

Report on Resource Adequacy Plan (Generation) for DVC (2026-27 to 2036-37) (Version 3.0)

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Government of India
Ministry of Power
Central Electricity Authority

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Disclaimer

In accordance with the Resource Adequacy Guidelines dated 28th June 2023, each Distribution Licensee is mandated to prepare a Resource Adequacy Plan (RAP) for a 10-year horizon, referred to as the Long-Term Distribution Licensee Resource Adequacy Plan (LT-DRAP), which shall be vetted and validated by the Central Electricity Authority (CEA). CEA has facilitated this study and prepared the report solely to assist DVC in fulfilling this requirement.

This Resource Adequacy Study for DVC has been conducted based on data and inputs provided by DVC Power Department. The findings, analysis and conclusions presented in this report are contingent upon the accuracy, completeness and timeliness of the information furnished by DVC. Any discrepancies or limitations in the data may affect the outcomes of the study accordingly.

It is expressly stated that the responsibility for the implementation of the study's recommendations, ensuring the adequacy of electricity resources, and undertaking any related actions, including financial implications if any, rests entirely with the utility.

Executive Summary

Ministry of Power had notified the Electricity (Amendment) Rules in December, 2022. As per Rule 16 of the Electricity (Amendment) Rules, Ministry of Power has notified Resource Adequacy (RA) Guidelines. According to these Guidelines, Central Electricity Authority (CEA) is entrusted with the responsibility of preparing the Long-Term National Resource Adequacy Plan (LT-NRAP). Further, each Distribution Utility is required to carry out a Long-Term Distribution Licensee Resource Adequacy Plan (LT-DRAP) to reliably meet its peak electricity demand and electrical energy requirement.

As per the Resource Adequacy Guidelines dated 28th June 2023, each Distribution Licensee shall prepare a Resource Adequacy Plan (RAP) with a 10-year planning horizon, LT-DRAP to meet its own peak electricity demand and electrical energy requirements. This plan shall be vetted/validated by CEA to leverage the benefits of national-level optimization for the Distribution Licensees. The LT-DRAP shall be prepared by the Distribution Licensees on an annual rolling basis, factoring in the already contracted capacity and optimizing the requirement for additional capacity.

Government of India has notified the Renewable Energy Consumption Obligation (RCO) trajectory up to 2029-30 vide gazette notification dated 27th of September 2025, which mandates that a specified portion of energy consumption must be met from renewable energy sources.

CEA initially carried a Resource Adequacy (RA) study for DVC with a planning horizon up to 2035-36. This study has now been updated and extended to cover the period up to 2036-37, incorporating the latest data furnished by the Utility and planning assumptions.

The electrical energy requirement and peak electricity demand for DVC are projected to increase with a CAGR of 3.60% each from 2026-27 to 2036-37. For satisfying resource adequacy i.e. meeting the electricity demand reliably and at least cost, the utility needs to methodically plan its capacity expansion either by investing in new generation capacity or by procuring power. In view of the reduction in cost of solar panels and technology options like Battery Energy Storage Systems, planning for long term optimal generation capacity mix gains tremendous importance so that the future generation capacity mix is cost effective as well as environment friendly.

To identify the least cost option for generation capacity expansion for the period 2026-27 to 2036-37, generation expansion planning study has been carried out with an objective to minimize the total system cost of generation including the cost of anticipated future investments while fulfilling all the technical constraints associated with various power generation technologies. The study also ensures compliance with the Renewable Consumption Obligation (RCO) notified by the Ministry of Power. Additionally, reliability study has been carried out to determine the probability of unmet demand and hours by implementing the variation in demand, variation in RE, and forced outage of thermal generators (Coal/ Lignite) etc.

Generation capacity expansion pathways have been considered for the long-term study based on the yearly capacity addition plan of DVC along with RCO constraints for Solar, Wind and DRE technologies. The Renewable capacities have been assessed in view of adherence to RCO notified by Ministry of Power considering the fungibility among different sources.

The Resource adequacy studies have projected likely optimal capacity mix for future years till 2036-37 which shall be able to reliably meet the projected electricity demand. Based on the study, the likely total projected contracted capacity for the year 2036-37 is around 16,614 MW which consists of 4,616 MW from coal; 578 MW from hydro; 6,751 MW from solar; 110 MW from Wind and 1,359 MW from Distributed Renewable Energy (DRE) source and 3,200 MW from Energy Storage Systems (BESS/PSP). This capacity will meet the projected electricity demand with prescribed reliability criteria.

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 have been notified in June, 2023, by 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 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 also helps in assessment of generation capacity requirement to be tied up or contracted on long term, medium term, and short-term basis.

Further, Ministry of Power vide notification dated 27th September, 2025, had notified the Renewable Energy Consumption Obligation (RCO) trajectory for the states/Discoms. Based on the trajectory specified, hydro, wind and other (solar, biomass etc.) RCO quantum in million units (MUs) has been calculated to find additional quantum of renewable capacity that the states/Discoms have to contract in addition to the existing/planned capacity to meet their RCO targets.

The study recommends an optimal resource mix up to the year 2036-37, taking into account technical and financial parameters associated with various capacities. It aims to optimize long-term power procurement while ensuring resource adequacy to meet electricity demand on a 24x7 basis, considering variations in electricity demand, RE generation, and forced outage of thermal capacities. The study also assesses the Planning Reserve Margin (PRM) required by the state to account for the aforementioned uncertainties, ensuring that demand can be reliably met throughout the year.

Prior to this, CEA had conducted the RA study for DVC up to 2035-36, based on data available with CEA and in accordance with the then RCO trajectory specified in the then Ministry of Power's Office Memorandum dated 20th October 2023.

2.0 Highlights of the Previous RA Study (Up to FY 2035–36)

1. In the earlier Resource Adequacy (RA) study, financial year 2024-25 had been considered as the base year, and the study covered the period from 2025-26 to 2035-36. The fuel-wise contracted capacity by DVC as on 31st March, 2025, is given in Fig. 1.

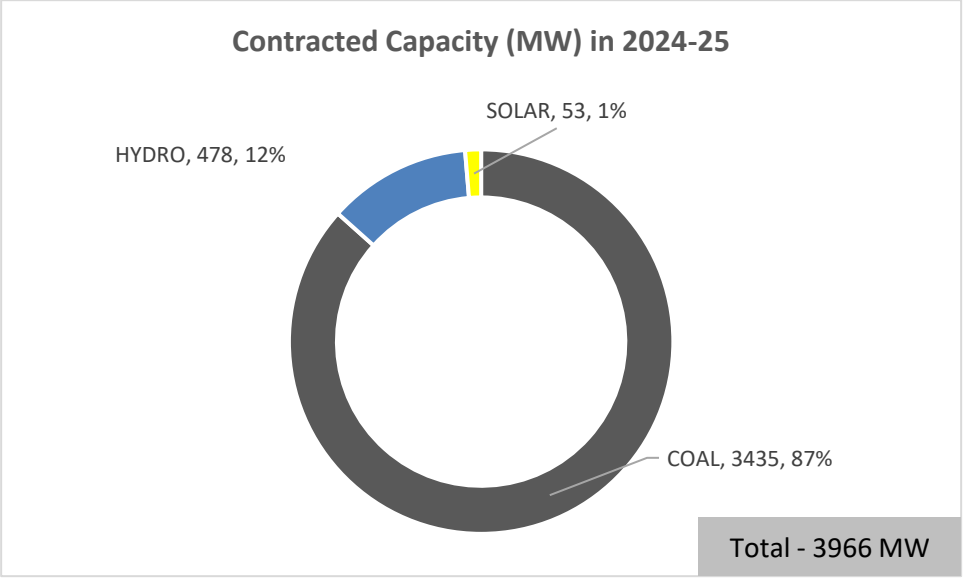


Figure 1: Fuel-wise Contracted Capacity (in MW) as on 31st March, 2025

2. The peak electricity demand and electrical energy projections furnished by the utility, that had been considered in the study is given in Table 1.

