MAHARASHTRA ELECTRICITY REGULATORY COMMISSION

DRAFT

MERC (Demand Flexibility and Demand Side Management – Implementation Framework, Cost-effectiveness Assessment; and Evaluation, Measurement and Verification) Regulations, 2024

August 2024

Maharashtra Electricity Regulatory Commission (Demand Flexibility and Demand Side Management – Implementation Framework, Cost-effectiveness Assessment; and Evaluation, Measurement and Verification) Regulations, 2024

MAHARASHTRA ELECTRICITY REGULATORY COMMISSION, MUMBAI

Maharashtra Electricity Regulatory Commission (Demand Flexibility and Demand Side Management – Implementation Framework, Cost-effectiveness Assessment; and Evaluation, Measurement and Verification) Regulations, 2024

ELECTRICITY ACT, 2003

No. MERC /Tech/Regulations/2024/XXX- In exercise of the powers conferred by sub-section (1) of Section 181 and clause (zp) of sub-section (2) of Section 181 of the Electricity Act, 2003, and all other powers enabling it in this behalf, the Maharashtra Electricity Regulatory Commission hereby makes the following Regulations, providing for Demand Flexibility and Demand Side Management - Implementation Framework, Cost-effectiveness Assessment; and Evaluation, Measurement and Verification framework to be followed by distribution licensees and for matters in connection therewith and incidental and ancillary thereto.

1. Short Title, Applicability, Commencement and Interpretation

1.1 These Regulations may be called the "Maharashtra Electricity Regulatory Commission (Demand Flexibility and Demand Side Management – Implementation Framework, Cost-effectiveness Assessment; and Evaluation, Measurement and Verification) Regulations, 2024".

1.2 These Regulations extend to the whole of the State of Maharashtra and applicable to all existing and prospective distribution licensees in the state.

1.3 These Regulations shall come into force from the date of their publication in the Official Gazette.

1.4 These Regulations shall be construed harmoniously with the Maharashtra Electricity Regulatory Commission (Multi Year Tariff) Regulations, 2024 as amended from time to time and Maharashtra Electricity Regulatory Commission (Resource Adequacy) Regulations, 2024.

1.5 These Regulations form three distinct components as follows: Part A: Implementation Framework; Part B: Cost-effectiveness Assessment; and Part C: Evaluation, Measurement and Verification. Three parts form the entire Regulations in its stated meanings.

2. Definitions

2.1 In these Regulations, unless the context otherwise requires:

1. "**Act**" means the Electricity Act, 2003 (36 of 2003) as amended from time to time;

2. "**Ancillary Service**" or "**AS**" in relation to power system operation, means the service necessary to support the grid operation in maintaining power quality, reliability and security of the grid and includes Primary Reserve Ancillary Service, Secondary Reserve Ancillary Service, Tertiary Reserve Ancillary Service, active power support for load following, reactive power support, black start and such other services as defined in the Grid Code;

3. **"ARR"** means Aggregate Revenue Requirement;

4. "**Avoided Costs"** means the incremental costs avoided by the distribution licensee when it does not purchase power because of implementation of DSM programmes, or otherwise defers or avoids distribution related costs from investment in existing/new distribution system upgrades;

5. **"Cost Effectiveness"** means an indicator of the relative performance or economic attractiveness of any investment in DF/DSM programme or when compared to the costs of energy produced and delivered in the absence of such an investment and as stipulated in the Part B of these Regulations;

6. **"Demand Flexibility"** means the capacity of demand-side loads that can vary their consumption patterns hourly or on another timescale to help integrate higher amounts of renewable energy resulting in making electricity more affordable to consumers with the co-benefits of reducing or deferring system costs;

7. **"Demand Flexibility Portfolio Obligations (DFPO)"** means a trajectory of flexible demand that a distribution licensee needs to ensure availability of on an annual basis to provide quick ramping-up and ramping-down of the load based on the system requirements including maximizing renewable energy integration services;

8. **"DF/Demand-Side Resource"** means a saving in consumption (kWh) and/or demand (kW/KVA) available as a result of implementation of DSM programme, to be expressed in three important dimensions: Quantum – as to how much is available (kWh and/or kW); Time – as to when is it available (at what time of day, on what days, in what season); and the Cost – as at what would be the cost;

9. "**Distribution Licensee**" shall have the meaning ascribed thereto in the Act;

10. "**DSM**" means Demand Side Management;

11. **"DF and DSM Consultation Committee**" means a committee set up under the convenorship of Secretary MERC to facilitate DF and DSM programme approval process for the Commission as detailed under Regulation 7 of these Regulations;

12. **"Energy Efficiency"** means activities or programmes that stimulate consumers to reduce energy use by making investments in more efficient equipment or control that reduces energy use while maintaining a comparable level of service as perceived by the consumer;

