Meghalaya State Electricity Regulatory Commission (Framework for Resource Adequacy) Regulations, 2023.

Meghalaya State Electricity Regulatory Commission

MEGHALAYA STATE ELECTRICITY REGULATORY COMMISSION

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No. MSERC/RA-REG/2023/01   Dated:12th April 2024

PRE-PUBLICATION

In exercise of the powers conferred under section 181 of the Electricity Act, 2003 (36 of 2003), read with section 61, 66, and 86 thereof and all other powers enabling it in this behalf, the Meghalaya State Electricity Regulatory Commission hereby make **previous publication** the following Regulations, namely, Meghalaya State Electricity Regulatory Commission (Framework for Resource Adequacy) Regulations, 2023

The Commission invites suggestion, if any, which may be submitted to the undersigned within 21 (twenty one) days from the date of this notice before the publication of the notification.

Chapter 1

Preliminary

1. **Short Title, Extent, and Commencement**
   1.1. These Regulations may be called the Meghalaya State Electricity Regulatory Commission (Framework for Resource Adequacy) Regulations, 2023.
   1.2. These Regulations shall extend to the whole state of Meghalaya.
   1.3. These Regulations shall come into force from the date of their 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 and transmission 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, and monitoring and compliance.

3. Scope and Applicability

3.1.   These Regulations shall apply to the generating companies, distribution licensees, State Load Despatch Centre, State Transmission Utility, and other grid connected entities and stakeholders within the State of Meghalaya.

4. Definitions

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

a. "**Act**" means the Electricity Act, 2003 (36 of 2003) and subsequent amendments thereof.

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

c. "**Capacity Credit**" or "**CC**" means a percentage of a resource's nameplate capacity that can be counted towards resource adequacy requirements.

d. "**Commission**" or "**State Commission**" means the Meghalaya Electricity Regulatory Commission (SERC) constituted under the Act.

e. "**Expected Energy Not Served**" or "**EENS**" means the expected amount of load (MWh) that may not be served for each year within the time horizon for Resource Adequacy planning.

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

g. "**Medium term**" means ten years for development of demand forecast, generation resource plan, and procurement plan.

h. "**Medium-Term Distribution Resource Adequacy Plan**" or "**MT-DRAP**" means plan for assessment of medium-term resource adequacy by the distribution licensee.

i. "**Net Load**" means the load derived upon exclusion of actual generation (MW) from renewable energy generation resources from gross load prevalent on the Grid during any time-block.

j. "**Normalized Energy Not Served**" or "**NENS**" is normalization of the EENS by dividing it by the total system load.

k. "**Planning Reserve Margin**" or "**PRM**" means a specified percentage of available capacity above peak demand as may be stipulated by Authority or Commission for the purpose of generation resource planning.

l. "**Resource Adequacy**" or "**RA**" means a mechanism to ensure adequate supply of generation 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 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.

m. "**Short term**" means five years for development of demand forecast, generation resource plan, and procurement plan.

n. "**Short-Term Distribution Resource Adequacy Plan**" or "**ST-DRAP**" means plan for assessment of short-term resource adequacy by the distribution licensee.

4.2. All other words and expressions used in these Regulations, although not specifically defined herein above, but defined in the Act, shall have the meaning assigned to them in the Act. 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 entails the planning of generation and transmission 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 important steps:
   a) Demand assessment and forecasting
   b) Generation resource planning
   c) Procurement planning
   d) Monitoring and compliance

5.3. The medium and short term for the purpose of these Regulations shall be considered as:
   a) Medium term procurement plan for a period up to ten years; and
   b) Short-term procurement plan for a period up to five years.

5.4. The distribution licensee shall develop and prepare 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.   Demand assessment and forecasting is an important step for Resource Adequacy assessment. It shall entail hourly or sub-hourly assessment and forecasting of demand within the distribution area of distribution licensee for multiple horizons (short/medium/long-term) using comprehensive input data and policies and drivers and scientific mathematical modeling tools.

6.2.   The distribution licensee shall be responsible for the assessment and forecasting of demand (MW) and energy (MWh) within its own control area.

6.3.   The distribution licensee shall determine the load forecast for each consumer category for which the Commission has determined separate retail tariff.

6.4.   The distribution licensee shall determine the load forecast for a customer category by adopting any of the following and/or combination of following methodologies:

   a) compounded average growth rate (CAGR);
   b) end use or partial end use;
   c) trend analysis;
   d) Auto-regressive integrated moving average (ARIMA);
   e) AI including machine learning, ANN techniques; and
   f) econometric (specifying the parameters used, algorithm, and source of data).

