UTTARAKHAND ELECTRICITY REGULATORY COMMISSION

'Vidyut Niyamak Bhawan', Near I.S.B.T., P.O.-Majra, Dehradun-248171

Draft Notification

May….., 2026

No…….: In exercise of the powers conferred under Section 181 of the Electricity Act, 2003 (36 of 2003), read with Sections 61, 66, and 86 thereof and all other powers enabling it in this behalf, and after previous publication, the Uttarakhand Electricity Regulatory Commission hereby makes the following Regulations, namely –

Chapter 1

Preliminary

1. Short Title, Extent, and Commencement

1.1. These Regulations shall be called the **"Uttarakhand Electricity Regulatory Commission (Framework for Resource Adequacy) Regulations, 2026"**.

1.2. These Regulations shall extend to the whole of Uttarakhand.

1.3. These Regulations shall come into force from the date of notification in the official gazette.

2. Objective

2.1. The objective of these Regulations is to enable the implementation of Resource Adequacy framework by outlining a mechanism for planning of generation resources for reliably meeting the projected demand in compliance with specified reliability standards for serving the load with an optimum generation mix.

2.2. The Resource Adequacy framework shall cover a mechanism for demand assessment and forecasting, generation resource planning, procurement planning, its monitoring and compliance.

3. Scope and Applicability

3.1. These Regulations shall apply to the Generating Companies, Distribution Licensee, State Load Despatch Centre, State Transmission Utility, Transmission Companies, other grid connected entities and stakeholders within the State of Uttarakhand.

4. Definitions

4.1. In these Regulations, unless the context otherwise requires,

a) "**Act**" means the Electricity Act, 2003 (No. 36 of 2003) and subsequent amendments thereof;

b) "**Authority**" or **"CEA"** means Central Electricity Authority referred to in sub-section (1) of Section 70 of the Act;

c) **"Capacity"** means the installed nameplate capacity of the resource.

d) "**Capacity Credit**" or "**CC**" means the firm capacity expressed as a percentage of a installed nameplate capacity that is considered for calculation of firm capacity to meet Resource Adequacy Requirements;

e) "**Commission**" or "**State Commission**" means the Uttarakhand Electricity Regulatory Commission (UERC) constituted under the Act.

f) "**CERC**" means the Central Electricity Regulatory Commission;

g) **"Electric Power Survey" or "EPS"** means a periodic electric power survey conducted by the Central Electricity Authority to assess the electricity demand on medium and long-term basis for each DISCOM/State/Union Territory/Region and for the Country;

h) "**Expected Energy Not Served**" or "**EENS**" means the expected amount of energy (MUs) that may not be served for each year within the time horizon period for Resource Adequacy planning;

i) "**Load Factor**" is calculated by dividing total electrical energy requirement for a given period of time by the product of maximum demand and that specific period of time. The formulae for calculating load factor on monthly and yearly basis are:

Monthly Load Factor (**in** %)

= (Energy Requirement in MU ∗ 100) / (Peak Demand in MW ∗ No. of days in the Month ∗ No. of hours in a day)

Yearly Load Factor (**in** %)

= (Energy Requirement in MU ∗ 100) / (Peak Demand in MW ∗ No. of days in the year ∗ No. of hours in a day)

j) "**Load Diversity Factor**" means the ratio of the sum of individual non-coincident

maximum loads of Divisions to the Maximum Demand of the DISCOM's operational area.

$$\boldsymbol{Load\ \_Diversity\ \_Factor}$$

$$=\Sigma(Individual\ non\_coincident\ maximum\ loads\ of\ Divisions)\ /\ (Maximum\ Demand\ of\ the\ DISCOM's\ Operational\ area)$$

Load Diversity Factor is always greater than 1.

k) "Load Research" means the systematic process of collecting and analyzing electricity consumption data from customers to understand when and how the energy is used which would enable the utilities to predict future demand, and manage infrastructure like transformers, ultimately supporting cost-effective demand-side management (DSM).

l) **"Long-Term"** means duration exceeding five years for development of demand forecasting and generation resource planning;

m) **"Long-Term Power Procurement"** means procurement of power under any arrangement or agreement with a term or duration exceeding five years;

n) "**Long-Term Distribution Resource Adequacy Plan**" or "**LT-DRAP**" means plan for assessment of long-term resource adequacy by the Distribution Licensee;

o) "**Loss of Load Probability**" or "**LOLP**" means probability that a system's load may exceed the generation and firm power contracts available to meet that load in a year;

p) **"Medium-Term"** means duration exceeding one year and up to five years for development of demand forecasting and generation resource planning;

q) **"Medium-Term Power Procurement"** means procurement of power under any arrangement or agreement with a term or duration exceeding one year and up to five years;

r) "**Medium-Term Distribution Resource Adequacy Plan**" or "**MT-DRAP**" means plan for assessment of medium-term resource adequacy by the Distribution Licensee;

s) **"Month"** means a calendar month as per the Gregorian Calendar;

t) "**Net Load**" means the load derived upon exclusion of actual renewable energy generation (MW) from gross load prevalent on the grid during any time-block;

u) "**Normalized Energy Not Served**" or "**NENS**" is the total expected load shed due to

supply shortage (MWh) as a percentage (%) of the total system energy, and, therefore, represents an overall percentage of system load that cannot be served.

v) "**Planning Reserve Margin**" or "**PRM**" means a percentage of the capacity over and above the State's coincident share in national peak demand as may be laid down by Authority or approved by the Commission from time to time for the purpose of generation resource planning;

w) **"Power Exchange"** means any Exchange operating as Power Exchange for electricity in terms of the Regulations issued by the Central Electricity Regulatory Commission;

x) **"Power Purchase Agreement (PPA)"** means the agreement entered into between the Procurer(s) and the Seller pursuant to which the Seller shall supply power to the Procurer(s) as per the terms and conditions specified therein;

y) **"Power Sale Agreement (PSA)"** shall mean the back-to-back agreement entered into between the Buying Entity(s) and the Intermediary Procurer/trader for onward sale of power purchased under any PPA;

z) **"Power Supply Agreement"** shall mean the agreement entered into between the Procurer(s) and the Seller pursuant to which the Seller shall supply power to the Procurer(s) as per the Ministry of Power Guidelines for long-term Procurement of Electricity from Thermal Power Stations set up on Design, Build, Finance, Own and Operate (DBFOO) basis and sourcing fuel as provided under Model Bidding Documents including allocation of coal under B(I), B(III) and B(IV) of SHAKTI (Scheme for Harnessing and Allocating Koyala (Coal) Transparently in India) Policy;

aa) "**Resource Adequacy**" or "**RA**" means a mechanism to ensure adequate generation resources to serve expected demand (including peak, off peak and in all operating conditions) reliably in compliance with specified reliability standards for serving the load with an optimum generation mix and with a focus on integration of environmentally benign technologies after taking into account the need, inter alia, for flexible resources, storage systems for energy shift, and demand response measures for managing the intermittency and variability of renewable energy sources;

bb) **"Short-Term"** means duration up to one year for development of demand forecasting and generation resource planning;

cc) **"Short-Term Power Procurement"** means procurement of power under any arrangement

or agreement with a term or duration of up to one year;

dd) "**Short-Term Distribution Resource Adequacy Plan**" or "**ST-DRAP**" means plan for assessment of short-term resource adequacy by the Distribution Licensee;

ee) "**SLDC**" means the State Load Despatch Centre of Uttarakhand

ff) **"State"** means the State of Uttarakhand;

gg) **"Year"** means financial year commencing on 1st April of the year and ending on 31st March of the succeeding year.