Table 1: Peak electricity demand and electrical energy projections as per DVC

	2025-26	2026-27	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34	2035-36
Electrical Energy Projections (MU)	27146	28503	29928	31424	32996	34645	36378	38197	40106	42112	44217
Peak Electricity Demand Projections (MW)	3544	3721	3907	4103	4308	4523	4749	4987	5236	5498	5773

3. To meet the above projected peak electricity demand and electrical energy requirement, the source-wise projected capacity (in MW) as outlined in the previous report is given in Table 2.

Table 2: Source-wise projected capacity (in MW)

Year	Coal	Hydro	Solar	Storage	DRE	SToA/MToA*	Total
2025-26	3435	478	395	0	465	614	**5387**
2026-27	3435	498	4408	1397	628	86	**10452**
2027-28	3888	498	5065	1850	805	0	**12106**
2028-29	4496	510	5661	2124	999	0	**13790**
2029-30	4496	510	6204	2457	1211	0	**14878**
2030-31	4496	578	6789	2741	1271	0	**15875**
2031-32	4496	578	7462	3069	1335	0	**16940**
2032-33	4496	578	8132	3420	1402	0	**18028**
2033-34	4496	578	8821	3773	1472	0	**19140**
2034-35	4496	578	9623	4222	1545	0	**20464**
2035-36	4496	578	10345	4622	1622	0	**21663**

**The SToA/MToA value represents the peak power requirement in MW and it was recommended that this requirement may be met through power procurement from the market or through bilateral agreements.*

4. The year-wise planned and additional capacity contract addition (in MW) for the above tabulated cumulative capacity is given in Table 3.

Table 3: Year-wise planned and additional capacity contract addition (in MW)

	Coal	Hydro	Solar		DRE	Storage		Total		SToA/MToA*
Year	**Planned**	**Planned**	**Planned**	**Addl.**	**Addl.**	**Planned**	**Addl.**	**Planned**	**Addl.**	**Addl.**
2025-26	0	0	342	0	465	0	0	342	465	614
2026-27	0	20	453	3560	163	0	1397	473	5120	86
2027-28	453	0	524	133	178	250	202	1227	514	0
2028-29	608	12	228	368	194	100	175	948	736	0
2029-30	0	0	350	193	211	0	332	350	737	0
2030-31	0	68	100	485	60	0	284	168	830	0
2031-32	0	0	100	572	63	0	328	100	964	0
2032-33	0	0	0	670	67	0	352	0	1089	0
2033-34	0	0	0	690	70	0	352	0	1112	0
2034-35	0	0	0	802	74	0	449	0	1325	0
2035-36	0	0	0	721	77	0	400	0	1198	0
Total	**1061**	**100**	**2097**	**8194**	**1622**	**350**	**4272**	**3608**	**14088**	-

**Requirement is for a particular year*

3.0 RA Study for DVC (from 2026-27 to 2036-37)

3.1 Present Power Scenario in DVC

The power supply position for DVC from 2021-22 to 2025-26 is given in Table 4.

Table 4: Power Supply Position of DVC

Power Supply Position						
Year	**Electrical Energy required (MU)**	**Electrical Energy supplied (MU)**	**Gap (MU)**	**Peak Electricity Demand (MW)**	**Peak Met (MW)**	**Peak Electricity Demand not met (MW)**
2021-22	23741	23736	5	3355	3338	17
2022-23	26339	26330	9	3402	3396	6
2023-24	26560	26552	8	3451	3451	0
2024-25	25891	25888	3	3708	3704	4
2025-26	24755	24751	4	3532	3523	9

The data in Table 4 indicates that over the past five years, DVC's electrical energy requirement and peak electricity demand have increased at a Compound Annual Growth Rate (CAGR) of 1.05% and 1.29% respectively.

As per the data provided by the utility, as of March 2026, the total contracted capacity for DVC is 4,531 MW. Out of the total contracted capacity (CC), the share of non-fossil fuel-based CC is 22%. The fuel-wise contracted capacity as on 31st March, 2026, is given in Table 5 and Fig. 2.

Table 5: Fuel-wise Contracted Capacity as on March 2025

Source	**Contracted Capacity (MW)**	**Percentage**
Coal	3555	78%
Hydro	478	11%
Solar	388	9%
Wind	110	2%
Total	**4531**	**100%**

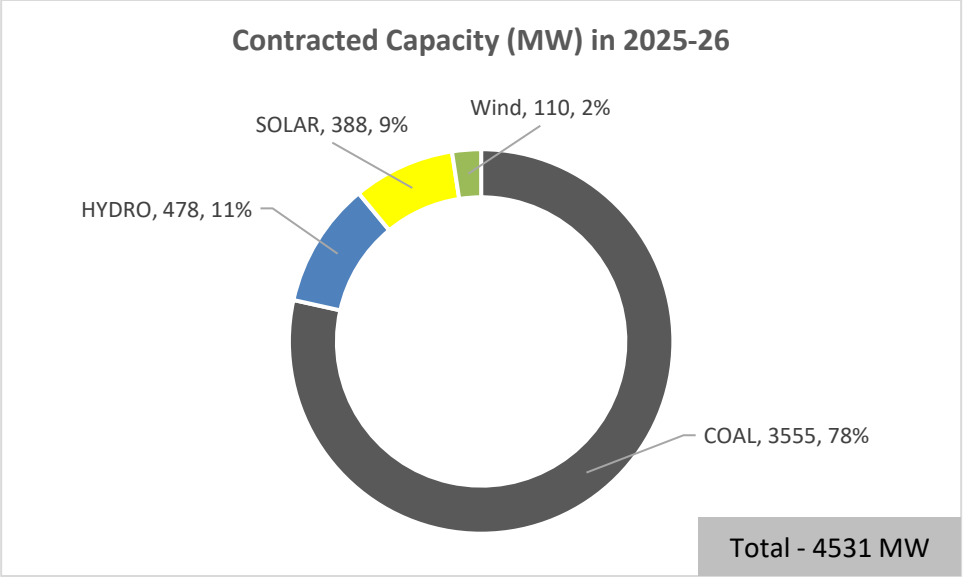


Figure 2: Fuel-wise Contracted Capacity (in MW) as on 31st March, 2026

3.2 Demand analysis of the year 2025-26

Hourly demand pattern of 2025-26 has been analyzed and it was observed that the peak demand season for DVC is typically during the months from February to June. DVC witnesses peak demand during non-solar hours. The month wise average hourly demand observed for the year 2025-26 is shown in Fig. 3.