6.5.   The distribution licensee may use Electric Power Survey (EPS) projections as base and/or any other methodologies other than the above-mentioned after recording the merits of the method. Further, distribution licensee should use best fit of various methodologies for the purpose of demand/load forecast taking into consideration probabilistic modelling approach for various scenarios (viz. most probable, business as usual, aggressive) as outlined under Clause 6.14.

6.6.   For the purposes of deciding the load forecast for a customer category and the methodology to be used for load forecasting of a customer category, the distribution licensee must conduct statistical analysis and shall select the method for which standard deviation is lowest and R-square is highest.

6.7.   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 their control area.

6.8.   The distribution licensee may modify the load obtained on either side, for each customer category, by considering the impact for each of the but not limited to the following activities. The impact shall be considered by developing trajectories for each of the 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)   DSM and demand response measures;
   e)   electric vehicles;
   f)   tariff signals;
   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 from seasonal consumers
   k)   availability of supply; and
   l)   policy influences such as 24X7 supply to all customers, LED penetration, efficient use of fans/appliances, increased use of appliances for cooking/heating applications, electrification policies, distributive energy resources, storage, and policies, which can impact econometric parameters, impact of national hydrogen mission. For each policy, a separate trajectory should be developed for each customer category.

6.9.   The distribution licensee may take into consideration any other factor not mentioned in clause 6.8 after recording the merits of its consideration.

6.10.   The medium-term load profile of the customer categories for which load research has been conducted may be refined on the basis of load research analysis. A detailed explanation for refinement conducted must be provided.

6.11.   The summation of energy forecast (MWh) for various consumer categories upon adjusting for captive, prosumer, and open access load forecast, as obtained as per clauses 6.4 to clause 6.10, as the case may be, shall be the load forecast for the licensee.

6.12.   The licensee shall calculate the load forecasts (in MWh) by adding a loss trajectory approved by the Commission in the latest tariff order. In the absence of the loss trajectory as approved by the Commission for the planning horizon, an appropriate loss trajectory stipulated by State or National policies shall be considered with a detailed explanation.

6.13. 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 load forecasts (in MWh) obtained in clause 6.12. If any other appropriate load factor is considered for future years, a detailed explanation shall be provided.

6.14. The distribution licensee shall conduct sensitivity and probability analysis to determine the most probable demand forecast. The distribution licensee must 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.

7. Short term (Hourly/Sub-hourly) Demand Forecast and Aggregation at State

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 customer 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 distribution licensee with inputs from state load dispatch center. A detailed explanation for refinement conducted must be provided.

7.3. The distribution licensee shall utilize state-of-the-art tools, scientific & mathematical methodologies and comprehensive data such as but not limited to weather data, historical data, demographic and econometric data, consumption profiles, policies and drivers etc. as may be applicable to their control area.

7.4. The distribution licensee shall produce hourly or sub-hourly five-years short-term (ST) and ten-years medium-term (MT) forecasts on a rolling basis and submit to SLDC by 30th April of each year for the ensuing year(s).

7.5. STU with inputs from SLDC and based on the demand estimates of the distribution licensees of the State, shall estimate, in different time horizons, namely long-term, medium term and short term, the demand for the entire State duly considering the diversity of the State.

7.6. SLDC shall aggregate demand forecasts by distribution licensees, consider the load diversity, congruency, seasonal variation aspects and shall submit state-level aggregate demand forecasts (MW and MWh) to the Authority and NLDC and RLDC by 31st May of each year for the ensuring year(s).

Chapter 4
Generation Resource Planning

8. Generation resource assessment and planning is the second step after demand assessment and forecasting and entails assessment of the existing and contracted resources considering their capacity credit and identification of incremental capacity requirement to meet forecasted demand including planning reserve margin.

9. **Key contours and important steps in Generation Resource Planning:**

9.1. Generation resource planning shall entail the following steps namely, (a) capacity crediting of generation resources, (b) assessment of planning reserve margin, and (c) ascertaining resource adequacy requirement and allocation for obligated entities within control area (regional/state).

9.2. The distribution licensee shall map all its contracted existing resources, upcoming resources, and retiring resources to develop the existing resource map in MW for the long term and medium term.

9.3. 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 with their values for each generating machine considered shall be provided in the resource plan.

9.4. Constraints such as penalties for unmet demand, forced outages, spinning reserve requirements, and system emission limits as defined in State and Central electricity grid codes and emission norms specified by the Ministry of Environment and Forest shall be identified and enlisted.