4.2. All other words and expressions used in these Regulations, although not specifically defined herein above, but defined in the Act or other Regulations of the Commission or CEA Guidelines, shall have the meaning assigned to them in the Act or other Regulations of the Commission or CEA Guidelines. The other words and expressions used herein but not specifically defined in these Regulations or in the Act but defined under any law passed by the Parliament applicable to the electricity industry in the State shall have the meaning assigned to them in such law.

Chapter 2

General

5. Resource Adequacy Framework

5.1. Resource Adequacy framework shall comprise planning of generation resources for reliably meeting the projected demand in compliance with specified reliability standards for serving the load with an optimum generation mix.

5.2. Resource Adequacy framework shall cover following steps:

a) Demand assessment and forecasting;
b) Generation resource planning;
c) Procurement planning;
d) Monitoring and compliance.

5.3. The Resource Adequacy exercise shall be developed and prepared for a planning period of 10 (ten) years on annual rolling basis.

5.4. The long, medium and short term for the purpose of these Regulations shall be considered as:

a) Long-term procurement plan for a period up to ten years; and

b) Medium-term procurement plan for a period up to five years; and

c) Short-term procurement plan for a period up to one year.

5.5. The Distribution Licensee shall develop and prepare Long-Term Distribution Resource Adequacy Plan (LT-DRAP), Medium-Term Distribution Resource Adequacy Plan (MT-DRAP), and Short-Term Distribution Resource Adequacy Plan (ST-DRAP) in accordance with the conditions outlined under these Regulations.

Chapter 3

Demand Assessment and Forecasting

6. Long-Term and Medium-Term Demand Forecast

6.1. The Distribution Licensee shall develop and prepare demand assessment and forecasting considering the guidelines for Long-term and Medium-term power demand forecast issued by Central Electricity Authority (CEA) from time to time.

6.2. Demand assessment and forecasting shall cover hourly or sub-hourly assessment and forecasting of demand within the distribution area of Distribution Licensee for multiple horizons, viz (Long-term/Medium-term/Short-term) shall be done using comprehensive input data, policies, drivers and scientific mathematical modelling tools.

6.3. The SLDC shall be responsible for providing Deviation Settlement Mechanism (DSM) accounts to the Distribution Licensee of previous financial year latest by 21st April of each year.

6.4. The Distribution Licensee shall be responsible for the assessment and forecasting of demand (MW) and energy requirement (MUs).

6.5. The Distribution Licensee shall prepare the load and energy forecast for each consumer category as specified by the Commission in its Retail Supply Tariff Order from time to time.

6.6. The Distribution Licensee shall determine the load forecast for a consumer category by adopting any of the following and/or combination of following methodologies:

a) Trend Analysis, i.e. Year on Year /compounded annual growth rate (CAGR) for past period and time series analysis;

b) End Use or Partial End Use method;

c) Auto-regressive integrated moving average (ARIMA) method;

d) Artificial Intelligence (AI) including machine learning, Artificial Neural Network (ANN)

techniques; and

e) Econometric Modelling (specifying the parameters used, algorithm, and source of data).

6.7. The Distribution Licensee may use Electric Power Survey (EPS) projections as base and/or any methodology other than the above-mentioned methodologies after providing detailed justification for the methodology adopted for demand forecasting. The Distribution Licensee shall use the best fit of various methodologies for the purpose of demand/load forecast after taking into consideration various scenarios such as most probable, business as usual, and aggressive, as specified under Regulation 6.17 of these Regulations.

6.8. For the purpose of methodology to be used for energy forecasting of a consumer category, the Distribution Licensee shall conduct statistical analysis and select the method for which the standard deviation is lowest, and R-squared (coefficient of determination) is highest.

6.9. The Distribution Licensee shall utilize state-of-the-art tools, scientific and mathematical methodologies, and comprehensive database such as, but not limited to, weather data, historical data, demographic and econometric data, consumption profiles, impact of policies and drivers, etc. as may be applicable to the Distribution Licensee's control area.

6.10. The Distribution Licensee may modify the energy forecast obtained on either side, for each consumer category, by considering the impact of the following activities. The impact shall be considered by developing trajectories for each activities based on the economic parameters, policies, historical data, and projections for the future:-

a) Demand-Side Management;

b) Open Access;

c) Distributed Energy Resources;

d) Deviation Settlement Mechanism and demand response measures;

e) Electric Vehicles and EV Charging Stations;

f) Tariff Signals including Time of the Day (ToD) Tariff;

g) Changes in specific energy consumption;

h) Increase in commercial activities with electrification;

i) Increase in number of agricultural pump sets and its solarization;

j) Changes in consumption pattern of seasonal consumers;

k) Availability of supply;

l) Impact of important festivals, working days or non-working days, Peak and Off-Peak

hours load pattern; and

m) Energy Storage System (ESS), e.g. Battery ESS, Pumped Storage System etc.; and

n) Policy influences such as 24x7 supply to all consumers, LED penetration, efficient use of agriculture pumps, fans/ACs/ appliances, increased use of appliances for cooking/ heating/cooling applications, electrification policies, distributive energy resources, storage, policies which can impact econometric parameters, impact of national hydrogen mission, energy efficiency measures, energy saving and conservation interventions, etc. For each policy, a separate trajectory should be developed for each consumer category.

6.11. The Distribution Licensee may take into consideration any other factor not mentioned in Regulation 6.10 of these Regulations after providing detailed justification for its consideration.

6.12. The long and medium-term load profiles of the consumer categories for which load research has been conducted may be refined on the basis of load research analysis using smart meter infrastructure. The load research shall include monitoring, collecting, and analyzing electrical usage, including consumption patterns, socio-economic factors, and peak load timing. This data is essential for long/medium term and short-term forecasting to avoid capacity shortages. A detailed explanation for refinement conducted must be properly documented by the Distribution Licensee.

6.13. The summation of energy forecast (MUs) for various consumer categories after adjusting energy forecast of captive consumers, prosumers and open access consumers as per Regulations 6.6 to 6.12 of these Regulations, as the case may be, shall form the basis of energy forecast (MW) for the Distribution Licensee at consumer level.

6.14. The Distribution Licensee shall calculate the energy forecast (MUs) of the State by considering distribution losses and Intra/Inter-State transmission losses as per realistic loss trajectory proposed by the Licensee or approved by the Commission:

Provided that for the purposes of estimating Aggregate Revenue Requirement (ARR) for ensuing years and approval of true-up of previous years, Distribution/Aggregate Technical and Commercial (AT&C) Losses trajectory as specified by the Commission from time to time shall be considered.

6.15. The peak demand (in MW) shall be determined by considering the average load factor, load diversity factor, seasonal variation factors for the last three years, and the energy forecasts (in MUs) obtained in accordance with Regulation 6.14 of these Regulations. If any other

appropriate load factor is considered for future years, a detailed justification shall be provided by the Distribution Licensee for its consideration.