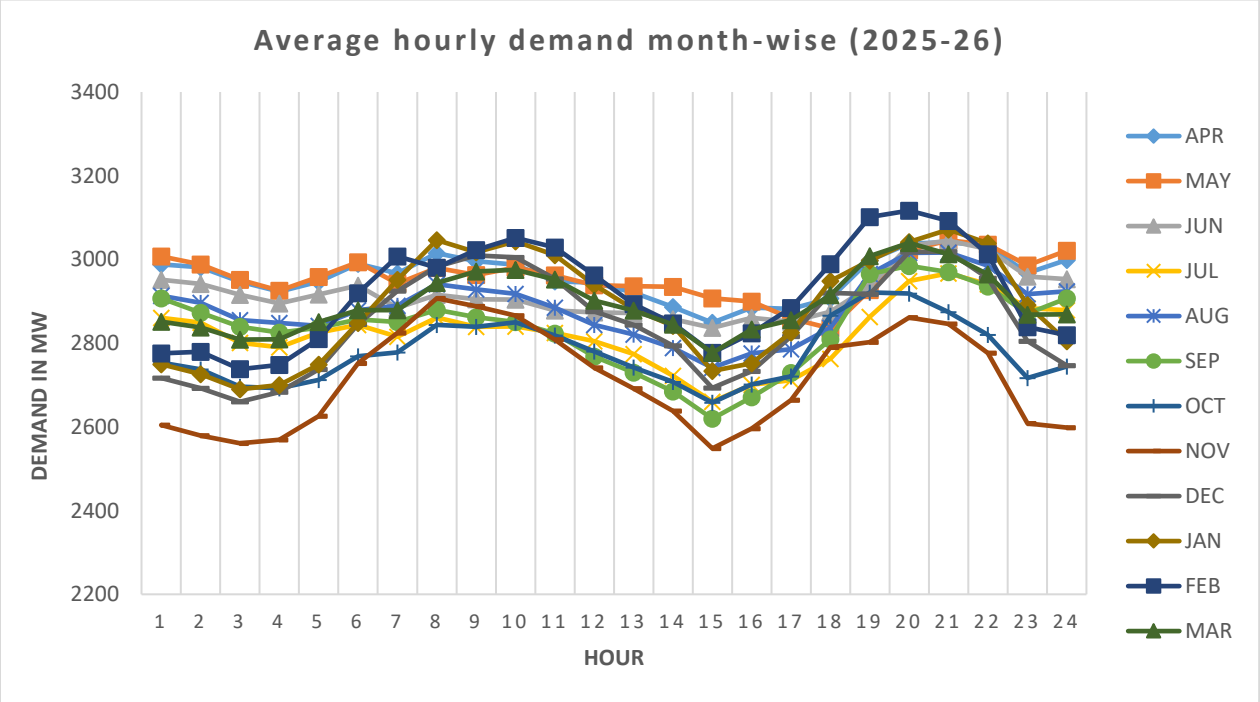


Figure 3: Average Hourly Demand Variation (Month-wise) for 2025-26

From the hourly demand data of 2025-26, the daily peak demand during solar hours and non-solar hours are plotted in Fig. 4. Peak demand generally occurs during non-solar hours.

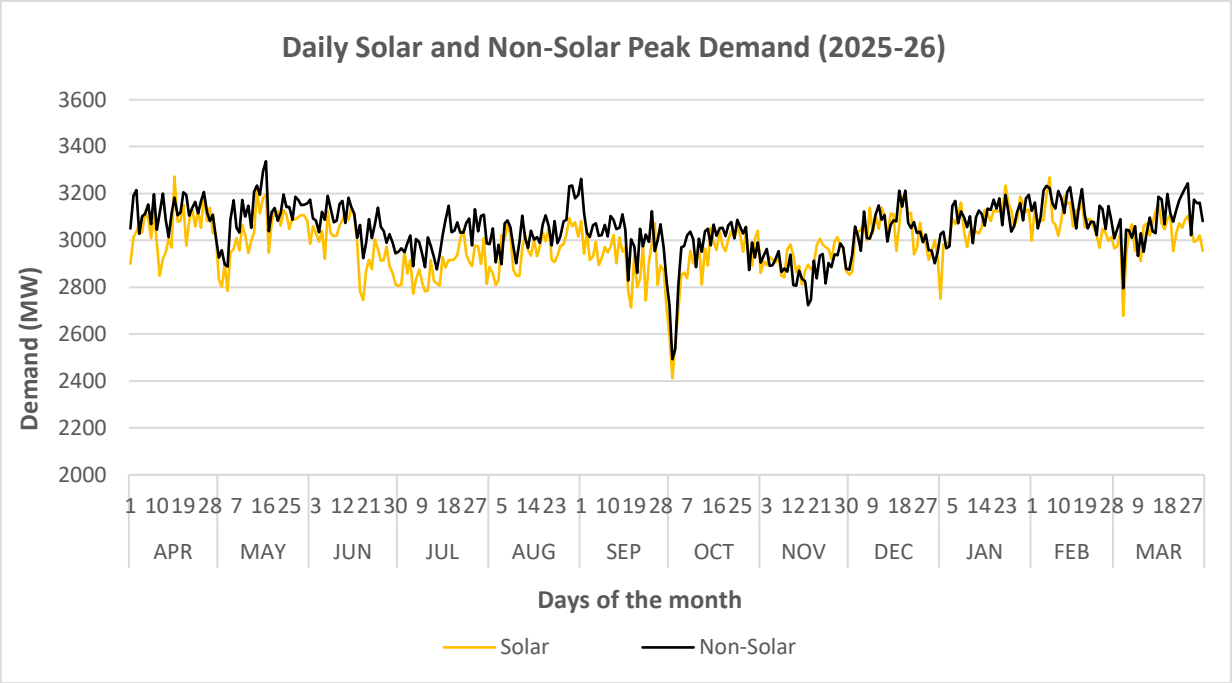


Figure 4: Solar and non-solar peak in MW for the year 2025-26

The hourly demand pattern of 2025-26 was analysed 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. Frequency Distribution of hourly demand profile for 2025-26 is shown in Fig. 5.

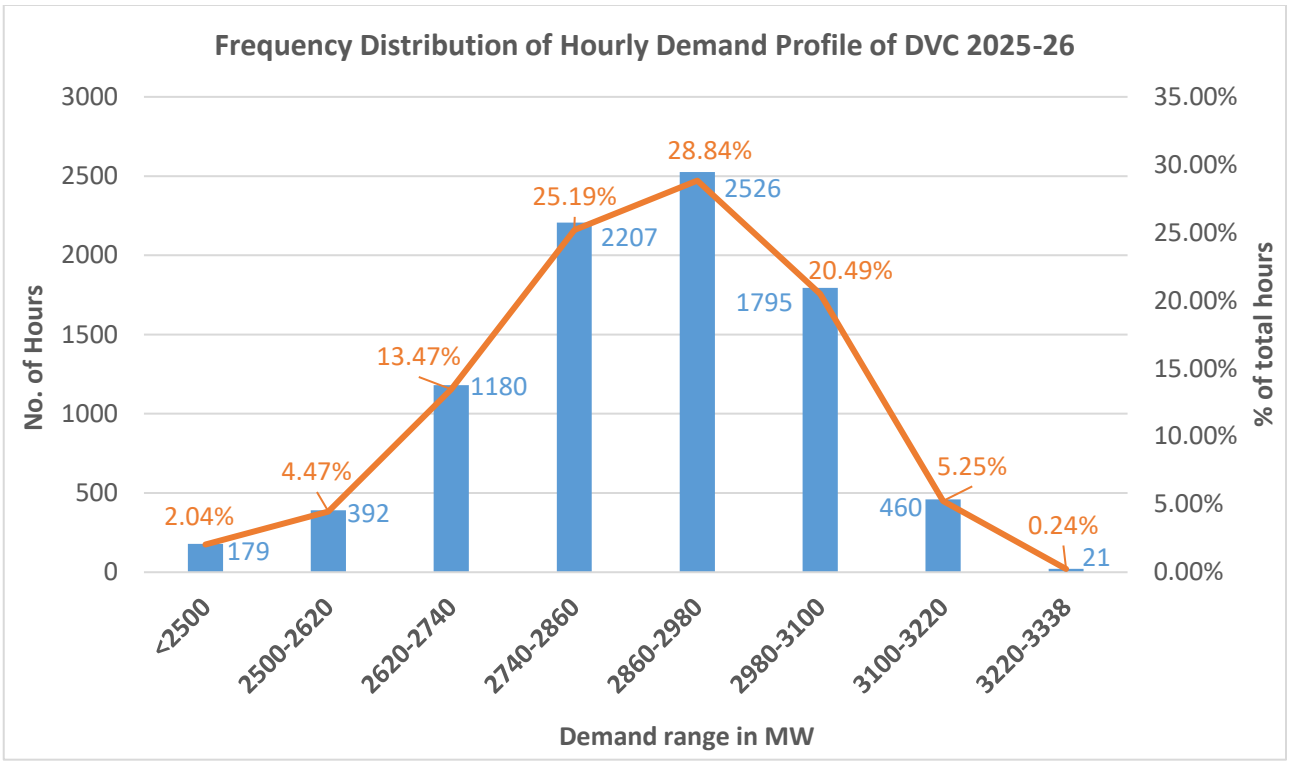


Figure 5: Frequency Distribution of Hourly Demand Profile of 2025-26

4.0 Principles of Generation Planning

The objective of Generation Planning process is to obtain an optimal generation capacity mix in the least cost manner to meet the electricity demand at every instance of time while ensuring the most efficient use of resources. The major aspects considered in the planning process are:

i) To supply 24x7 reliable power to the consumers
ii) To achieve objectives of all policies of the Government of India such as RCO trajectory, RE capacity addition etc.
iii) To achieve sustainable development.
iv) To fulfil desired operational characteristics of the system such as reliability and flexibility.
v) Most efficient use of resources.
vi) Fuel availability

4.1 Generation Expansion Planning Tool - STELLAR

Central Electricity Authority (CEA) has successfully developed an indigenously built generation expansion planning tool that integrates long-term capacity planning, economic dispatch, and reliability analysis into a unified framework. Named “STELLAR” (Strategic Expansion for Long-Term Load Adequacy and Resilience), the tool represents a significant advancement in power system modelling and planning. STELLAR is a state-of-the-art optimisation model framework specifically designed to support long-term decision-making in the electricity sector, with a focus on ensuring

resource adequacy, operational resilience, and cost-effective system evolution in line with India's energy transition goals.

