	2029-30
5.	Talchar Stage-II	216.26	COAL	2030-31
6.	NLC Stage-I and NLC Stage-II	10.95	COAL	2030-31
7.	Gautami CCPP	239.31	GAS	2024-25
8.	GVK Extension	118.56	GAS	2024-25
9.	Konaseema CCPP	250.05	GAS	2025-26
10.	Vemagiri CCPP	199.39	GAS	2029-30
11.	Kaiga A.P.S.	138.57	NUCLEAR	2027-28
12.	Madras A.P.S.	21.89	NUCLEAR	2027-28

Assumption for Resource Adequacy Studies for the state of Telangana

1. Electricity Demand & peak requirement: As per Telangana Projections
2. Demand Profile: Based on hourly demand profile of 2023-24
3. Existing, Planned, and Expiring Capacity Due to PPA Termination/Retirement: As per the information received from TELANGANA
4. Future RE Capacity addition: based on RPO trajectory
5. Cost parameters: based on information in National Electricity Plan

RE CUF considered

Hydro CUF Existing & Planned	Solar CUF Existing & Planned	Wind CUF Existing & Planned	Biomass
23%	21% & 23%	27%	15%

Technical Parameters

Technology	Type	Availability (%)	Ramping (%/min)	Min. Technical (%)	Start -up time (hr)		
					Hot	Warm	Cold
Coal/ Lignite	Existing/Planned	85	1	55	2	5	10
	Candidate	88	1	55	2	5	10
Gas	Existing	90	5	40	1.5	2	3
Nuclear	Existing/Planned	68	Const. Load	-	-	-	-
Biomass	Existing/Planned	60	2	50	2	4	8
Hydro	Existing/Planned/ Candidate	As per available hourly generation profile	100	-	-	-	-
Solar	Existing/Planned		-	-	-	-	-
	Candidate		-	-	-	-	-
Wind	Existing/Planned		-	-	-	-	-

	Candidate		-	-	-	-	-
Pumped storage	Existing/Planned	95	50	-	-	-	-
	Candidate		50	-	-	-	-
Battery Energy Storage	Candidate	98	NA	-	-	-	-

Technology	Type	Heat Rate (MCal/MWh)		Aux. Consum. (%)	Min. online time (hr)	Min. offline time (hr)	Start-up fuel consumption (MCal/MW)		
		At max loading	At min loading				Hot	Warm	Cold
Coal	Existing/ Planned	2300 to 2879	2438 to 3052	7.0	6	4	600	1000	1800
	Candidate (SC & USC)	2060 to 2125	2183 to 2253	6.5	6	4	600	1000	1800
Gas	Existing	2000 to 2900	2260 to 3277	2.5	4	3	30	50	90
Nuclear	Existing/ Planned	2777	2777	10	6	4	-	-	-
	Candidate	2777	2777	10	-	-	-	-	-
Biomass	Existing/ Planned	4200	4450	8	6	4	600	1000	1800
	Candidate	4200	4450	8	6	4	600	1000	1800
Hydro	Existing/ Planned	-	-	0.7	-	-	-	-	-
	Candidate	-	-	0.7	-	-	-	-	-
	Existing/ Planned	-	-	pump efficiency	-	-	-	-	-

Pumped Storage	Candidate	-	-	80 %	-	-	-	-	-
Battery Energy Storage	Candidate	-	-	Round trip losses 12%	-	-	-	-	-

Transmission Parameters

A single node has been considered for the purpose of study with all generating units and demand connected to the node. No transmission bottleneck has been considered for the study. Interstate ATC limit has not been considered in the study.

Financial Parameters

Following cost parameters have been assumed in the year 2021-2022:

Resource	Capex* (in ₹/MW)	O&M Fixed Cost (in ₹/MW)	Construction Time (in years)	Amortization /Life time (in years)
Coal	8.34 Cr	19.54 Lakh	4	25
Hydro~	6 Cr to 20 Cr	2.5% of Capex	5 to 8	40
Solar**	4.5 Cr to 4.1 Cr	1 % of Capex	0.5	25
Wind(Onshore)	6 Cr	1% of Capex	1.5	25
Wind(Offshore)	13.7 Cr	1% of Capex	1.5	25
Biomass	9 Cr	2% of Capex	3	20
Pumped Storage	3 Cr to 8 Cr	5 % of Capex	7	40
Battery Energy Storage (2-Hour)	5.13 Cr to 3.13 Cr	1 % of Capex	0.5	14
Battery Energy Storage (4-Hour)	8.22 Cr to 4.72 Cr	1 % of Capex	0.5	14
Battery Energy Storage (5-Hour)	9.77Cr to 5.51 Cr	1 % of Capex	0.5	14

Battery Energy Storage (6-Hour)	11.31 Cr to 6.30 Cr	1 % of Capex	0.5	14

* All the Capex figures are on actual basis at the cost level of 2021-22 i.e., inflation is not considered while calculating capex.