6.16. The Distribution Licensee shall conduct sensitivity and probability analysis to determine the most probable demand forecast. It shall also develop long-term and medium-term demand forecasts for possible scenarios, while ensuring that at least three different scenarios (most probable, business as usual, and aggressive scenarios) are developed.

6.17. The Distribution Licensee shall maintain the database of actual energy consumption in its area of operation, block-wise/hourly/monthly for all consumer categories, which shall form the basis for future demand forecasting for intervals/periods as notified by the Commission from time to time.

7. Short-Term Demand Forecast

7.1. The Distribution Licensee shall develop a methodology for hourly or sub-hourly demand forecasting and shall maintain a historical database.

7.2. For the purpose of ascertaining hourly load profile and for assessment of contribution of various consumer categories to peak demand, load research analysis shall be conducted, and influence of demand response, load shift measures, time of use shall be factored in by the Distribution Licensee with inputs from State Load Despatch Centre (SLDC). A detailed explanation for methodology adopted must be properly documented by the Distribution Licensee.

7.3. The Distribution Licensee shall utilize state-of-the-art tools, scientific and mathematical methodologies (including, inter alia, the methodologies as listed in Regulation 6.6 of these Regulations, as deemed relevant), and comprehensive data but not limited to weather data, historical data, demographic and econometric data, consumption profiles, policies and drivers, etc. as may be applicable to the area of Distribution Licensee.

8. Aggregation of Demand Forecast

8.1. The Distribution Licensee shall prepare hourly or sub-hourly 1-year Short-term (ST), 5-year Medium-term (MT) and 10-year Long-term (LT) demand forecasts on a rolling basis and submit the same to SLDC by 30th April of each year for the ensuing year(s).

8.2. SLDC shall aggregate the demand forecasted by the Distribution Licensee, duly considering the diversity of the State, congruency, seasonal variation aspects and shall prepare the monthly 1-year Short-Term (ST), 5-year Medium-Term (MT) and 10-years Long-Term (LT) forecasts for

the entire State after considering the Intra state transmission loss as approved by the Commission in the Business Plan of the STU from time to time and the transmission loss figure available for the last year of the Business plan shall be considered for assessment of demand for the future years.

8.3. The Distribution Licensee shall with inputs from SLDC, estimate, in different time periods, namely Long-term, Medium-term, and Short-term, the demand for the entire State duly considering the load diversity of the State.

8.4. SLDC shall submit the state-level aggregate demand forecasts (MW and MUs) for Long-Term, Medium-Term and Short-Term to the Authority, NLDC, NRLDC, STU by 31st May of each year for the ensuing year(s).

Chapter 4

Generation Resource Planning

9. Preparation of Generation Resource Planning

9.1. Distribution Licensee shall plan and assess the required generation resources considering the existing resources, upcoming resources (not yet commissioned), capacity credit and incremental capacity requirement to meet forecasted demand including planning reserve margin (PRM).

9.2. Generation Resource Planning shall involve the following steps namely,

a) Capacity crediting of generation resources;

b) Assessment of planning reserve margin; and

c) Ascertaining resource adequacy requirement and allocation to Distribution Licensee.

9.3. The Distribution Licensee shall map all its existing resources, upcoming resources, and retiring resources to develop the existing resource map in MW for the Long-term and Medium-term power procurement plan.

9.4. The mapping shall include critical characteristics and parameters of the generating machines, such as heat rate, auxiliary consumption, ramp-up rate, ramp-down rate, etc., for thermal machines; hydrology and machine characteristics etc. for hydro machines; and renewable resources, their Capacity factors/CUFs, etc. for renewable resource–based power plants to be considered in the resource plan. All the characteristics and parameters for each generating

machine considered shall be provided in the resource plan. Some of the important parameters that would be considered for this resource characteristic assessment shall include but not limited to following:

a) Planning Reserve Margin;

b) Actual demand met by the State/Distribution Licensee in hourly time block resolutions for last 5 years;

c) Estimated load growth during the planning period;

d) Critical characteristics, machine characteristics, hydrology for hydro machines and technical parameters of thermal and hydro generation plants, such as:

   i. Name of plant, location (State/Region);

   ii. Capacity (MW) (for existing and planned capacities);

   iii. Heat Rate for thermal generating stations;

   iv. Auxiliary Consumption (MW);

   v. Maximum and Minimum Generation Limits (MW);

   vi. Ramp Up and Ramp Down Rate (MW/min);

   vii. Start-up time (Minimum up and down time);

   viii. Plant Availability Factor (% of time), etc.; and

   ix. Capacity utilization factor (CUF) for renewable resource-based power plants.

e) All the characteristics and parameters with their values for each generating plant considered shall be provided in the resource plan;

f) Under-construction capacity/retirement of generation capacity/ contracted capacity/ bilateral contracts/renovation;

g) Potential technologies, gestation periods and lifetime of different assets;

h) Capacities and generation profile of renewable generation;

i) Historical forced outage rates and planned maintenance rates of generation capacities;

j) Renewable Purchase Obligation (RPO) including Energy Storage Obligation targets, etc.;

k) Constraints such as penalties for unmet demand, forced outages, and system emission limits as defined in State Grid Code and Indian Electricity Grid Code and emission norms specified by the Ministry of Environment, Forest and Climate Change (MoEFCC)

shall be identified and enlisted.

l) Transmission expansion plans with timelines

m) Evacuation arrangements with timelines for RE generation resources.

9.5. The Distribution Licensee shall also include a Planning Reserve Margin (PRM) as specified by the Authority or the Commission, as the case may be. In the absence of any guidelines from the Commission, the Distribution Licensee can consider suitable planning reserve with proper justification, which will be subject to approval by the Commission. The value of planning reserve margin considered shall be stipulated in the resource plan along with justifications.

10. Capacity Crediting of Generation Resources

10.1. The Distribution Licensee shall compute Capacity Credit (CC) factors for their contracted generation resources by applying the net load-based approach as outlined hereunder. The average of the Capacity Credit (CC) factor for each type of contracted generation resource for the preceding five years on a rolling basis shall be considered as Capacity Credit factor for the purpose of Generation Resource Planning.

10.2. The Net Load based approach/methodology for the determination of Capacity Credit (CC) factors for generation resources shall be adopted as under.

The following clause (a) to (f) outlines CC factor calculation for Solar generation source as an illustration which shall be applied for calculation of CC factor for other generation sources also :

a) For each year, the hourly recorded Gross Load (in MW) for 8760 hours (8784 hours for leap year) (or sub-hourly time-blocks) shall be arranged in descending order;

b) For each hour, the Net Load (in MW) shall be calculated by subtracting the actual solar generation (in MW) corresponding to that load for 8760 hours (8784 hours for leap year) (or sub-hourly time-blocks) and then arranged in descending order;

c) The difference between these two load duration curves mentioned under clause (a) and (b) above represents the contribution of capacity factor of solar generation;

d) Installed capacity (in MW) of solar generation capacity shall be summed up corresponding to the top 250 load hours (or sub-hourly time-blocks) as computed in clause (b) above. The selection for 250 top load hours (or sub-hourly time-blocks) shall be considered from the arranged descending order of Net Load hours;

e) Total generation from solar generation (in MUs) corresponding to these top 250 load hours shall be summed up;

f) Resultant CC factor shall be (Total Solar Generation for top 250 load hours)/(Installed RE Capacity for top 250 load hours), as per formula below:

$$\text{CC factor} = \frac{\text{Sum of Solar Generation (MW) for top 250 load hours}}{\{\text{Sum of Solar Capacity (MW) for top 250 load hours}\}}$$

g) The process for CC factor determination shall be undertaken for each year for duration of past five-years and the resultant CC shall be the average of CC values of past 5 years:

Provided that at the time of determining CC factor considering past five-years duration values, the Distribution Licensee shall exclude abnormal values during the year for following events or circumstances, but not limited to:-

a) Act of God including but not limited to lightning, drought, fire and explosion, earthquake, volcanic eruption, landslide, flood, cyclone, typhoon, tornado, geological surprises, natural disaster or exceptionally adverse weather conditions, which are in excess of the statistical measures for the last hundred years; or

b) Any disaster declared by the Central Government under Disaster Management Act as amended from time to time; or

c) Any act of war, invasion, armed conflict or act of a foreign enemy, blockade, embargo, revolution, riot, insurrection, terrorist, or military action.