STELLAR serves as a comprehensive and robust platform for long-term generation and transmission planning, supporting informed policymaking and investment strategies in India's evolving power sector. The salient features of STELLAR include representative-day modelling, co-optimisation of energy and ancillary services, demand response modelling, and reliability modelling.

The schematic diagram of the software is given in Figure 6.

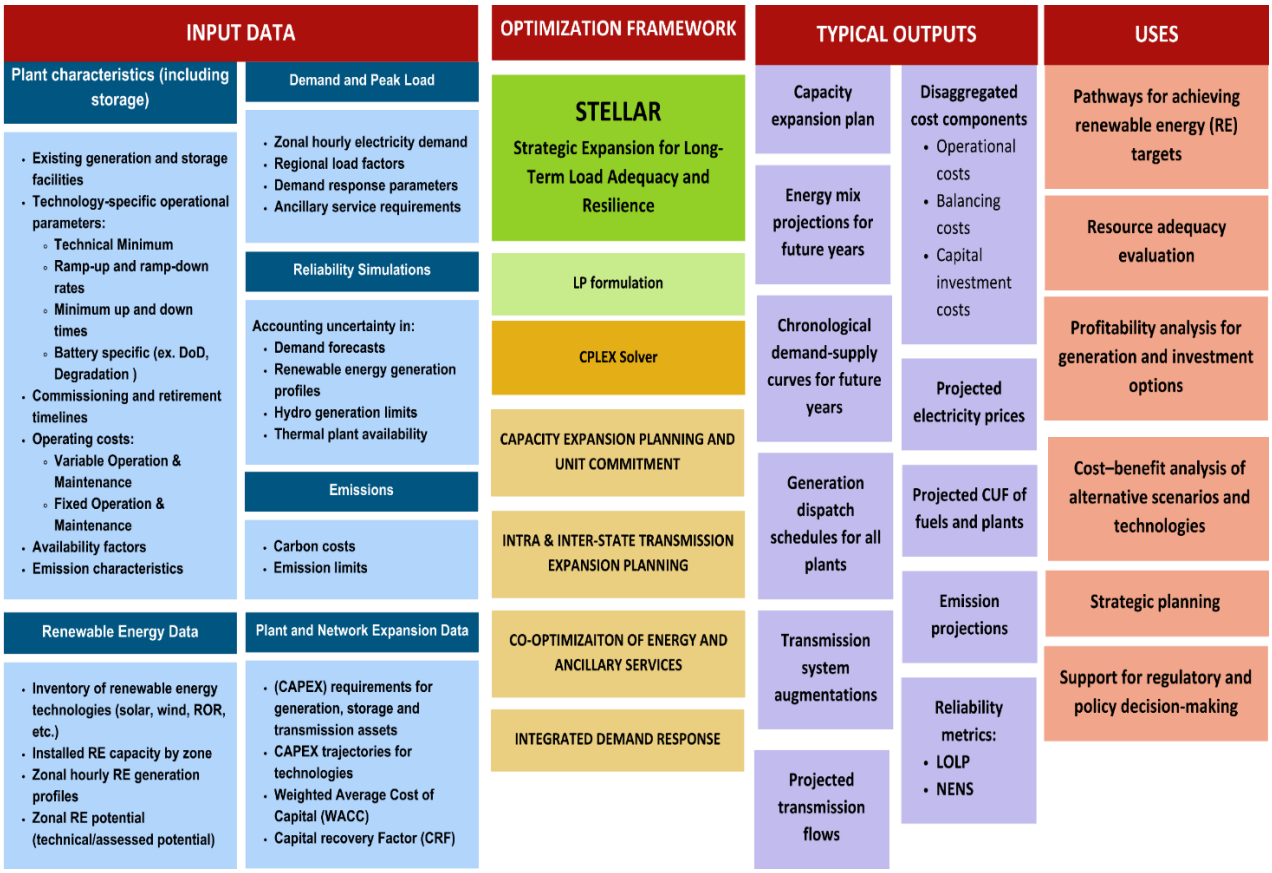


Figure 6: Schematic Diagram

5.0 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 every 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. E.g., 0.0274 % probability of load being lost.
- **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 energy requirement) to create a Normalized Energy Not Served (NENS) metric.

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 is 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 generally expressed as a certain percent of the projected peak electricity demand.

5.1 Variation in Electricity Demand

The variation in demand pattern for last two years viz. 2024-25 and 2025-26 (considering 2024-25 as the base year) has been analyzed. The demand pattern variation across 2024-25 and 2025-26 is shown in Fig. 7.

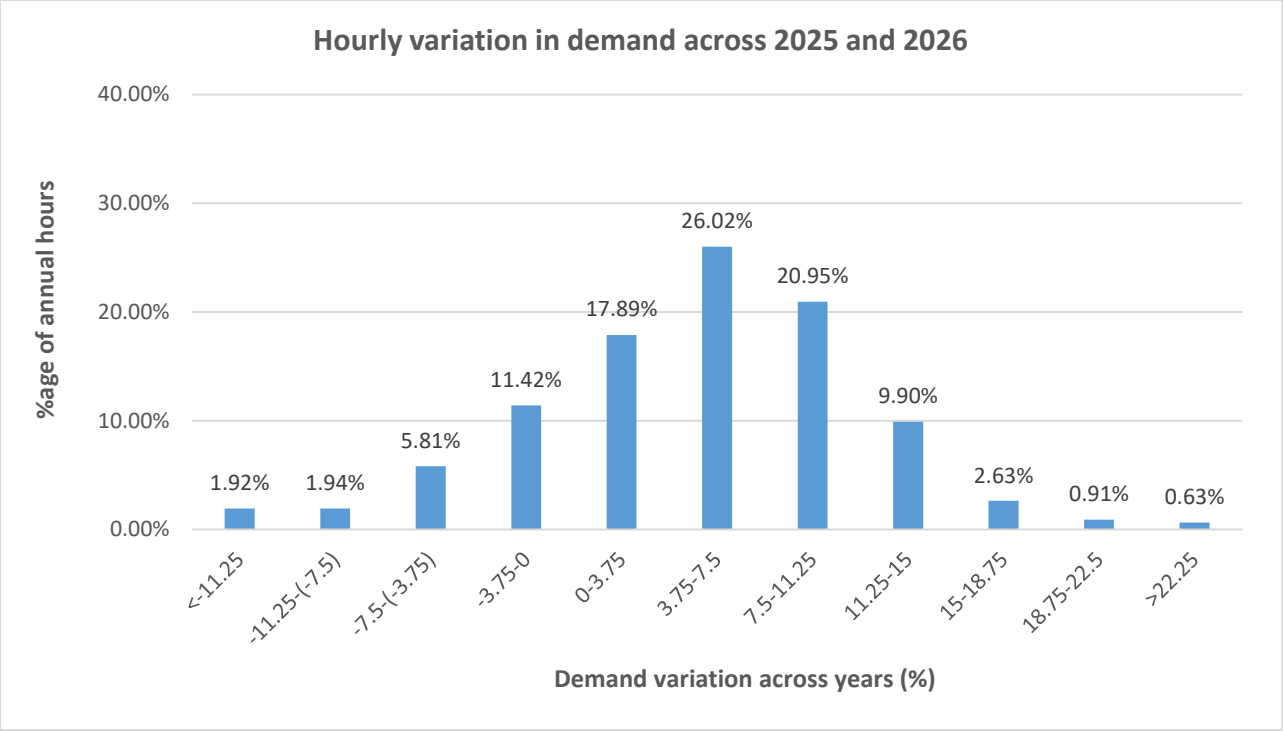


Figure 7: Hourly Variation in Demand across years

It can be observed that the hourly demand typically varies within ±7.5% for ~61% of instances. This variation is primarily due to temperature, weather parameter or any random outages of transmission line and generating units etc. This variation has been captured in the reliability study by incorporating a variation of ±10% in the projected hourly demand for the future years by introducing a random variable (with normal distribution) for demand as per observed behavior over the years.