13. **"Evaluation, Measurement and Verification (EM&V)"** means activities included under Part C of these Regulations, which target evaluation, monitoring, measurement and verification of DF / DSM programmes;

14. **"Independent Verification Agency (IVAs)"** are either individuals certified as energy auditors or energy managers or measurement and verification professionals or organisations with individuals certified as energy auditors or energy managers or measurement and verification professionals;

15. **"IPMVP"** means International Performance Measurement & Verification Protocol which provides guidelines that can be used to estimate the savings from the DF/DSM programmes;

16. **"Life"** means an estimate of the median number of years that the DF/ DSM measures installed under the programme are still in place and operable; or warrantied years of service or as defined by DF/DSM Consultation Committee should there be a need or as suggested by the licensee;

17. "**LRIRIM**" means Lifecycle Revenue Impact of the DF/DSM programmes on tariffs;

18. **"Load Management"** means programmes that reduce or shift peak demand away from periods of high-cost electricity to non-peak or lower cost time periods, with a neutral effect on or negligible increase in electric use;

19. **"Load Research"** means an activity embracing the measurement and study of the characteristics of electric loads to provide a thorough and reliable knowledge of trends, and general behaviour of the load characteristics of the consumers serviced by the distribution licensee using a variety of metering (including data capture from smart metering systems), surveys, detailed energy audits of consumer-end energy consumption to capture diurnal, daily, monthly, seasonal and annual usage patterns;

20. **"MYT**" means Multi year tariff;

21. "**NPV**" means Net Present Value;

22. "**PCT**" means Participant Cost Test which measures the quantifiable benefits and costs to an "average" consumer for participating in a DF/DSM programme;

23. "**RIM**" means Ratepayer Impact Measure test which checks what impact the programme implementation and costs would have on consumers;

24. "**SCT**" or Societal Cost Test measures the quantifiable benefits and costs of the DF/DSM programme on society as a whole;

25. "**TRC**" means Total Resource Cost test which measures the total quantifiable benefits and costs of a DF/DSM programme;

2.2 Words and expressions used herein and not defined shall have the meanings assigned to them in the Act or the rules or regulations made thereunder.

3. PART A: IMPLEMENTATION FRAMEWORK

4.

5. Basic Principles

5.1. DF / DSM as a key part of the licensee operations

Every Distribution Licensee shall make DF / DSM an integral part of their day-to-day operations, and undertake planning, designing and implementation of appropriate DF / DSM programmes on a sustained basis that are measurable, replicable and available for smooth grid operations at supply and demand-side of the electricity sector stakeholders; and also contribute to the proper functioning of the Resource Adequacy requirements under other regulations.

5.2. Cost recovery of DF / DSM measures

Distribution Licensees may recover all justifiable costs incurred by them in any DF / DSM related activity, including conducting Load Research (LR), planning, designing, implementing, monitoring and evaluating DF / DSM programmes, by adding these costs in the MYT filings and annual financial reporting. All such DF / DSM related activities/ programmes undertaken by the Distribution Licensees:

(i) Will need to be cost effective for the consumers of the Distribution Licensees as well as to the Distribution Licensees themselves as stipulated under Part B of these regulations;

(ii) Shall protect the interest of all consumers and be implemented in an equitable manner;

(iii) Will result in overall tariff reductions for all the consumers of the licensees;

(iv) Will result in embedding renewable energy on the consumer-side of the meter or supply-side of the meter.

5.3. Distribution Licensees shall be guided by these Regulations:

(i) While developing a robust five-year and one-year DF / DSM portfolio structure on a rolling basis linked to planning and submitting load research and proposing measures to be implemented by them as regards demand flexibility, load management, energy conservation and energy efficiency portfolio of programmes;

(ii) While submitting to the Commission the impact on energy and demand, together with the cost-benefit analysis as stipulated under Part B of these Regulations and the evaluation, measurement and verification of the implemented programmes stipulated under Part C of these Regulations;

(iii) While addressing specific directions of the Commission.

6. DF / DSM Guiding Principles

The duties of the Distribution Licensees shall be as follows:

a) **Development of DF / DSM portfolio:** Distribution Licensees shall develop a strong portfolio of DF / DSM programmes, on the basis of comprehensive load research, that provide long-term savings and feed into the resource adequacy requirements. The DF / DSM portfolio shall contribute to the integrated resources planning requirements, resource adequacy assessment and provide a market transformation trigger. The DF / DSM programme portfolio shall include the following key sections:

(i) findings of a detailed load research activity based on smart metering infrastructure, automated metering infrastructure and appliance-level metering to assess peak convergence, consumer surveys;

(ii) consumers' perspectives and willingness to participate in the DF / DSM initiatives;

(iii) detailed working of the possible DF programmes to be implemented and the DFPO targets that include all components such as DF, energy efficiency and energy conservation measures;