10.3. CC factors for hydro generation resources shall be computed based on water availability with different CC factors for run-of-the-river hydro power projects and dam-based/storage-based hydro power projects.

10.4. CC factor for thermal resources shall be computed based on coal availability and planned/ forced outages.

10.5. For the purpose of generation resources, contribution of CC factor for such generation resource where such resource is located in the grid (namely inter-state or intra-state generation resource whose entire capacity is not tied up with the distribution licensee, as the case may be) as contracted by the Distribution licensee shall be considered. For this purpose, CC factors as specified by Authority or as approved by the Commission shall be considered.

10.6. The Distribution Licensee shall share CC factors for their contracted resources alongwith

justification for its computations with SLDC by 15th May of each year for the ensuing year(s).

10.7. SLDC shall calculate state-specific CC factors considering the aggregate State Demand and State Net Load and contracted RE generation resources available in the State and shall submit such CC factor information to the Authority, NLDC and NRLDC by 31st May of each year for ensuing year(s).

11. Assessment of Planning Reserve Margin (PRM)

11.1. Planning Reserve Margin (PRM) as a percentage of peak load represents the excess generation resource or planning reserve required to be considered for the purpose of generation resource planning.

11.2. Planning Reserve Margin (PRM) factor shall be based on the reliability indices in terms of Loss of Load Probability (LOLP) and Normalized Energy Not Served (NENS) as may be specified by the Authority or separately computed by the Distribution Licensee and STU/SLDC at State level, subject to approval by the Commission, and the same shall be considered by the Distribution Licensee in their planning for resource adequacy requirement and generation resource capacity planning.

11.3. The Distribution Licensee may consider higher planning reserve margins, subject to prior approval from the Commission.

11.4. The capacity planning by the Distribution Licensee and the State level resource adequacy planning by STU/ SLDC shall factor in PRM while developing the state-level Integrated Resource Plan.

12. Resource Adequacy Requirement and its Allocation

12.1. The Distribution Licensee shall determine capacity requirement to meet demand and PRM considering available capacity adjusted for capacity crediting for existing and planned contracted generation resources.

12.2. The available capacity as determined in Regulation 12.1 shall then be plotted over a time axis of 15-minute intervals or longer, but not more than one hour. This shall form the resource map of the Distribution Licensee.

12.3. The Distribution Licensee shall subtract the resource map developed in Regulation 12.2 from the demand forecast developed in Regulation 6 of these Regulations to identify the resource gap. The resource gap in terms of RA compliance for the Distribution Licensee for the long

term and medium term shall be developed in the manner as specified in these Regulations.

12.4. The Distribution Licensee shall conduct sensitivity and probability analysis to determine the most probable resource gap. It shall also develop Long-term, Medium-term, and Short-term resource gap plans for possible demand forecasting scenarios, while ensuring at least three different scenarios (most probable, business as usual, and Pessimistic Scenario) are developed. Based on most probable scenario, the Distribution Licensee shall undertake development of Long-term, Medium-term, and Short-term Distribution Resource Adequacy Plan exercise to meet the Resource Adequacy target requirement.

12.5. The Distribution Licensee shall submit the RA plans (LT-DRAP, MT-DRAP & ST-DRAP) so developed to the Commission by 31st August of each year. The Distribution Licensee shall also submit the RA Plans to the STU and SLDC for further examination so as to apprise the Commission as per these Regulations.

12.6. **Long-Term Distribution Resource Adequacy Plan (LT-DRAP)**

a. RA requirement planning shall be done with reference to national coincident peak to optimize the requirement of incremental capacity addition through an annual rolling plan. Long-term National Resource Adequacy Plan (LT-NRAP) as may be published by Central Electricity Authority to determine the optimal Planning Reserve Margin (PRM) requirement at the national level for ensuring reliable supply targets and Short-term National Resource Adequacy Plan (ST-NRAP) as may be published by NLDC for a one-year look-ahead shall act as guidance for the Distribution Licensee for undertaking the Resource Adequacy exercises.

b. Based on the allocated share in national peak provided in LT-NRAP for the State, the Distribution Licensee shall ascertain its share in the national peak within 15 days of the publication of LT-NRAP.

c. The Distribution Licensee, based on the share in national peak provided in LT-NRAP, shall plan to contract the capacities over and above the State coincident demand in national peak prescribed by LT-NRAP or procure higher to meet their Resource Adequacy Requirement (RAR) at the time of national peak.

d. The Distribution Licensee shall demonstrate to the Commission 100% tie-up for the first year and a minimum 90% tie-up for the second year to meet the requirement of their contribution towards meeting national peak. Only resources with long / medium / short-

term contracts shall be considered to contribute to the RAR.

e. For subsequent three years, the Distribution Licensee shall furnish a plan to meet estimated requirement of their contribution to meet national peak for the Commission's approval.

f. The Distribution Licensee shall submit the details of the contracted capacities for the ensuing years for meeting RAR of the national peak to SLDC within 15 days from the date of approval from the Commission. SLDC shall aggregate the total contracted capacities at the state level and submit the information to NRLDC, under intimation to the Commission, within 15 days from the date of receipt from the Distribution Licensee.

g. The Distribution Licensee shall keep the share of Long-term contracts in the range of 80-85% of the RAR and Medium–term contracts in the range of 10% - 15% of the RAR, while the balance of RAR shall be met through Short-term contracts:

   Provided that power procurement through exchange, shall not be considered towards the contribution for meeting RAR.

h. The contract mix mentioned under Regulation 12.5 (g) of these Regulations may be periodically reviewed by the Commission.

i. The LT-DRAP shall be carried out by the Distribution Licensee on an annual rolling basis considering the contracted capacity as a part of the system, which shall be optimized for additional capacity required.

j. The Distribution Licensee through LT-DRAP, shall demonstrate to the Commission their plan to meet their Peak demand and energy requirement with a mix of Long-term, Medium-term, and Short-term contracts.

k. The share of long-term contracts in the entire mix of the contracts of the Distribution Licensee shall be at least equal to the maximum of the quantum of long-term contracts determined for meeting RAR of national peak as per Regulation 12.5 (c) of these Regulations, and quantum obtained from LT-DRAP for fulfilling own energy and peak requirement as per Regulation 12.5 (l) of these Regulations.

l. The Distribution Licensee shall prepare a 10-year Long-term Distribution Resource Adequacy Plan (LT-DRAP) to meet the peak demand and energy requirement for the State of Uttarakhand including State's contribution to meet national peak (PRM).

m. The Distribution Licensee while formulating the LT-DRAP shall also consider the constraints mentioned in **Annexure–I** of these Regulations.

n. The Distribution Licensee may take inputs from the LT-NRAP like PRM, capacity credits, etc. while formulating the LT-DRAP and shall submit their plans to CEA by 30th September of each year for the ensuing year(s) for validation.

o. The Distribution Licensee shall submit the LT-DRAP duly vetted by CEA along with necessary supporting documents, formats (enclosed as **Annexure-II** to these Regulations) and details for meeting RAR, to the Commission for approval within 15 days from the date of receipt of CEA's approval.