5.2 Variation in RE

In the Long-term capacity expansion planning studies, a particular profile for Solar is considered based on the observed generation data to determine the optimal capacity mix. However, due to intermittent nature of these sources, generation from these non-dispatchable sources may vary across years. As per the analysis carried out based on historical generation data, solar and hydro based generation has been varied by ±10% and ±5% respectively to incorporate the variation in these generation sources and plan for requisite measures to mitigate such behavior.

5.3 Forced Outage of Thermal Generators

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

Based on these variations, reliability studies have been carried out to ascertain robustness of the system.

6.0 Inputs/Assumptions for the Study

i) The peak electricity demand and electrical energy requirement as furnished by DVC is given in Table 6.

Table 6: Electricity demand projections

	Peak Electricity Demand Projections (MW)	Electrical Energy Requirement Projections (MU)
2026-27	3721	26009
2027-28	3907	27309
2028-29	4103	28674
2029-30	4308	30108
2030-31	4437	31011
2031-32	4570	31942
2032-33	4707	32900
2033-34	4848	33887
2034-35	4994	34904
2035-36	5144	35951
2036-37	5298	37029

ii) Future demand profile till the year 2036-37 has been projected using the demand profile for the year 2025-26 as the base profile.

iii) The actual solar and hydro generation profiles and CUFs have been considered as per data available in CEA.

iv) The capital costs of candidate plants for coal, solar, and battery/PSP technologies is detailed in the Annexure and are aligned with current market trends and recent price discovery.

v) The planned capacity has been considered based on the tie-up information as furnished by DVC. The same is summarised in Table 7 and details are furnished in Annexure.

Table 7: Source wise planned capacity addition (MW)

FY	Coal	Hydro	Solar	Storage
2026-27	0	20	592	350
2027-28	0	0	453	250
2028-29	0	0	524	100
2029-30	767	12	228	0
2030-31	294	0	350	0
2031-32	0	68	100	0
2032-33	0	0	100	0
2033-34	0	0	0	0
2034-35	0	0	0	0
2035-36	0	0	0	0
2036-37	0	0	0	0
Total	**1061**	**100**	**2347**	**700**

vi) **Renewable Energy Consumption Obligation (RCO) trajectory**: Ministry of Power vide gazette notification dated 27th September, 2025, had notified the source wise minimum share of consumption of non-fossil sources (renewable energy) by designated consumers, till the year 2029-30 as given in Table 8.

Table 8: Renewable Energy Consumption Obligation (RCO) 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)	(5)	(6)	(7)
2.	**2026-27**	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

It is estimated that the share of RE generation in the generation mix shall at least remain 43.33% beyond 2029-30. Further, the DRE percentage has also been assumed to be constant at 4.5% beyond 2029-30. Hence, the suggested trajectory of Renewable Consumption Requirement up to FY 2036-37 is given in Table 9.

Table 9: Renewable Energy Consumption Obligation (RCO) trajectory (in %) considered for the study

Sl. No.	Year	Wind renewable energy	Hydro renewable energy	Other renewable energy	Total renewable energy (without DRE)	Distributed renewable energy
(1)	(2)	(3)	(4)	(5)	(3) + (4) + (5)	(7)
1.	**2026-27**	1.97	1.34	29.94	33.25	2.70
2.	**2027-28**	2.45	1.42	31.64	35.51	3.30
3.	**2028-29**	2.95	1.42	33.10	37.47	3.90
4.	**2029-30**	3.48	1.33	34.02	38.83	4.50
5.	**2030-31**	38.83			38.83	4.50
6.	**2031-32**	38.83			38.83	4.50
7.	**2032-33**	38.83			38.83	4.50
8.	**2033-34**	38.83			38.83	4.50
9.	**2034-35**	38.83			38.83	4.50
10.	**2035-36**	38.83			38.83	4.50
11.	**2036-37**	38.83			38.83	4.50

Based on the trajectory specified, RCO quantum in million units (MUs) from hydro, wind, other (Solar, biomass etc.) and distributed renewable energy (DRE) is calculated and given in Table 10.

Table 10: Total Energy required to meet RCO (MU)

Sl. No.	Year	Wind renewable energy (MU)	Hydro renewable energy	Other renewable energy	Distributed renewable energy	Total renewable energy
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	**2026-27**	512.37	348.51	7786.94	702.23	9350.06
2.	**2027-28**	669.07	387.79	8640.54	901.19	10598.59
3.	**2028-29**	845.89	407.18	9491.22	1118.30	11862.59
4.	**2029-30**	1047.76	400.44	10242.77	1354.86	13045.84
5.	**2030-31**	12041.70			1395.51	13437.21
6.	**2031-32**	12402.95			1437.38	13840.33
7.	**2032-33**	12775.04			1480.50	14255.54
8.	**2033-34**	13158.29			1524.91	14683.20
9.	**2034-35**	13553.04			1570.66	15123.70
10.	**2035-36**	13959.63			1617.78	15577.41
11.	**2036-37**	14378.42			1666.31	16044.73

As indicated in Table 11, DVC with its existing and envisaged future capacity additions will not be able to meet its RCO requirements from the year 2026-27 onwards.

Table 11: Renewable Energy Surplus/Deficit other than DRE

FY	RE Generation required to meet RCO [excluding DRE]		RE Generation available/met (From existing/planned contracts)		RCO Surplus (+)/Deficit (-)
	(MU)	(%)	(MU)	(%)	(%)
2026-27	8648	33.25%	3544	13.63%	-19.62%
2027-28	9697	35.51%	4417	16.18%	-19.33%
2028-29	10744	37.47%	5427	18.93%	-18.54%
2029-30	11691	38.83%	5913	19.64%	-19.19%
2030-31	12042	38.83%	6588	21.24%	-17.59%
2031-32	12403	38.83%	7044	22.05%	-16.78%
2032-33	12775	38.83%	7237	22.00%	-16.83%
2033-34	13158	38.83%	7237	21.36%	-17.47%
2034-35	13553	38.83%	7237	20.73%	-18.10%
2035-36	13960	38.83%	7237	20.13%	-18.70%
2036-37	14378	38.83%	7237	19.54%	-19.29%

The electricity demand furnished by DVC represents the electricity demand recorded on the grid (the drawl from the grid) and reflects the net demand after accounting for energy consumed by prosumers from behind-the-meter generation. The same has been considered as input to the STELLAR model.

Requirement of DRE has been considered exogenously. Considering anticipated increase in DRE, the Renewable Compliance Obligation (RCO) targets of MoP, along with its anticipated achievements,

are outlined in Table 12, where Solar Rooftop Generation as per RCO trajectory has been considered, which has then been utilized in calculating the RCO.

Table 12: Renewable Energy from DRE

FY	DRE required to meet RCO		DRE available/met (From existing/ planned contracts)		RCO Surplus (+)/ Deficit (-)
	(MU)	(%)	(MU)	(%)	(%)
2026-27	702	2.70%	0	0%	-2.70%
2027-28	901	3.30%	0	0%	-3.30%
2028-29	1118	3.90%	0	0%	-3.90%
2029-30	1355	4.50%	0	0%	-4.50%
2030-31	1396	4.50%	0	0%	-4.50%
2031-32	1437	4.50%	0	0%	-4.50%
2032-33	1480	4.50%	0	0%	-4.50%
2033-34	1525	4.50%	0	0%	-4.50%
2034-35	1571	4.50%	0	0%	-4.50%
2035-36	1618	4.50%	0	0%	-4.50%
2036-37	1666	4.50%	0	0%	-4.50%

7.0 Outcome of the model

7.1 Investment options to meet the electricity demand

To meet the projected electricity demand, investment options (i.e., candidate capacities) have been given to the model to find the least cost optimal capacity mix required to meet the electricity demand while fulfilling the RCO obligations. The capacity projections (existing, planned, to be tied up) for DVC are given in Table 13.