(iv) portfolio and programme-specific cost-effectiveness assessment;

(v) DFPO (DF) and DSM evaluation, measurement and verification procedures developed for future verifications, using online metering and monitoring services;

(vi) funds deployment plan to meet the yearly DF targets and other energy efficiency and energy conservation portfolio roll-out on an annual basis.

b) **Timelines for submission of DF / DSM portfolio and according approvals:** The distribution licensees shall submit a "DF / DSM programme portfolio and implementation action plan" (format in Annexure 1) 3 months prior to the submission of the MYT Tariff filings. The Commission shall accord its approval with specific suggestions or directions to be incorporated in the MYT filings within 60 days. On an annual basis, the distribution licensees shall submit "Status report on DF / DSM implementation" by 31 March in the ensuing year reporting on the portfolio performance to allow the Commission to approve or disapprove incentives or disincentives claimed by the distribution licensee. However, in MYT submission due for filing by 30 November 2024, distribution licensees shall submit block estimates and budgets to implement DF/DSM portfolio with the MYT Petition and detailed DF/DSM portfolio and implementation plan submitted within first three months of notification of these Regulations to be approved by the Commission before 31 March 2025.

c) **DFPO multi-year targets:** Distribution Licensees shall adhere to specific demand flexibility portfolio obligations (DFPO) set-up with a following specific trajectory:

Year	DFPO as percentage of peak demand experienced in previous Financial Year
FY 2025-26	3%
FY 2026-27	4%
FY 2027-28	5%
FY 2028-29	6%
FY 2029-30	7%

Subsequent to the first five years of trajectory for DFPO described above, the Distribution Licensees shall perpetually ensure 7% of the previous year's peak demand as DFPO till the time it is revised by the Commission.

d) **DFPO incentives and disincentives:** Distribution Licensee shall be eligible for an incentive of INR 0.20 Crores for every MW achieved in excess of DFPO. Similarly, Distribution Licensee shall be subjected to a disincentive of INR 0.20 Crores for every MW underachievement of DFPO.

e) **DF / DSM portfolio deployment in key sectors:** Distribution Licensees shall implement programmes that add to the structures of resource adequacy and those that include demand flexibility to provide quick ramp-up and ramp-down services, reduce peak demand and associated costly power purchase, specifically in the urban centres and embedding cheaper renewable energy available within and from outside of the distribution licensee area of supply. The Demand Flexibility programmes shall also

include Demand Response initiatives involving consumers agreeing to modulate their load shapes through a contract with the licensee. Given the new loads that are now experienced by the Distribution Licensees, programme basket proposed and implemented through these Regulations shall include, but not limited to, the following:

a) time-based and selective pumping (based on the cost of energy) in Lift Irrigation Schemes, Municipal Corporations, Urban Local Bodies, Nagar parishads, drinking water schemes at villages and cluster of villages;

b) smart charging of electric vehicles in the 2-wheeler, 3-wheeler, passenger cars, fleet vehicles, public transportation buses, freight carriers, first-mile and last-mile delivery vehicles;

c) behind-the-meter battery energy storage systems;

d) heat pumps in residential, hospitals, hotels, industries, commercial buildings;

e) thermal energy storage systems in residential, hospitals, hotels, industries, commercial buildings.

In addition to the above, specific energy conservation initiatives at the consumers' premises, including lowest category of domestic consumer base, agricultural sector shall be included in the portfolio and shall be funded through the DF portfolio budget.

f) **Public disclosure of the DF / DSM portfolio and review documents:** Distribution Licensee shall publish key documents such as Load Research, appliance use and saturation reports, DF / DSM programme portfolio and implementation action plan and Status report on DF / DSM implementation on their website for public knowledge and consumption. On an annual basis, the adherence to the DFPO and DSM activities shall be published on the websites of distribution licensees. DF / DSM portfolio evaluation, measurement and verification reports shall be submitted to the Commission as well as put out in the public domain.

7. DF / DSM Consultation Committee (DSM-CC)

A separate DF / DSM Consultation Committee shall be set up under these Regulations through a specific notification of the Commission with a stated tenure and terms of reference. The DF / DSM Committee shall be a group of experts working under the direction of the Commission, to review and provide suggestions and objections on the DF / DSM programme portfolio submitted by the distribution licensees and recommend its findings on DF / DSM Programmes to the Commission for approval. Secretary to the Commission shall act as the Convenor of the DF / DSM Committee with participation

from distribution licensees, Maharashtra Energy Development Agency (MEDA) representing the Bureau of Energy Efficiency (BEE), Chief Electrical Inspector, sectoral experts including representatives of academic/research institutions and private sector with specific knowledge of DF / DSM opportunities. The DF / DSM Consultation Committee shall evaluate the "DF / DSM Programme Portfolio and Implementation Plan" submitted by the distribution licensees and provide its recommendations to the Commission, and assist in the evaluation of the "Status report on DF / DSM implementation" submitted by licensees. The DF / DSM Committee shall also assist in creation of sectoral expertise in the stakeholder groups to actively guide design, implementation and evaluation of DF/DSM programmes.