12.7. **Medium-Term Distribution Resource Adequacy Plan (MT-DRAP)**

a. The Distribution Licensee shall prepare a 05-year MT-DRAP in line with the approach and methodology as discussed in Regulation 12.5 above.

b. The Distribution Licensee shall submit the MT-DRAP to the Authority and the NLDC by 31st August of each year for the ensuring year(s).

c. The Distribution Licensee shall submit the MT-DRAP duly vetted by CEA along with necessary supporting documents, formats (enclosed as **Annexure-II** to these Regulations) and details for meeting RAR, to the Commission for approval alongwith LT-DRAP.

12.8. **Short-Term Distribution Resource Adequacy Plan (ST-DRAP)**

a. SLDC shall prepare one-year look ahead ST-DRAP (Short-term Distribution Resource Adequacy Plan) on an annual basis for operational planning, at the State level based on the LT-DRAP study results. The SLDC shall review the ST-DRAP on a daily, monthly and quarterly basis based on actual availability of generation resources.

b. The Distribution Licensee shall submit the ST-DRAP to the Authority and the NLDC by 31st August of each year for the ensuing year(s).

c. The Distribution Licensee shall submit the ST-DRAP duly vetted by CEA along with necessary supporting documents, formats (enclosed as **Annexure-II** to these Regulations) and details for meeting RAR, to the Commission for approval alongwith LT-DRAP.

12.9. The Commission shall approve Resource Adequacy Plan (LT-DRAP, MT-DRAP, ST-DRAP) of the Distribution Licensee within 60 days of submission by the Distribution Licensee of the duly vetted Resource Adequacy Plan (LT-DRAP, MT-DRAP, ST-DRAP) by CEA for the

ensuring year(s) including annual rolling plans, as the case may be, upon taking into consideration various scenarios as well as allocation of Resource Adequacy requirement allocated to the State/Distribution Licensee based on its contribution to the National/state peak respectively as determined by Authority/NLDC/RLDC and STU/SLDC, as the case may be.

Chapter 5
Procurement Planning

13. Procurement planning shall consist of:

(a) Determining the optimal power procurement resource mix;

(b) Deciding on the modalities of procurement type and tenure; and

(c) Engaging in the capacity trading or sharing of capacity to minimize risk of resource shortfall and to maximize rewards of avoiding stranded capacity or contracted generation.

14. Procurement Resource Mix

14.1. In power procurement strategy, the Distribution Licensee shall ensure an optimal procurement generation resource mix and also facilitate smooth integration of Renewable Energy (RE) sources in its portfolio of power procurement resource options, while meeting reliability standards and Renewable Purchase Obligation targets. Further, the future capacity mix may comprise of existing capacities, planned capacities and capacity addition required to meet the increasing demand of the Distribution Licensee considering appropriate gestation period of the generation resource.

14.2. For identification of the optimal generation procurement resource mix, optimization techniques and least-cost modelling shall be employed by the Distribution Licensee in order to avoid stranded capacity. The Distribution Licensee shall engage in adoption of least cost modelling and optimization techniques and shall demonstrate the same in its overall power procurement planning exercise to be submitted to Commission for approval by 30th April of each Financial Year.

14.3. The Distribution Licensee shall contract the optimal portfolio of resources to meet Distribution Licensees' future demand and Resource Adequacy Requirement (RAR) obligations, based on the output derived from the LT-NRAP study results.

14.4. The Distribution Licensee shall consider Long / Medium / Short-term contracts of generation

resources towards the contribution for meeting RAR:

Provided that power procurement through power exchanges, shall not be considered towards the contribution for meeting RAR.

14.5. The Distribution Licensee shall contract additional resources based on the LT-DRAP to meet its own peak demand.

14.6. The power capacity procurement from Renewable Energy sources for fulfilling the RPO targets shall be carried out as per Uttarakhand Electricity Regulatory Commission (Tariff and Other Terms for Supply of Electricity from Renewable Energy Sources and non-fossil fuel based Co-generating Stations) Regulations, 2023, as amended from time to time.

14.7. The power procurement from Wind, Solar PV, Wind Solar Hybrid, and Round the Clock (RTC) generation sources shall be carried out as per the guidelines for tariff based competitive bidding process notified by the Ministry of Power.

14.8. The Distribution Licensee shall contract storage capacity corresponding to the results of LT-DRAP capacity addition requirement for future years from Battery Energy Storage System (BESS) or Pumped Storage Projects (PSP) or any other storage technology as per the guidelines for tariff based competitive bidding process notified by the Ministry of Power.

14.9. The Distribution Licensee may contract power through State Generating Stations/ Central Generating Stations/ Independent Power Producers (IPPs)/ Captive Power Plants (CPPs)/ Renewable Power Plants including Co-Generation Plants/Central Agencies /State Agencies/ Intermediaries / Traders / Aggregators / Power Exchanges or through Bilateral Agreements / Banking Arrangements with other Distribution Licensee and any other sources as may be approved by the Commission.

14.10. The Distribution Licensee may procure power on Short-term and Medium-term basis through DEEP and PUShP portal and OTC Platform.

15. Procurement Type and Tenure

15.1. The Distribution Licensee, while determining the modalities and tenure of procurement of resources, shall ensure that procurement contracts shall be decided first within the region, subject to the least cost resource availability considering transmission constraints and cost of transmission for procurement from outside the region and then across regions if necessary.

15.2. The Distribution Licensee shall identify the generation resource mix and also procurement

strategy in Long-term, Medium-term and Short-term period and seek approval of the Commission.

15.3. The Distribution Licensee in its overall power procurement planning approach shall employ greater emphasis on adequate contracting through Long-Term and Medium-Term arrangements. However, the Distribution Licensee shall ensure that entering into new Long-Term and Medium-Term contracts does not contribute towards accumulation of stranded capacity and additional burden to the consumers on account of fixed cost associated with stranded capacity.

15.4. The Distribution Licensee through annual rolling plan shall ensure incremental capacity addition through Long-term/Medium-term/Short-term duly factoring the existing and planned procurement arrangements of the Distribution Licensee.

15.5. The distribution licensee shall submit the state-level aggregated Annual Rolling Plan to NRLDC by 20th January of each year for the ensuing year(s).