~ The Capex values of Hydro and PSS candidates are considered as per the project cost details furnished by the respective developers for state and private sector plants and as per RCEs done periodically by CEA for central sector plants.

**Solar Cost is assumed to reduce from Rs 4.5 Cr/MW in 2021-22 to Rs 4.1 Cr/MW in 2029-30.

Telangana Resource Adequacy Results

Y-o-Y Capacity Addition

All Figures in MW

	COAL		WIND	SOLAR			PSP		BATTERY			
	Planned Telangana Coal	CAND Telangana Coal	Cand Telangana Wind	Planned Solar	Cand Telangana Solar 2028	Cand Telangana Solar 2029-2035	Planned PSP	Cand PSP	Planned Telangana Battery 2h	Cand Telangana Battery 2h	Cand Telangana Battery 4h	Cand Telangana Battery 6h
2025/26	0	0	0	2474	0	0	0	0	0	0	0	0
2026/27	0	0	0	0	0	0	0	0	250	1723	2000	0
2027/28	0	0	0	0	8700	0	0	0	0	0	361	1665
2028/29	0	0	500	0	0	2000	0	0	0	0	0	366
2029/30	1600	0	500	0	0	1841	1000	0	0	0	0	0
2030/31	800	0	500	0	0	1930	0	0	0	0	0	0
2031/32	0	0	500	0	0	1490	0	0	0	0	0	0
2032/33	0	0	500	0	0	1319	0	0	0	0	165	14
2033/34	0	842	500	0	0	1212	0	0	0	0	0	545
2034/35	0	648	500	0	0	1161	0	0	0	0	0	493
Total	**2400**	**1489**	**3500**	**2474**	**8700**	**10952**	**1000**	**0**	**250**	**1723**	**2526**	**3084**

RPO Trajectory

	HYDRO (MU)	WIND (MU)	SOLAR (MU)	RE GEN (MU)	Telangana Energy Requirement (MU)	% Achieved	% RPO Target
2025/26	5221	289	15840	21468	96596	22.2%	30.9%
2026/27	4892	289	15850	21149	102732	20.6%	33.3%
2027/28	5333	289	33328	39029	108932	35.8%	35.5%
2028/29	5613	1405	37097	44159	115347	38.3%	37.5%
2029/30	6531	2527	40529	49631	122627	40.5%	38.8%
2030/31	6694	3584	43786	54109	128032	42.3%	40.5%
2031/32	6808	4652	46177	57681	133211	43.3%	41.5%
2032/33	6854	5736	48450	61085	138600	44.1%	42.3%
2033/34	6838	6817	50746	64446	144206	44.7%	43.0%
2034/35	6773	7888	52918	67623	150040	45.1%	43.5%

DRE (MU)	% DRE Achieved	% DRE Target
2026	2.1%	2.1%
2774	2.7%	2.7%
3592	3.3%	3.3%
4495	3.9%	3.9%
5514	4.5%	4.5%
6398	5.0%	5.0%
7322	5.5%	5.5%
8311	6.0%	6.0%
9368	6.5%	6.5%
10497	7.0%	7.0%

Projected Contracted Capacity

All Figures in MW

	COAL	GAS	NUCLEAR	HYDRO	WIND	SOLAR	PSP	BATTERY	DRE	NCES	STOA
2025/26	14077	224	214	2518	128	7889	0	0	1598	90	4535
2026/27	14077	224	214	2518	128	7889	0	3973	2189	90	4882
2027/28	14077	224	54	2518	128	16589	0	5999	2835	59	3157
2028/29	13538	224	54	2518	628	18589	0	6366	3548	34	4294
2029/30	14138	25	54	2518	1128	20430	1000	6366	4353	34	3516
2030/31	14700	25	54	2518	1628	22360	1000	6366	5050	34	4167
2031/32	14700	25	54	2518	2128	23850	1000	6366	5781	34	5330
2032/33	14700	25	54	2518	2628	25168	1000	6545	6561	34	6434
2033/34	15099	25	54	2518	3128	26380	1000	7090	7396	34	6970
2034/35	15746	25	54	2518	3628	27541	1000	7583	8287	34	7468

Thank You