8. DF/DSM funding

Funding of all the DF / DSM portfolio programmes and plans to be implemented by the Distribution Licensees shall be included in the MYT Tariff filings with an annual funds deployment requirement and reported as a part of annual review. Distribution Licensees shall be allowed to recover all costs, clearing the cost-effectiveness assessment test included in Part B of these Regulations, incurred by them in any DF / DSM related activity, including planning, conducting load research, designing, implementing, monitoring and evaluating DSM programmes, by adding these costs to their ARR to enable their funding through tariff structure. All costs incurred to conduct load research on an annual basis, setting-up of online monitoring systems, setting-up of network operating centres, data-driven online and real-time monitoring services, deployment of appliance-level metering infrastructure on a sample basis, conducting energy audits at consumers' premises, awareness campaigns, targeted research activities, dissemination efforts and all other legitimate expenses to further the cause of DF / DSM.

The Commission may direct the Distribution Licensees to adopt other complementing DF / DSM funding approaches such as creating a pool of funds through collection of DF-DSM Charge at a later date through tariff; if such an approach is found beneficial.

9. PART B: COST-EFFECTIVENESS ASSESSMENT TESTS

These Regulations will be used to assess the economic-effectiveness of a portfolio and programmes thereunder with some of the decision variables such as, inter alia, DF/DSM measure/programme costs and impacts (both energy – kWh and demand – kVA or KW), discount rate, life, escalation rate and avoided cost.

10. Cost-effectiveness Criteria

Distribution Licensees shall share specific Cost-effectiveness Assessment test results as a part of the DF / DSM portfolio submission. Distribution Licensees shall evaluate Total Resource Cost (TRC) test as the main hurdle test; followed by the Ratepayer-Impact

Measure (RIM) test that confirms the fact that programme implementation and costs incurred would not impact the tariffs adversely. The Life-cycle revenue impact (LRIRIM) should not be more than Rs. 0.005/kWh or over 0.05% of existing tariff as tariff increase, whichever is higher. The programme screening shall be carried out using the following decision tree:

a) TRC as the main hurdle test: All DF / DSM programmes that show positive number for the Net Present Value (NPV) of the Benefits over the NPV of Costs should be considered for evaluation of RIM test;

b) RIM test: DF / DSM Programmes that show positive number when NPV of the Benefits over the Costs for the Ratepayers are considered should be implemented,

c) LRIRIM test: DF / DSM Programmes that do not show positive number for RIM test should be implemented if the tariff impact due to the implementation of the DF / DSM Programmes is less than Rs. 0.005/kWh or less than 0.05% of the existing tariff, whichever is higher. All the energy savings numbers should be corrected for power shortages, if any.

11. Total Resources Cost test

The main hurdle test shall be carried out by calculating Net Present Value (NPV) of Benefits (B) and Costs (C). NPV for a DF / DSM measure/programme shall be determined as the difference between B and C.

Where,

B = NPV of measure/programme benefits discounted over a specified time period

C = NPV of measure/programme costs discounted over a specified time period

If the measure/programme benefit in year "t" is "B_t", and discounting rate is "r", the time period for discounting is "n" years, then B can be expressed as:

$$B = \sum_{t=1}^{n} \lfloor (B_t)/ (1+r)^{t-1} \rfloor \quad \text{(equation 1)}$$

Similarly, if the measure/programme cost in year "t" is "C_t", and discounting rate is "r", the time period for discounting is "n" years, then C can be expressed as:

$$C = \sum_{t=1}^{n} \lfloor (C_t)/ (1+r)^{t-1} \rfloor \quad \text{(equation 2)}$$

Cost elements for the TRC test shall be determined considering the following:

a) The cost of efficient device/equipment/appliance/ technology or practice, including the applicable taxes, duties and levies;

b) Installation, trial and commissioning costs associated with efficient device/equipment / appliance/practice/technology;

c) Yearly operation and maintenance costs over the life of the measure/programme;

d) Old inefficient equipment removal and safe disposal costs (if the DSM measure/programme involves replacement or retrofitting);

e) Programme administration, monitoring and evaluation costs;

f) Programme marketing costs.

Notes:

If there are any tax credits, the same shall be considered as reduction in the cost. Similarly, if there is old equipment/device / appliance / technology etc. that is being replaced; the salvage value of this old equipment or device shall be considered as a reduction in the cost.