15.6. The Distribution Licensee must ensure that procurement process for the projected demand is undertaken and completed sufficiently in advance so that the procured capacity becomes available when it is required to serve the projected load. The following table gives the number of years before which procurement process must be completed in advance as compared to the year of projected requirement for various types of generation and types of procurement:

Resource	Long Term	Medium Term
Coal/Lignite	7	2
Hydro	9	2
Solar	2	1
Wind	3	1
PSP	5	3
Other Storage (including BESS)	2	1
Nuclear	9	3

16. Approval of Power Purchase Agreement

16.1. Any new Capacity agreement / tie-up shall be subject to the prior approval of the Commission in view of necessity, reasonableness of cost of power purchase and promotion of working in an efficient, economical and equitable manner.

16.2. All procurement of Long/ Medium/ Short-Term power from various sources shall be carried out as per the Guidelines/ Rules/ Regulations/ Policies issued by the Commission/ Central Government from time to time.

16.3. Any new power purchase agreement for Long/Medium-term or amendments to existing Long/Medium-Term Power Purchase Agreement (PPA)/ Power Sale Agreement (PSA) entered into by the distribution licensee shall be subject to the prior approval of the Commission in respect of:

(i) Necessity;

(ii) Reasonability of cost;

(iii) Promoting efficiency, economy, equitability and competition;

(iv) Conformity with requirements of quality, continuity and reliability of supply;

(v) Conformity with safety and environmental standards;

(vi) Conformity with criterion of power purchase as laid down by the Commission;

(vii) Conformity with policy directives of the State Government and policies issued by the Government of India viz. National Electricity Policy, Tariff Policy, Long-Term and Short-Term power procurement guidelines etc.

16.4. The distribution licensee shall submit the list of all existing Power Purchase Agreements executed with different conventional power plants as well as RE Generators along with the Resource Adequacy plan.

17. Sharing of Capacity

17.1. The Distribution Licensee shall duly factor in the possibility of Long-term / Medium-term/ Short-term capacity sharing while preparing the Resource Adequacy plan and optimally utilize the platform for Inter-State capacity sharing or trading mechanism created by the Central Commission/Central Government to optimize the capacity costs as far as possible.

17.2. The Distribution Licensee shall submit information about contracted capacity to the SLDC and STU for compliance verification.

18. Variation in Power Purchase

(a) The Distribution Licensee may undertake additional power procurement during the year with prior approval of the Commission , over and above the approved resource adequacy procurement plan, where there has been an unanticipated increase in the demand for electricity or a shortfall or failure in the supply of electricity from any approved source of supply during the year or when the sourcing of power from existing tied-up sources becomes costlier than other available alternative sources.

(b) The Distribution Licensee may enter into a Short-term arrangement or agreement for procurement of power when faced with emergency conditions that threaten the stability of the grid, or when directed to do so by the SLDC/RLDC to prevent grid failure or during exigency conditions and for banking with other States on Short-term basis without prior approval of the Commission:

Provided that the details of such Short-term procurement shall be submitted to the Commission within 45 days from date of procurement of power with proper justification substantiating the emergency / exigency conditions.

Chapter 6

Monitoring and Compliance

19. Monitoring and Compliance

19.1. The Distribution Licensee shall comply with the Resource Adequacy requirement in accordance with the timelines specified under Regulation 21 of these Regulations. In case of non-compliance, appropriate non-compliance charges as may be determined by the Commission, shall be applicable.

19.2. The Distribution Licensee shall not be allowed to recover such non-compliance charges as part of its ARR.

19.3. Based on the MT-DRAP and ST-DRAP, STU and SLDC shall communicate the state-aggregated capacity shortfall to the State Commission within 15 days of the receipt of approved Resource Adequacy Plan from the Distribution Licensee of each year for the ensuing year(s) and advise the Distribution Licensee to commit additional capacities.

At the end of each Financial Year, SLDC shall submit the deviation in RAR plan from actual demand profile during that financial year to the Commission and also upload such details on its website.

Chapter 7

Roles and Responsibilities and Timelines

20. Data Requirement and Sharing Protocol

20.1. Distribution Licensee shall maintain and share all data related to demand assessment and forecasting with the STU/SLDC, such as:-

a) Consumer data;

b) Historical demand data;

c) Weather data;

d) Demographic and econometric variables;

e) Distribution Losses and intra/inter-State Transmission losses;

f) Actual energy requirement;

g) Availability including curtailment, peak electricity demand, and peak met along with changes in demand profile (e.g.: agricultural shift, time of use, etc.); and

h) Historical hourly load pattern, etc.

20.2. Distribution Licensee shall maintain and share all statistics and database pertaining to policies and drivers with SLDC, such as:-

a) LED penetration, efficient fan/ ACs penetration, appliance penetration, increased usage of electrical appliances for cooking, heating, cooling, etc., in households;

b) Increase in commercial activities for geographic areas/regions;

c) Increase in number of agricultural pumps;

d) Solarization within Distribution Licensees' area;

e) Changes in specific energy consumption;

f) Consumption pattern from seasonal consumers;

g) Demand Side Management (DSM);

h) Distributed Energy Resources (DERs);

i) Electric Vehicles (EVs);

j) Open Access (OA);

k) National Hydrogen Mission;

l) Reduction of AT&C losses, etc:

Provided that statistics and database pertaining to households such as LED penetration, efficient fan penetration, appliance penetration, increased usage of electrical appliances for cooking, etc., shall be utilized by SLDC whenever statistical information and database become available through Distribution Licensee.

20.3. The Distribution Licensee shall maintain at least past 10 years of statistics in their database pertaining to consumption profiles for each class of consumers, such as domestic, commercial, public lighting, public water works, agricultural/irrigation, LT industries, HT

industries, railway traction, bulk (non-industrial HT consumers), open access, captive power plants, insights from load survey, contribution of consumer category to peak demand, seasonal variation aspects, etc., and share the same with SLDC.

20.4. SLDC shall maintain the Distribution Licensee-specific as well as aggregate for State as a whole, statistics and database pertaining to aggregate demand assessment and forecasting data as mentioned above and share State-level assessment with the Authority/NLDC and RLDC for regional/national assessment from time to time.

20.5. The Distribution Licensee shall share information and data pertaining to the existing and contracted capacities with their technical and financial characteristics including hourly generation profiles to SLDC for computation of State-level capacity credit factors and for preparation of State-level assessment.

20.6. SLDC and the Distribution Licensee shall aggregate generation data and share State-level projections with the Authority and NLDC as the case may be for assessment of Resource Adequacy requirement.

21. Timelines

21.1. The SLDC shall be responsible for providing Deviation Settlement Mechanism (DSM) accounts to the Distribution Licensee of previous financial year latest by 21st April of each year *[refer Regulation 6.3]*.

21.2. The Distribution Licensee shall prepare hourly or sub-hourly 1-year Short-term (ST), 5-year Medium-term (MT) and 10-year Long-term (LT) demand forecasts on a rolling basis and submit the same to SLDC by 30th April of each year for the ensuing year(s) *{refer Regulation 8.1]*.

21.3. SLDC shall submit the state-level aggregate demand forecasts (MW and MUs) for Long-Term, Medium-Term and Short-Term to the Authority, NLDC, NRLDC, STU by 31st May of each year for the ensuing year(s) *[refer Regulation 8.4]*.

21.4. The Distribution Licensee shall share CC factors for their contracted resources alongwith justification for its computations with SLDC by 15th May of each year for the ensuing year(s) *[refer Regulation 10.6]*.