9.5. The distribution licensee shall also include a planning reserve as specified by the Authority or Commission, as the case may be. In the absence of any guidelines from the Commission, the distribution licensee can consider suitable planning reserve. The value of planning reserve 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 under Clause 10.2 of this Regulation. The five-year average of the Capacity Credit (CC) factor for each type of the contracted generation resource for the recent 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 determination of Capacity Credit (CC) factors for generation resources (including wind and solar) shall be adopted as under:

    a) For each year, the hourly recorded Gross Load for 8760 hours (or time-block) shall be arranged in descending order.

    b) For each hour, the Net Load is calculated by subtracting the actual wind or solar generation corresponding to that load for 8760 hours (or time-block) and then arranged in descending order similar to Step 1.

    c) The difference between these two load duration curves represents the contribution of capacity factor of wind generation or solar generation, as the case may be.

    d) Installed capacity of wind or solar generation capacity is summed up corresponding to the top 250 load hours.

    e) Total generation from wind or solar generation corresponding to these top 250 hours is summed up.

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

$$\text{CC factor} = \frac{\text{Sum of RE Generation for top } x \text{ hours}}{\text{Sum of RE Capacity for top } x \text{ hours}}$$

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

10.3. For the purpose of Inter-state contracted RE generation or intra-state RE resources, contribution of CC factor for the RE or generation resource where such resource is located into grid (viz. inter-state or intra-state, as the case may be) as contracted by the distribution licensee shall be considered. For this purpose, CC factors as specified by Authority or the Commission shall be considered.

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

10.5. The distribution licensee shall share CC factors for their contracted resources along with justification for its computations with State Load Despatch Centers.

10.6. SLDC shall calculate CC factors considering the aggregate State Demand and State Net Load and contracted RE generation resources available in the State, including the capacity credits at both national and state peaks, and shall submit such CC factor information to the Authority and NLDC and RLDC from time to time.

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. Such Planning Reserve Margin (PRM) factor (for example, 7%) shall be based on the reliability indices in terms of Loss of Load Probability (LOLP, for example, 0.2%) and Normalized Energy Not Served (NENS, for example, 0.05%) as may be specified by the Authority and the same shall be considered by utilities in their planning for resource adequacy requirement and generation resource capacity planning.

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

12.   Ascertaining Resource Adequacy Requirement and its Allocation for Control Area

12.1. Upon applying CC factors as determined under Regulation 10 of these regulations and determining adjusted capacity for contracted generation resources (existing and planned), the sum of such adjusted contracted generation capacity (existing and planned) over a time axis of 15-minute intervals or longer, but not more than one hour, shall form the resource map of the distribution licensee.

12.2. The distribution licensee shall subtract the resource map developed in clause 12.1 from the demand forecast developed in section 6 (ref. Clause 6.13) 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.

12.3. The distribution licensee shall conduct sensitivity and probability analysis to determine the most probable resource gap. The distribution licensee shall also develop long-term and medium-term resource gap plans for possible scenarios, while ensuring that at least three different scenarios (most probable, business as usual, and aggressive) are developed.

12.4. Based on most probable scenario, the distribution licensee shall undertake development of Medium-term Distribution Resource Adequacy Plan (MT-DRAP) and

Short-term Distribution Resource Adequacy Plan (ST-DRAP) exercise by 31st August of each year to meet RA target requirement.

12.5. RA requirement planning shall be conducted with reference to both national and state coincident peaks to optimize requirement of incremental capacity addition through annual rolling plan. A Mid-term review of national and state RA requirement planning shall be conducted to check for events of slippages by states, if any.

12.6. While planning RA requirement, the distribution licensee shall duly factor in the allocation of RA requirement to the state as may be suggested by the Authority or the NLDC, as the case may be, based on contribution to National Co-incident Peak Demand (CPD) for MT-RA and ST-RA.

12.7. The Commission shall approve MT-DRAP and ST-DRAP of the distribution licensees by 30th September of each year for the ensuring year(s) incl. 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 peak or National RA requirement as determined by Authority or the NLDC or the RLDC, 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 to minimize risk of resource shortfall and to maximize rewards of avoiding stranded capacity or contracted generation.

14. Procurement Resource Mix

14.1. The distribution license in its power procurement strategy shall lay emphasis on the optimal procurement generation resource mix that shall enable smooth RE integration in its portfolio of power procurement resource options while meeting reliability standards.

14.2. For identification of the optimal generation procurement resource mix, optimization techniques and least-cost modeling shall be employed in order to avoid stranding of assets. The distribution licensee shall engage in adoption of least cost modeling and optimization techniques and demonstrate the same in its overall power procurement planning exercise to be submitted to Commission for approval.

14.3. Procurement by distribution licensees shall be consistent with the identified resource mix and considering overall national electricity plan and policies notified by the Appropriate Government from time to time.

15. Procurement Type and Tenure

15.1. The distribution licensee, while determining the modalities and tenure of procurement of resource mix, shall ensure that at the initial level, available capacity within the region shall be optimized. For further optimization, procurement contract shall be decided first within the region subject to the least cost resource availability considering transmission constraints & cost of transmission for procurement from outside the region and then across regions if necessary.