Benefits of a DF / DSM programme or a DF / DSM measure are the savings in the energy (kWh) consumed and/or savings in the demand (kW). The kWh savings shall be calculated based on the number of hours the energy efficient appliance/equipment is used and number of days in a year the appliance/equipment is used. These savings usually occur at the point of use and are experienced by the consumer installing a DF / DSM measure or consumer participating in a DF / DSM programme. To arrive at the avoided purchase of power by the licensee, the participant savings at the point of use have to be suitably adjusted to account for system transmission and distribution losses. The DF projects also have the possibility of participating in the central Ancillary Services market defined under CERC Regulations No. RA-14026(11)/3/2019-CERC. All such additional revenues shall be included in the benefits stream.

Thus, if savings at point of use in year "t" are ΔS_t expressed in kWh, and if transmission and distribution losses expressed as percentage in the same year are TL_t and DL_t, respectively, the Avoided Purchase of Power in year "t" (APPt) by the licensee would be: $= \Delta S_t/[(1-TL_t) \times (1-DL_t)]$. If rate of power purchase in year "t" is R_t, then Avoided Power Purchase Cost ($APPC_t$) in year "t" would be: $= APP_t \times R_t$

Any reduction in "intra-state transmission charges", as a result of reduction in the average co-incident peak demand of the licensee shall be considered a "benefit" under this test.

While calculating energy and demand savings as benefits, year-on-year escalation rate of 5% should be considered. Tests should consider a discount rate of 10.5%.

Both benefits and costs shall be calculated over the "Life" of the technology being deployed. Distribution Licensee shall use the "warrantied" life of the retrofit by the technology provider as it is important to ensure that the savings considered are realized over the life-span of the equipment/appliances. Alternately, "life" as may be defined by the DSM Consultation Committee shall be used.

12. Ratepayer Impact Measure test

(i) Cost elements mentioned below shall be used in "equation 1"

a) The cost of efficient device/equipment/appliance/ technology or practice, including the applicable taxes, duties, levies, etc. paid for by the licensee or to the extent paid for by the licensee;

b) Installation, trial and commissioning costs associated with efficient device/equipment/appliance/practice/technology paid by the licensee or to the extent paid by the licensee;

c) Yearly operation and maintenance costs over the life of the measure/programme paid for by the licensee or to the extent paid for by the licensee;

d) Old inefficient equipment removal and safe disposal costs (if the DSM programme involves replacement or retrofitting) paid for by the licensee or to the extent paid for by the licensee;

e) Programme administration, monitoring and evaluation costs paid for by the licensee or to the extent paid for by the licensee;

f) Programme marketing costs, including incentives, if any, paid by the licensee or to the extent paid for by the licensee;

g) Decrease in licensee revenues due to the DSM programme;

(ii) Benefits of the DSM programme shall be calculated as "Avoided Cost of Power Purchase". If savings due to a DSM programme/measure at point of use in year "t" are ΔS_t, and if transmission and distribution losses in the same year are TL_t and DL_t, expressed as a percentage respectively, the Avoided purchase of power in year "t" (APPt) by the licensee would be: = $\Delta S_t/[(1\text{-}TL_t) \times (1\text{-}DL_t)]$

If rate of power purchase in year "t", is R_t, then avoided power purchase cost ($APPC_t$) in year "t" would be: = $APP_t \times R_t$

(iii) Any reduction in "intra-state transmission charges", as a result of reduction in the average co-incident peak demand of the licensee shall be considered as a "benefit" under this test;

(iv) While calculating energy and demand savings as benefits, year-on-year escalation rate of 5% should be considered;

Note: Tests should consider a discount rate of 10.5%.

(v) Both benefits and costs shall be calculated over the "Life" of the technology;

(vi) Distribution Licensee shall use the "warrantied" life of the retrofit by the technology provider as it is important to ensure that the savings considered are realized over the life-span of the equipment/appliance. Alternately, "life" as may be defined by the DSM Consultation Committee shall be used;

13. Life-cycle Revenue Impact – RIM test

(i) LRIRIM test shall be conducted using same data used for calculating the RIM test described in Regulation 9 of these regulations.

(ii) Difference between NPV of Cost and NPV of Benefits shall be divided with total utility kWh sales to determine the rate impact on the non-participants.

(iii) Distribution Licensees shall also submit results of two more test – Participants Cost Test (PCT) and Societal Cost Test (SCT); though these are not considered in the decision-making. Methods for carrying out the PCT and SCT are provided in Annexure 2 to these Regulations.

14. Values of key inputs used in the tests

The default input values to be considered by all Distribution Licensees in the State, shall be as follows:

a) Avoided cost of power purchase for TRC, RIM and PCT – Weighted Average of Highest Marginal Cost of Power Purchase related to top 10% of energy use stack for the past one year.

b) Avoided cost of power purchase for SCT – Rs. 12/kWh (prevalent ceiling rate for Day ahead market set by CERC)

c) Escalation rates for power sales, avoided cost of purchase – 5% year-on-year.

d) Discount rate for TRC and RIM tests – 10.5%.

e) Discount rate for PCT – 13%.

f) Discount rate for SCT – 10.5%.