Table 13: Year-wise contracted capacity projections (existing, planned, to be tied up) (in MW)

Year	Coal	Hydro	Solar	Wind	Energy Storage System	DRE	SToA/MToA
2026-27	3555	498	980	110	350	573	793
2027-28	3555	498	1433	110	600	735	841
2028-29	4322	498	1957	110	700	912	0
2029-30	4616	510	4185	110	1700	1105	0
2030-31	4616	510	5472	110	2700	1138	0
2031-32	4616	578	5572	110	3200	1172	0
2032-33	4616	578	5672	110	3200	1207	0
2033-34	4616	578	5761	110	3200	1243	0
2034-35	4616	578	6097	110	3200	1281	0
2035-36	4616	578	6428	110	3200	1319	0
2036-37	4616	578	6751	110	3200	1359	0

The projected year-wise contracted capacity mix is given in Figure 10.

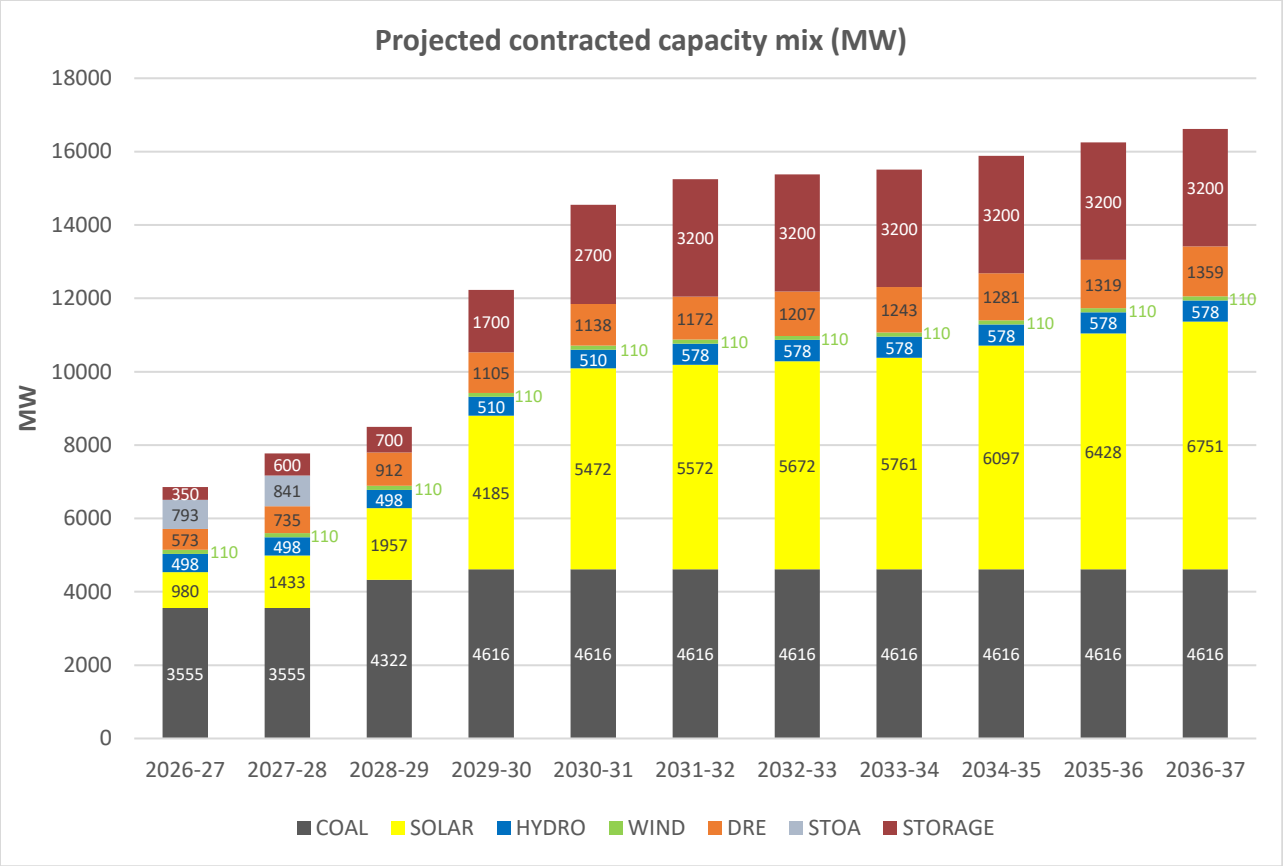


Figure 10: Projected Contracted Capacity Mix Year-wise (MW)

The SToA/MToA requirement can be fulfilled through power procurement from market or bilateral agreements. The SToA/MToA value reflects the peak value requirement and seasonal banking requirements in terms of MW.

Reliability studies have been conducted based on the projected capacity for the year 2036-37. The analysis confirms that the projected capacity meets the reliability criteria specified in the National Electricity Plan (NEP), with the Loss of Load Probability (LoLP) and Not-Served Energy (NENS) remaining within the permissible limits of 0.2% and 0.05%, respectively as specified in the National Electricity Plan (Generation)].

The Resource adequacy studies have projected likely optimal capacity mix for future years till 2036-37 which shall be able to meet anticipated electricity demand reliably. Based on the study, the likely total projected contracted capacity for the year 2036-37 is around 16,614 MW which consists of 4,616 MW from coal; 578 MW from hydro; 6,751 MW from solar; 110 MW from Wind; 1,359 MW from Distributed Renewable Energy (DRE) source and 3,200 MW from Storage (BESS/PSP). This capacity shall be able to meet the projected demand with prescribed reliability criteria and to comply with the stipulated Renewable Energy Consumption Obligation (RCO) targets. Based on the

capacity addition, the planning reserve margin works out to be about 12%. Capacity mix required by 2036-37 is shown in Figure 11.

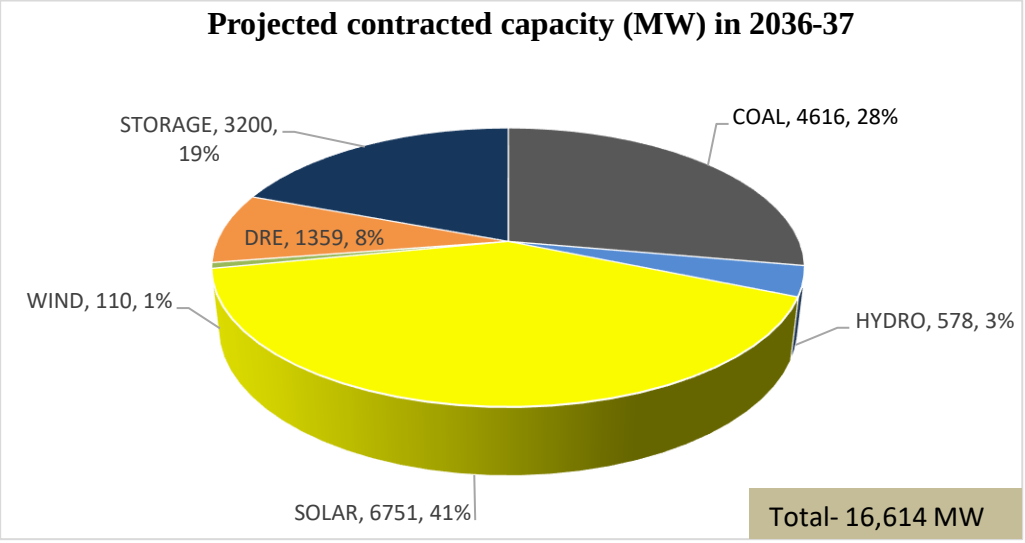


Figure 11: Contracted Capacity Mix in 2036-37

It is important to note that any deviations in the commissioning schedule of the planned capacity could result in a situation where DVC is unable to meet the projected peak electricity demand and electrical energy requirements identified in this study with the available resources. Such changes may also lead to an increase in the cost of meeting DVC's power demand reliably.