15.2. The distribution licensees shall identify the generation resource mix and also procurement strategy in long-term, medium-term and short-term horizon and seek approval of the Commission.

15.3. In its overall power procurement planning approach, the distribution licensee shall lay greater emphasis on adequate contracting through long and medium term arrangements.

15.4. Assessment through Annual Rolling Plan shall ascertain incremental capacity addition requirement through MT/ST upon factoring in existing and planned procurement initiatives of the distribution licensee.

15.5. The distribution licensee shall contract capacities by 30th November of each year and submit the Annual Rolling Plan to STU/SLDC by 31st December of each year for ensuring year(s).

15.6. STU and SLDC shall submit state-level aggregated plan to RLDC and RLDC shall submit regional-level aggregated plan to NLDC by 31st January of each year for the ensuing year(s).

16. Sharing of Capacity

16.1. The distribution licensee shall duly factor in the possibility of 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, and optimize the capacity costs as far as possible. Additionally, it shall be noted that for meeting national coincident peak, 100% of the contracted capacities have to be firm capacities (cannot be met through power exchange), whereas for meeting the state peak, firm capacities along with short-term contract capacities (banking, PXs etc) can be used.

16.2. The distribution licensee shall submit information about contracted capacity to the SLDC and the STU for compliance verification.

16.3. The distribution licensee, the STU and the SLDC shall seek approval of the Commission to the procurement plan as well as Annual Rolling Plans.

Chapter 6
Monitoring and Compliance

17. Monitoring and Compliance

17.1. **Monitoring and Reporting**: Based on the MT-DRAP and ST-DRAP, STU and SLDC shall communicate the state-aggregated capacity shortfall to the State Commission by 30th September of each year for the ensuring year(s) and advise the distribution licensees to commit additional capacities.

17.2. **Treatment for shortfall in RA Compliance**: Distribution licensees shall comply with the RA requirement and in case of non-compliance, appropriate non-compliance charge shall be applicable for the shortfall for RA compliance.

Chapter 7

Roles and Responsibilities and Timelines

18. Data Requirement and Sharing Protocol

18.1. Distribution licensees shall maintain and share with STU/SLDC all data related to demand assessment and forecasting such as but not limited to consumer data, historical demand data, weather data, demographic and econometric variables, T&D losses, actual electrical energy requirement and availability including curtailment, peak electricity demand, and peak met along with changes in demand profile (e.g.: agricultural shift, time of use, etc.), historical hourly load shape, etc.

18.2. Distribution Licensee shall maintain all statistics and database pertaining to policies and drivers, such as LED penetration, efficient fan penetration, appliance penetration, increased usage of electrical appliances for cooking, etc., in households, increase in commercial activities for geographic areas/regions, increase in number of agricultural pumps and solarization within control area, changes in specific energy consumption, consumption pattern from seasonal consumers such as tea plants, DSM and DERs, EVs and OA, National Hydrogen Mission, reduction of AT&C losses, etc. shall also be shared.

18.3. Distribution Licensee shall maintain at least past 10 years of statistics in its database pertaining to consumption profiles for each class of consumers, such as domestic,

commercial, public lighting, public water works, 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. shall also be shared.

18.4. SLDC shall maintain the licensee-specific as well as aggregate for state as whole, the statistics and database pertaining to aggregate demand assessment and forecasting data mentioned above and share state-level assessment with the Authority and the NLDC for regional/national assessment from time to time.

18.5. 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 with STU and SLDC for computation of state-level capacity credit factors and for preparation of state-level assessment.

18.6. SLDC and STU shall aggregate generation data and share state-level assessment with the Authority and NLDC for assessment of RA requirement.

18.7. STU shall communicate allocation of regional and national RA requirement to the distribution licensees.

19. Timelines

19.1. Distribution licensees shall submit demand forecasts to SLDC by 30th April of each year for the ensuring year(s).

19.2. SLDC shall aggregate and submit state-level forecasts to the Authority and the NLDC by 31st May of each year for the ensuring year(s).

19.3. Distribution licensees shall perform MT-DRAP and ST-DRAP exercise by 31st August of each year for the ensuring year(s).

19.4. STU and SLDC shall submit state-level aggregated plan to NLDC by January of each year.

Chapter 8

Miscellaneous

20. Power to Give Directions

20.1. The Commission may from time to time issue such directions and orders as considered appropriate for implementation of these regulations.

21. Power to Relax

21.1. 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, may relax any of the provisions of these Regulations on its own motion or on an application made before it by an interested person.

22. Power to Remove Difficulties

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

Sd/-

Secretary

Meghalaya State Electricity Regulatory Commission