The Commission may, by order, revise the above values annually, if necessary.

15. PART C: EVALUATION, MEASUREMENT AND VERIFICATION

16.

17. DSM Evaluation, Measurement & Verification Guiding Principles

Three basic types of evaluations covered under these Regulations include:

a) **Impact evaluation** that determines the impacts (e.g., energy and demand savings) and co-benefits (e.g., avoided emissions, health benefits, job creation, energy security, transmission/distribution benefits, and water savings) that directly result from a programme. Impact evaluations support cost-effectiveness analyses aimed at identifying relative programme costs and benefits.

b) **Process evaluation** that assesses programme delivery, from design to implementation, in order to identify bottlenecks, efficiencies, what worked, what did not work, constraints, and potential improvements. Timeliness in identifying opportunities for improvement is essential to making corrections along the way.

c) **Market effects evaluation** that estimates a programme's influence on encouraging future DF/DSM projects because of changes in the energy marketplace. These evaluations are primarily, but not exclusively used for programmes with market transformation elements and objectives.

Entire Evaluation, Measurement & Verification (EMV) process for all the demand flexibility and demand side management projects and programmes shall be managed in a transparent manner using online and real-time assessment tools wherever feasible. The Distribution Licensees shall empanel Independent Verification Agencies (IVAs), who are either individuals or organizations with expertise defined under these Regulations. Cost of the appointment of empanelled IVAs shall be included in the DF / DSM portfolio costs submitted by Distribution Licensee as a part of the project costs. The Commission may choose to have an IVA evaluate the programmes directly as well on a case-to-case basis if it chooses to do so.

18. Impact Evaluation

The impact evaluation expressed as gross energy/demand savings and the demand flexibility created shall be determined by comparing energy use and demand after a DF / DSM programme is implemented (i.e. the reporting period) with the energy use and demand if the programme not been implemented (i.e. the baseline). The estimated savings shall be determined by the following equation:

Estimated savings = (baseline use) – (reporting period use) ± (appropriate adjustments)

The impact evaluation shall primarily be carried out using either of the three approaches:

- Measurement & verification approach;
- Deemed savings approach; and
- Large-scale data analysis.

18.1. Measurement & verification approach

Four generic measurement & verification methodologies A, B, C and D described in the International Performance Measurement & Verification Protocol (IPMVP) may be used to estimate the savings comparing baseline use and reporting period use with appropriate adjustments thereto. The distribution licensee should propose the evaluation process that complies with the IPMVP guidelines at the approval stage of the new demand side management programmes. If the distribution licensees wish to propose any other suitable methodologies, the portfolio and programmes should include those explicitly with justifications thereto. **Annexure 3** shows the general description of the four measurement & verification methodologies as per IMPVP.

18.2. Deemed savings approach

Deemed savings (also referred to as "stipulated" savings) shall be reported on the basis of historical savings values of typical DSM projects. Sources of deemed savings values must be documented in the evaluation plan. The deemed savings determined for a sample of projects shall be applied to all the projects in the DSM programme to estimate the programme-level savings. The deemed savings approach shall be recommended by the distribution licensee for DSM programmes that are repeated and have fixed operating conditions (e.g. operating hours) and well-substantiated savings values (e.g. energy consumption patterns). Distribution licensees shall propose this approach when well documented and systematically validated sources, such as historical evaluations, are available for certain types of technologies.

18.3. Large-scale data analysis

In case of established homogenous energy use patterns and implementation of programmes in such categories, the savings evaluation can be carried out using time-series comparisons of energy use before and after the implementation of demand side management programmes. Other approach shall include comparison of energy use of participants and non-participants.

The EM&V plan proposed by the distribution licenses shall also include the methodology to be followed to determine net impacts from the gross impacts calculated based on the methodologies proposed under 13.1, 13.2 and 13.3. The Net-to-Gross Ratio proposed should include free-riders, non-participant spill-over and participant spill-over. The distribution licensees shall use survey techniques such as self-reporting surveys and interviews of key participants.

19. Process evaluation

Distribution licensees shall also include robust process evaluations to improve the programme design and cost-effectiveness of the proposed measures. Process evaluations shall be structured in order to examine the efficiency and effectiveness of DF/DSM programme implementation procedures and systems.

These evaluations shall include interviews with those involved in the programme, analysis of their answers, and comparing results to established best practices. The process evaluation shall include recommendations for changing a programme's structure, implementation approaches, or programme design, delivery, and goals supported through the findings from the evaluation interviews. The primary instrument used in the process evaluations shall be data collection (e.g., surveys, questionnaires, and interviews) from administrators, designers, participants (such as facility operators), implementation staff (including contractors, subcontractors, and field staff), and key policy makers. Other key elements of a process evaluation shall be workflow and productivity measurements; reviews, assessments, and testing of records, databases, programme-related materials, and tools; and collection and analysis of relevant data from third-party sources (e.g., equipment vendors, trade allies).