As per the study, DVC likely needs to contract the following capacities (planned and additional) every year till 2036-37 to meet its demand reliably as shown in Table 14.

Table 14: Year wise Capacity Addition (in MW)

	Coal	**Hydro**	**Solar**		**DRE**
Year	Planned Contracts	Planned Contracts	Planned Contracts	Additional Requirement	Additional Requirement
2026-27	-	20	592	-	573
2027-28	-	-	453	-	162
2028-29	767	-	524	-	177
2029-30	294	12	228	2000	193
2030-31	-	-	350	937	33
2031-32	-	68	100	-	34
2032-33	-	-	100	-	35
2033-34	-	-	-	89	36
2034-35	-	-	-	337	37
2035-36	-	-	-	330	38
2036-37	-	-	-	324	40
Total	**1061**	**100**	**2347**	**4016**	**1359**

	Storage		Total		SToA/MToA*
Year	Planned Contracts	Additional Requirement	Planned Contracts	Additional Requirement	Additional Requirement
2026-27	350	-	962	573	793
2027-28	250	-	703	162	841
2028-29	100	-	1391	177	
2029-30	-	1000	534	3193	
2030-31	-	1000	350	1970	
2031-32	-	500	168	534	
2032-33	-	-	100	35	
2033-34	-	-	-	125	
2034-35	-	-	-	374	
2035-36	-	-	-	369	
2036-37	-	-	-	363	
Total	**700**	**2500**	**4208**	**7875**	

**Yearly requirement*

The projected generation mix for the state is shown in Figure 12 and 13.

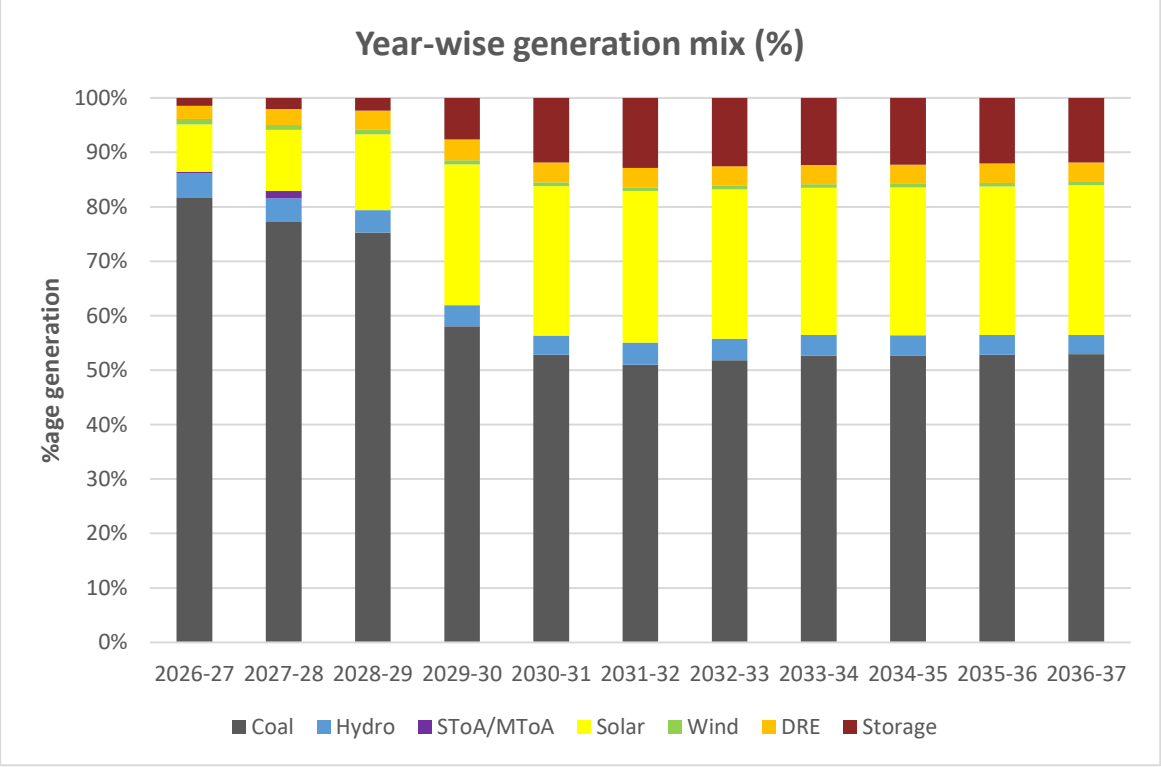


Figure 12: Year-wise projected net generation mix (in %)

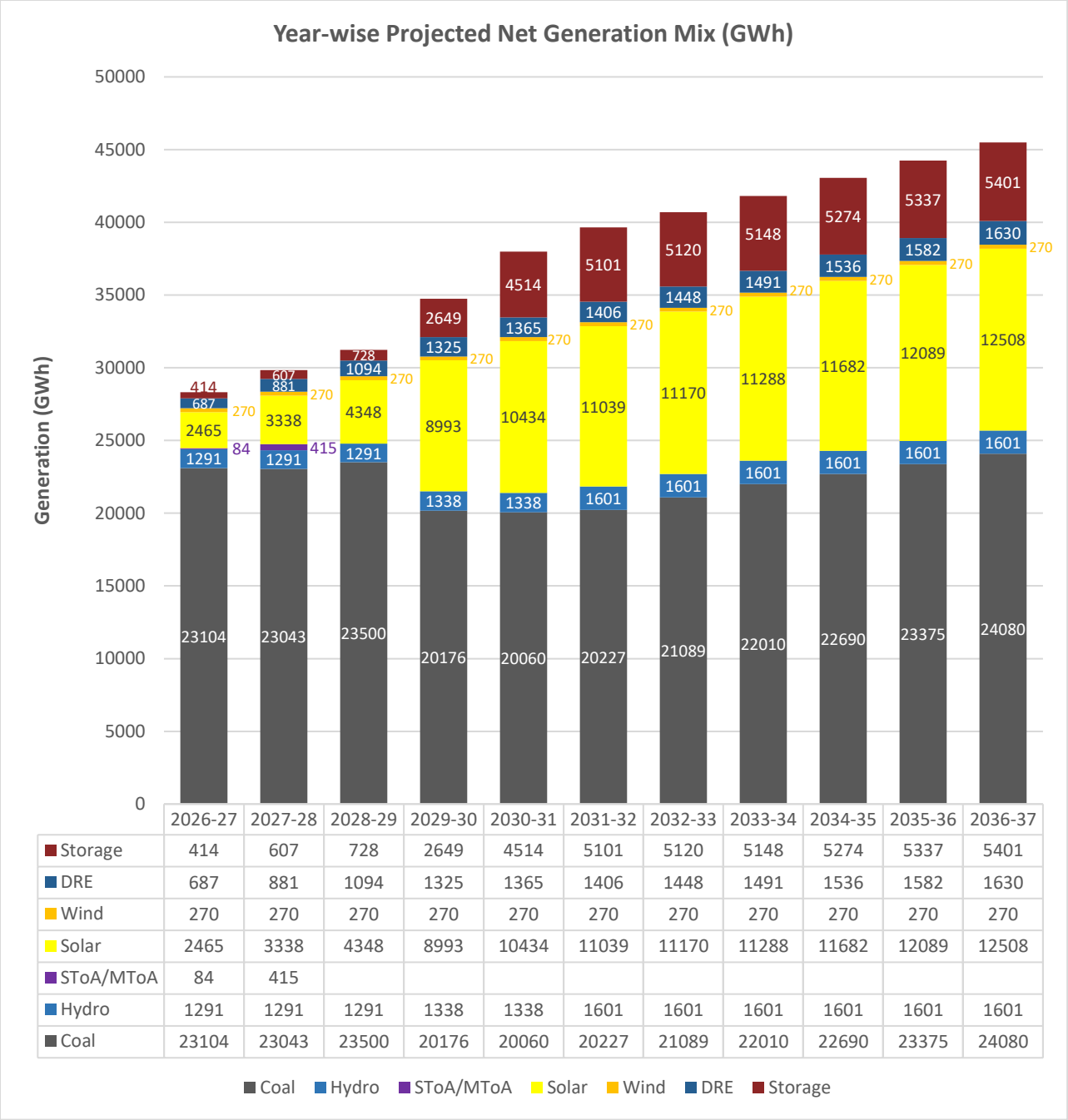


Figure 13: Year-wise projected net generation (in GWh)