21.5. SLDC shall calculate state-specific CC factors considering the aggregate State Demand and State Net Load and contracted RE generation resources available in the State and shall submit such CC factor information to the Authority, NLDC and NRLDC by 31st May of each year for

ensuing year(s) *[refer Regulation 10.7]*.

21.6. Based on most probable scenario, the Distribution Licensee shall undertake development of Long-term, Medium-term, and Short-term Distribution Resource Adequacy Plan exercise to meet the Resource Adequacy target requirement. The Distribution Licensee shall submit the RA plans (LT-DRAP, MT-DRAP & ST-DRAP) so developed to the Commission by 31st August of each year. The Distribution Licensee shall also submit the RA Plans to the STU and SLDC for further examination so as to apprise the Commission as per these Regulations [*refer Regulation 12.5]*.

21.7. Based on the allocated share in national peak provided in LT-NRAP for the State, the Distribution Licensee shall ascertain its share in the national peak within 15 days of the publication of LT-NRAP *[refer Regulation 12.6(b)]*.

21.8. The Distribution Licensee shall submit the category-wise consumption information of previous financial years and any other information as may be required by SLDC by 21st April of each year for the ensuing year(s).

21.9. Distribution Licensee shall perform and submit the MT-DRAP and ST-DRAP to the Authority and the NLDC by 31st August of each year for the ensuring year(s).

21.10. The SLDC, on behalf of the Distribution Licensee in the State, shall submit demand forecasts (peak and energy requirement) for the next 10 years, assessment of existing generation resources, CC factor information and such other details as may be required for the LT-NRAP to CEA and ST-NRAP to NLDC by 31st May of every year for ensuing year(s).

21.11. SLDC shall allocate each Distribution Licensee's share in the national peak within 15 days of the publication of LT-NRAP report of each year for the ensuing year(s).

21.12. The Distribution Licensee shall submit the LT-DRAP plans to CEA by 30th September of each year for the ensuing year(s) for validation *[refer Regulation 12.6(n)]*.

21.13. The Distribution Licensee shall submit the LT-DRAP plan duly vetted by CEA along with details for meeting the RAR of national peak to the Commission within 15 days from the date of receipt of CEA approval *[refer Regulation 12.6(o)]*.

21.14. The Distribution Licensee shall submit MT-DRAP and ST-DRAP along with LT-DRAP to the Commission for approval *[refer Regulation 12.7(c) & (refer Regulation 12.8 (c)]*.

21.15. The Distribution Licensee shall submit the details of the contracted capacities for the ensuing

year for meeting RAR of national peak to SLDC within 15 days from the date of approval by the Commission *[refer Regulation 12.6(f)]*.

21.16. SLDCs shall aggregate the total contracted capacities at the State level and submit the information to the NLDC, under intimation to the Commission, within 15 days from the date of receipt from the Distribution Licensee *[refer Regulation 12.6(f)]*.

21.17. The Distribution Licensee shall engage in adoption of least cost modelling and optimization techniques and shall demonstrate the same in its overall power procurement planning exercise to be submitted to Commission for approval by 30th April of each Financial Year *[refer Regulation 14.2]*.

21.18. The distribution licensee shall submit the state-level aggregated Annual Rolling Plan to NRLDC by 20th January of each year for the ensuing year(s) *[refer Regulation 15.5].*

21.19. The details of Short-term procurement when faced with emergency conditions shall be submitted to the Commission within 45 days from date of procurement of power with proper justification *[refer Regulation 18(b)]*.

21.20. Based on the MT-DRAP and ST-DRAP, STU and SLDC shall communicate the state-aggregated capacity shortfall to the State Commission within 15 days of the receipt of approved Resource Adequacy Plan from the Distribution Licensee of each year for the ensuing year(s) and advise the Distribution Licensee to commit additional capacities. *[refer Regulation 19.3]*.

21.21. The contracting for balance capacity shortfall as communicated by NLDC shall be completed by the end of March of each year for the ensuing year(s) by the Distribution Licensee.

21.22. The Distribution Licensee, after contracting the balance capacity shall submit the information to the Commission by 1st April of each year for the current year(s).

Provided that in case there is delay in communication by NLDC for balance capacity shortfall, the Distribution Licensee may seek approval from the Commission for time extension for contracting the balance capacity by 25th March of each year.

Chapter 8

Miscellaneous

22. Placing of information on websites

22.1. The monthly/weekly/day-ahead/intra-day power procurements/sale by the Distribution

Licensee and generator schedule shall be made available on the websites of the Distribution Licensee and SLDC within 15 days of such procurements/sale with ease of access to the current as well as archived data.

22.2. SLDC shall also publish the monthly Merit Order Dispatch (MoD) stack along with per unit variable cost of each generating station on its website.

23. Constitution of dedicated cells

23.1. The Distribution Licensee shall establish a planning cell for Resource Adequacy within three months of these Regulations coming into force. The cell shall have the requisite capability and tools for demand forecast, capacity, RE integration, etc.

23.2. Another round the clock dedicated cell shall also be constituted by the Distribution Licensee for power purchase/sale of power on real-time basis and to also undertake intra-day, day-ahead, week-ahead power procurement through Power Exchanges or any other means. The Distribution Licensee shall frame suitable guidelines for the modus operandi of the dedicated cells in line with the spirit of these Regulations and shall apprise the Commission of the same within 45 days from the date of coming into force of these Regulations.

24. Assessment to involve consultation

24.1. The Distribution Licensee shall make the Resource Adequacy Plan in consultation with State Sector Generating Companies, Distribution Licensee, Central Sector Generating Companies, Transmission Companies, National / Regional /State Load Despatch Centre, and Central Electricity Authority. It shall also make enquiries with the Trading Companies and States with surplus power to estimate the likely availability and price of power across the country for peak, off-peak and normal periods. The Distribution Licensee may also consult with research agencies with relevant experience.

25. Deviation from the Norms

25.1. The parametric norms considered for approval of the Resource Adequacy Plan and Power procurement plan thereof, may be determined in deviation from the norms specified in these Regulations. Provided that the reasons for deviation from the norms specified under these Regulations shall be recorded in writing.

26. Power to Relax

26.1. The Commission may by general or special order, for reasons to be recorded in writing, and

after giving an opportunity of hearing to the parties likely to be affected by grant of relaxation, may relax any of the provisions of these Regulations on its own motion or on an application made before it by an interested person.

27. Power to Remove Difficulties

27.1. If any difficulty arises in giving effect to any of the provisions of these Regulations, the Commission may, by an order, make such provisions, not inconsistent with the provisions of the Act and these Regulations, as may appear to be necessary for removing the difficulty/difficulties.

28. Power to amend

28.1. The Commission may from time to time add, vary, alter, modify, or amend any provisions of these Regulations after following the necessary procedures.

29. Repeal and Savings

29.1. Nothing in these Regulations shall be deemed to limit or otherwise affect the inherent power of the Commission to make such orders as may be necessary to meet the ends of justice or to prevent abuses of the process of the Commission.

29.2. Nothing in these Regulations shall bar the Commission from adopting in conformity with the provisions of the Act a procedure, which is at variance with any of the provisions of these Regulations, if the Commission, in view of the special circumstances of a matter or class of matters and for reasons to be recorded in writing, deems it necessary or expedient for dealing with such a matter or class of matters.