20. Market Effect Evaluation

The EM&V shall also assess Market effects as a result of the specific DF / DSM programmes. This evaluation shall include:

- Assessment of additional DF / DSM programmes implemented by the participants without the support from distribution licensee.

- Additional entities implementing the technical interventions promoted through the distribution licensee's DSM programmes.

- Assessment of pricing, changes in predominant efficiencies and availability of efficient products in the market.

21. Empanelment of Independent Verification Agencies

Distribution Licensees, supported through these Regulations, shall empanel Independent Verification Agencies (IVAs). The IVCs shall be selected based on the following criteria:

a) IVAs should be individual consultants, consultancy organizations, academic/research institutions, civil society organisations and/or consortia thereof;

b) IVAs should have at least one BEE Certified Energy Auditor or Certified Energy Manager; or a Certified Measurement & Verification Professional (CMVP) certified by any national or international certification agency on their team in case of consultancy organizations/consortia thereof; and

c) Shall possess experience in design, implementation, review, measurement, verification and statistical analysis related to large datasets. The IVAs appointed for specific projects should not have been involved in DF / DSM programme design, implementation, review, and any related activity.

22. EM&V report formats

The EM&V reports submitted by the IVAs shall include at a minimum the following – DF / DSM portfolio / programme description, description of the proposed impact, process and market evaluation methodologies, description of measurement instruments, sampling process, reporting period, baseline period, metering/measurement accuracies, statistical analyses carried, list of assumptions, survey instruments used and annexes including the key raw data, list of respondents with their contact details, and credentials of IVAs.

23. Powers to remove difficulties

If any difficulty arises in giving effect to any of the provisions of these Regulations, the Commission may by order, take suitable action, not being inconsistent with the Act, which appears to the Commission to be necessary or expedient for the purpose of removing difficulties.

24. Orders and Practice Directions

Subject to the provisions of the Act, the Commission may from time-to-time issue orders and practice directions in regard to the implementation of these Regulations.

25. Power to Amend

The Commission may, at any time, vary, alter, modify or amend any provisions of these Regulations.

Mumbai **Secretary,**

Dated:27 August 2024 **Maharashtra Electricity Regulatory Commission**

26.

27. Annexure 1: Format of DF / DSM programme portfolio and implementation action plan

DF / DSM Plan Document to be submitted by the Distribution Licensees for the approval of the Commission shall be required to include the following general elements:

1. **Executive summary:** Provide here an overview of the Plan, including the DF / DSM target for the Plan period; total funding envisaged for the MYT period with a break up of funds for programmes and funds for administration and management of DF / DSM effort by the licensee, listing and brief description of the DF / DSM programmes proposed to be implemented for meeting the DF / DSM targets set by the Commission; Plan level and individual DF / DSM programme level cost effectiveness, including impact on consumer tariffs; qualitative and/or quantitative contribution of the Plan towards Commission's key policy objectives; year wise break up of achievement of targets and funds requirement; major assumptions and risks.

2. **Introduction:** Discuss here the achievements during the past multi-year plan, including what targets were set, to what extent were they/are they achieved/ likely to be achieved and the reasons and explanations if the targets set have not been achieved; to what extent and how effectively the funds earmarked have been used; what were the major constraints faced in the implementation of various programmes; what lessons have been learned.

3. **Characteristics of Distribution Licensee System:** Present time series (past 5 years) information about power situation in general, including demand met, load shedding, if any; the consumer base of the licensee – total number of consumers, consumers by rate category; Total consumption and break-up of the same by consumer and rate category; Source wise energy purchase and the average rate of purchase of power; Load duration curve, peak load by season, typical average daily, seasonal and weekly load curves; Forecast of demand, energy requirement, sales and revenue requirement over the next five years (Plan period), including elaboration of methodology used, data used, statement of underlying assumptions used and basis for the assumptions, sensitivity analysis carried out and changes in assumptions and other conditions assumed for carrying out sensitivity analysis.

4. **DF / DSM Plan targets and the resource availability estimates:** Discuss here the proposed DSM targets and the resource requirements for meeting the targets.

5. **Identification of sectors, segments and end-uses for the achievement of targets:** Discuss here what sectors (domestic, commercial, industrial, agriculture, municipal), segments (consumer category, such as – offices, hospitals, hotels, malls, banks,

industrial cluster -MIDC industrial estate, geographical area, street lighting, gram panchayat water supply systems, specific feeders, etc.) and end-uses (lighting, pumping, heating, space cooling, air-conditioning, etc.) you intend to target for the achievement of the targets and justification for choosing these sectors, segments and end-uses.