8.0 Conclusions

Based on the Resource Adequacy studies of DVC up to the year 2036-37, the following conclusions may be drawn:

1. The study has been done based on the hourly electricity demand pattern of the year 2025-26. It has been observed that the peak demand season is typically from February to June with peak demand occurring during non-solar hours.
2. The study has considered electrical energy and peak electricity requirement projections as per the projections available with DVC, which envisages that the annual energy requirement and the peak electricity demand for the state is likely to grow at a CAGR of 3.60% for the period of 2026-27 to 2036-37. The projected peak electricity demand and electrical energy requirement in 2036-37 is 5298 MW and 37029 MU.
3. As per the resource adequacy studies, the likely total projected contracted capacity for the year 2036-37 is around 16,614 MW which consists of 4,616 MW from coal; 578 MW from hydro; 6,751 MW from solar; 110 MW from wind and 3,200 MW from Storage and 1359 from DRE. This capacity shall be able to meet the projected demand with prescribed reliability criteria and to comply with the stipulated Renewable Energy Consumption Obligation (RCO) targets.
4. The state is projected to face unserved energy in the coming years and will need to contract additional solar, wind and storage capacities beyond those already planned. In addition to the existing and already planned contracts, the state needs to tie up approximately 4,016 MW of solar-based capacity, 2,500 MW of Storage and 1,359 MW DRE by 2036-37 (refer Table 14). Additionally, there will be a requirement for Medium-Term Open Access (MToA) and Short-Term Open Access (SToA) ranging from around 750 MW to 850 MW in the initial years, as detailed in the report. These MToA/SToA needs can be met through power procurement from market or through bilateral agreements. The MToA/SToA values represent peak electricity demand requirements as well as seasonal banking needs, expressed in terms of megawatts (MW) and is only required during non-solar hours of peak demand months viz. from February to June.
5. LT-DRAP was also verified against the coincident peak requirement to be met by DVC at the time of national peak, as provided for in the Long-term National Resource Adequacy Plan (LT-NRAP) published by CEA for the period from 2026-27 to 2035-36. It was found that the planned capacity for FY 2026-27 and FY 2027-28 is adequate to meet the coincident peak demand while maintaining the required national level PRM.
6. The Planning Reserve Margin (PRM) for DVC has been assessed at about 12%. Further, the study indicates year-wise short-term/medium-term/bilateral requirements inclusive of the PRM capacity to meet the demand optimally.

7. Timely commissioning of planned capacities is critical for ensuring that the state meets its projected peak electricity demand and electrical energy requirements reliably. Any deviation from the planned schedule may lead to resource shortfalls and could significantly increase the cost of reliably meeting the state's power demand.
8. DVC is suggested to periodically review the progress of all the under construction/planned projects and accordingly plan alternate sources of baseload/firm power for the intervening period in case of slippages in the planned capacity.
9. It is likely that DVC may have surplus capacity, which can be shared with other utilities/states through banking/bilateral arrangements, including the PUShP portal.
10. Accurate demand assessment is fundamental to capacity expansion modelling and directly impacts the Resource Adequacy (RA) study outcomes. To achieve realistic and data-driven results, DISCOMs are strongly encouraged to adopt scientific tools and robust methodologies for demand forecasting.

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Annexure

Planned Future Contracts (MW) considered in the study

S. No.	Tied capacity name	Type of generation	Expected COD	DVC share (in MW)
1.	Raghunathpur Thermal Power Station Ph-II Unit-1	Coal	2028-29	139
2.	Raghunathpur Thermal Power Station Ph-II Unit-2	Coal	2029-30	139
3.	Koderma Thermal Power Station Ph-II Unit-1	Coal	2028-29	314
4.	Koderma Thermal Power Station Ph-II Unit-2			314
5.	Durgapur Thermal Power Station	Coal	2029-30	155
6.	Kiru HEP	Hydro	2026-27	15
7.	Rangeet-IV HEP	Hydro	2026-27	5
8.	Teesta-VI HEP	Hydro	2029-30	12
9.	Dibang MPP Hydro Electric Project	Hydro	2031-32	68
10.	ACME Solar	Solar	2026-27	250
11.	DVC Solar	Solar	2025-26	342
12.			2026-27	453
13.			2027-28	524
14.			2028-29	228
15.			2029-30	350
16.			2030-31	100
17.			2031-32	100
18.	Greenko PSP	PSP	2026-27	100
19.	ACME BESS 4h	BESS	2026-27	250
20.	Battery (2hrs)	BESS	2027-28	250
21.	Battery (4hrs)	BESS	2028-29	100
	TOTAL			**4208**

Assumption for Resource Adequacy Studies

1. Electricity Demand & Peak requirement: As per projections furnished by DVC.
2. Demand Profile: Based on hourly demand profile of 2025-26.
3. Existing & Planned Capacity: As per the information shared by DVC.
4. Cost parameters: based on information in National Electricity Plan.

RE CUF considered

Hydro	Solar	Wind	DRE
32 %	21%	28%	14%

Technical Parameters

Technology	Type	Availability (%)	Ramping (%/min)	Min. Technical. (%)
Coal/ Lignite	Existing/Planned	85	1	55
	Candidate	88	1	55
Gas	Existing	90	3	40
Nuclear	Existing/Planned	68	Const. Load	-
Biomass	Existing/Planned	60	2	50
Hydro	Existing/Planned/ Candidate	As per available hourly generation profile	100	-
Solar	Existing/Planned		-	-
	Candidate		-	-
Wind	Existing/Planned		-	-
	Candidate		-	-
Pumped storage Plant	Existing/Planned	95	50	-
	Candidate		50	-
BESS	Candidate	98	NA	-

Technology	Type	Heat Rate (MCal/MWh)		Aux. Consum. (%)	Min. online time (hr)	Min. offline time (hr)
		At max loading	At min loading			
Coal	Existing/ Planned	2300 to 2879	2438 to 3052	7.0	6	4
	Candidate (SC & USC)	2060 to 2125	2183 to 2253	6.5	6	4
Gas	Existing	2000 to 2900	2260 to 3277	2.5	4	3
Nuclear	Existing/ Planned	2777	2777	10	6	4

Technology	Type	Heat Rate (MCal/MWh)		Aux. Consum. (%)	Min. online time (hr)	Min. offline time (hr)
		At max loading	At min loading			
	Candidate	2777	2777	10	-	-
Biomass	Existing/ Planned	4200	4450	8	6	4
	Candidate	4200	4450	8	6	4
Hydro	Existing/ Planned	-	-	0.7	-	-
	Candidate	-	-	0.7	-	-
Pumped Storage Plant	Existing/ Planned	-	-	Round trip efficiency 80 %	-	-
	Candidate	-	-		-	-
BESS	Candidate	-	-	Round trip efficiency 88%	-	-

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:

Resource	Capex (in ₹/MW)	O&M Fixed Cost (in ₹/MW)	Construction Time (in years)	Amortization /Life time (in years)
Coal	12 Cr	30 Lakh	4	25
Solar	4.5-4 Cr	1 % of Capex	1	25
Battery Energy Storage System (4-Hour)	5 Cr to 3.6 Cr	1 % of Capex	1	15
Pumped Storage Plant	5 Cr	30 Lakh	4	40