29.3. Nothing in these Regulations shall, expressly or impliedly, bar the Commission dealing with any matter or exercising any power under the Act for which no Regulations have been framed, and the Commission may deal with such matters, powers, and functions in a manner it thinks fit.

By the order of the Commission

(Neeraj Sati)
Secretary

Methodology of Preparation of Resource Adequacy Plan with constraints

(a) The hourly demand profile for the Distribution Licensee shall be projected over the planning period by the Distribution Licensee, based on the forecasted values of annual energy requirement and peak demand trajectory. The annual energy requirement and peak demand shall be forecasted using the methods specified in Regulation 6.6 of these Regulations. The projected hourly demand for the future years shall be used as inputs into the model. The Distribution Licensee shall ensure that the generation expansion planning model chosen is capable of simulating on an hourly chronological resolution[1]. This is necessary to capture the behaviour of the system with respect to ramping of conventional generation, profiles of RE generation, behaviour of energy storage, etc.

(b) After establishment of demand profile for all future years, the model would undertake an optimization exercise to minimize the total system cost to meet the future demand adhering to all power system parameters. Following constraints should be considered while modelling by the Distribution Licensee:

- **Planning Reserve Margin / Resource Adequacy Requirement:** The Resource Adequacy Requirement (RAR) constraint shall ensure that the total Resource Adequacy (Generation capacity) of the Distribution Licensee fulfils the Planning Reserve Margin as determined by CEA. The resource adequacy requirement for each Distribution Licensee shall be computed as:

$$RAR = Contribution^{2}\ to\ forecasted\ national\ peak\ demand\ in\ GW \times (1 + PRM)$$

From the supply side, the RAR shall be the sum of the "firm capacity" or "capacity credits" of contracted / planned capacities (including renewables, storage, otherresources such as demand response) along with derated interconnection limits (imports)[3].

Both, supply side and demand side RAR shall match. The Thermal capacity credit shall be calculated by reducing the auxiliary consumption and the forced outage rate from the installed capacity.

[1] It is preferred to simulate all 8760 hours (8784 hours for leap year) on a chronological resolution in a year. However, if computational challenges are faced, the Distribution Licensee can select the representative periods, which may be different. The representative periods chosen are reflective of various projected demand and supply profiles for the base year and future years. Initially, hourly simulation is planned based on hourly data availability, however, the time granularity may be increased to sub-hourly provided there is availability of sub-hourly demand and RE generation data.

[2] This shall be calculated as Distribution Licensee's demand at the time of national peak demand.

[3] The firm capacity shall be calculated as provided in Annexure-III of these regulations.

The capacity credits for generating resources and demand response resources to meet the national peak shall be as estimated by CEA. The capacity credits published by CEA for each resource type may differ between existing and new resources and between resources in different regions. For example, a solar based power plant in the Southern Region will have a capacity credit, which could be different compared to a solar plant in the Northern Region. Similarly, an upcoming wind-based power plant could have a different capacity credit compared to an already commissioned wind plant in the same region. The Distribution Licensee shall use these capacity credits for generation sources with which it has a PPA located outside the State, while planning to meet their RAR. For example, a Distribution Licensee having a PPA with an existing solar based power plant located in a southern State would use the capacity credit of existing solar based power plants in the Southern Region.

- **Portfolio balance constraints:** The portfolio balance shall ensure that the total generation within a control area of Region/State/Distribution Licensee and the import of power to the control area of region/State/Distribution Licensee is equal to the sum of the demand, exports from the control area of region/State/Distribution Licensee, any energy not served and curtailment, for each hour.

- **RE Generation constraints:** For renewable energy resources, such as solar and wind, the RE generation shall be constrained as per the hourly profile of the resource. Historic profiles of renewable sources shall be used to generate the hourly profiles. Additional constraints shall ensure that the Distribution Licensee's overall renewable generation targets are met and included while formulating LT-DRAP.

- **Conventional Generation constraints:**

  (a) Unlike solar and wind, thermal resources are dispatchable. However, the thermal resources are bound by constraints such as maximum and minimum generation limits, ramp rates, spinning reserve offers, plant availability and unit commitment decisions.

  (b) The dispatch (energy offer) plus the reserve offer (specified through CERC/UERC Regulations) for each generator is constrained to be within the maximum and minimum generation limits. Generation between two consecutive time blocks also must be within the ramping capabilities of the resources. Unit commitment decisions, such as start-up/shut-down, minimum up and down times, etc., require binary variables to implement and are to be included. Additionally, generation units may have periods of outages, which may need to be captured by using an availability factor.

  (c) The capacity for each year needs to be tracked by a constraint, which shall ensure that

the capacity in a particular year is equal to the capacity last year plus any new capacity investment minus capacity retirement, if any.

- **RPO constraints:** Fulfilment of Renewable Purchase Obligation shall be considered as one of the objectives of Resource Adequacy. Technology options like renewable energy generation for round the clock energy supply backed with storage (Battery and PSP), standalone renewable energy capacity along with hydro capacity for balancing renewable energy generation shall be considered while carrying out resource adequacy exercise for Distribution Licensee.

- **Storage constraints:** Due to the intermittent nature of renewable energy generation, the need for resources, which can store surplus energy and despatch the stored energy during low RE generation periods becomes vital. Storage charge and discharge at any instant are constrained by the storage level or the state of charge (SoC) of the storage resource, and the maximum charge / discharge limit. The resource shall only discharge if there is sufficient energy present due to prior charging of the resource. To implement this, considering the chronological sequence of time is also important.Since, storage resources convert electricity to other forms of energy, there are also some efficiency losses (round-trip efficiency) which shall be accounted for. Different technologies may have different discharge periods (energy limits), power outputs (maximum charge / discharge) and levels of efficiency.

- **Operating (Spinning) Reserve constraints:** Operating reserve shall ensure that sufficient resources are in the system and kept online or on standby each hour to account for load forecast errors, intermittency of RE or meeting contingencies in real time. The thumb rule for operating reserve requirement shall be defined based on discussions with the SLDC and shall be considered as an input parameter to the model.

- **Demand Response:** Potential for demand side management such as shifting of load or demand response can be considered while undertaking the Resource Adequacy Plan (RAP). The constraints such as periods when load shifting can occur, and the maximum quantum of load, which can be shifted over a period shall be included.

ANNEXURE -II

Formats (1 to 13) enclosed separately

ANNEXURE -III

The firm capacity to meet the Resource Adequacy Requirement (RAR) shall be calculated as shown below:

$$RAR = \sum_{i=1}^{num\_solar} Solar\_Capacity * Solar\_Capacity\_Credit + \sum_{i=1}^{num\_wind} Wind\_Capacity * Wind\_Capacity\_Credit + \sum_{i=1}^{num\_hydro} Hydro\_Capacity * Hydro\_Capacity\_Credit + \sum_{i=1}^{num\_thermal} Thermal\_Capacity * Thermal\_Capacity\_Credit + \sum_{i=1}^{num\_nuclear} Nuclear\_Capacity * Nuclear\_Capacity\_Credit + \sum_{i=1}^{num\_storage} Storage\_Capacity * Storage\_Capacity\_Credit + \sum_{i=1}^{num\_other} Other\ Resource\_Capacity * Other\ Resource\ \_Capacity\_Credit + \sum_{i=1}^{num\_Other} Import\_limit * Capacity\_Credit$$