6. **Identification of DF / DSM measures/technology options / portfolio plans to achieve DSM targets:** Discuss here the process (including justification) that has been used for identification of DSM measures and technologies (within the identified sectors, segments and end-uses) that you intend to target for achievement of the targets. Also discuss here the DSM measures and technologies that were considered but were finally rejected and reasons for their rejection, including screening criteria used, if any, assumptions used, if any, basis for the assumptions, etc.

7. **Individual Programme Description:** For each of the DSM programme included in the final identified portfolio of DSM programmes, provide information highlighted at the end of this Annexure.

8. **Annual and cumulative achievements:** Present here annual contribution that will come forth from various DSM programmes in the final identified portfolio (to ensure that the Plan cumulative targets are met).

9. **Administration and management of DSM implementation by the distribution licensee:** Discuss here the proposed organisation for the administration and management of the DSM effort over the Multi-year Plan period, in terms of capacity building for employees, load research and potential studies, and all other requirements to implement DSM Programmes, Portfolio and Plans.

10. **Funds Requirement and Financing:** Present here the year wise (for each of the multi-years of the Plan period) funds requirement for the total Plan covering programme implementation and management costs and financing plan.

11. **DF/DSM Plan EM&V:** Describe here the EM&V Plan for the DSM Plan. The EM&V Plan to be included here will be guided by the EM&V regulations of the Commission.

12. **DF/DSM Plan monitoring and reporting:** Describe here the monitoring and reporting Plan (frequency, minimum content, format, indicators and means of verification chosen).

13. **Implementation Plan:** Present here the schedule of implementation of different elements of the programmes, portfolio and plan; also qualifying the same with submission of activity charts.

27.1. Elements of DF / DSM Portfolio / Programme Document

The Programme Document should act as a reference document for the licensee and all stakeholders. It will have information on the consumer segments where identified DSM measures are to be implemented. It will also have information on incentives and features of consumer/vendor interface, delivery options, institutional relationships, detailed programme implementation plan with time lines and implementation responsibilities. The Programme Document shall include the following elements.

1. **Programme description:**
    a. Description of DSM measures and technologies, the programme is intending to implement, including listing of brands and manufacturers/vendors that will be eligible for inclusion in the DSM programme, relevant pricing, quality assurance and replacement/guarantee policy.
    b. Consumer segments the programme is targeting, including eligibility criteria to be used for identification of potential consumers within the identified target segment.
    c. Other stakeholders (financiers, energy services companies, equipment vendors, consultants, energy auditors, trade associations, groups of persons, NGOs, academic institutions, government organisations) involved in the implementation process, description of their roles and responsibilities and manner of participation.
    d. Barriers the programme is addressing.
    e. Strategy the programme proposes to use, including proposed incentives, if any, strategies to motivate consumers and other stakeholders to participate in the programme, description of payment and collection mechanism and equipment/appliance/service delivery mechanism.
    f. Description of programme management and implementation arrangements, including description of institutional relationships and internal programme tracking systems to be followed by the licensees.

2. **EM&V, monitoring & reporting:**
    The section will describe EM&V and monitoring and reporting plans:
    a. Description of baseline calculation and description of monitoring and verification methodology.
    b. Description of DSM programme monitoring, review and impact (in terms of programme participation, in terms of increases in penetration level of efficient devices and technologies, and in terms of load reduction/energy savings) analysis system/mechanism – who will monitor, what will be monitored, how will be monitored, who will verify, how frequently will be monitored, who will prepare monitoring/progress reports, etc.

3. **Detailed Implementation Plan:**

a. This section will describe if the programme will have any phases (e.g. demonstration/pilot etc.).
b. The section will also have description of main activities, and indication of their sequencing and interdependence. For each main activity, the section will also provide description of who will be responsible for the activity and when will the activity be performed.

4. **Estimate of annual and cumulative savings** due to the programme with all the assumptions used in savings estimation process, including base line considered.

5. **Annual programme funding requirements**: This section will have description of financing arrangement, including share of distribution licensee, vendors, consumers, retailers, State government, Central government, etc.

6. **Cost effectiveness calculation details**, including programme costs and benefits, impact on consumer tariffs, with explicit description of all the input values considered and all the assumptions used in cost effectiveness calculations and for input values.

7. **Dispute Resolution Mechanism:** Appropriate mechanism to be followed for resolution of disputes arising during programme implementation stage. Statement of how the distribution licensee will resolve concerns and issues that the distribution licensee may have as regards the manner in which the programme is being implemented.

28. Annexure 2: Methods to carry out the PCT and SCT

A.1. Participants Cost Test (PCT)

This test provides a measure of the quantifiable benefits and costs to an "average" consumer for participating in a DSM programme. Since many consumers do not base their decision to participate in a DSM programme entirely on quantifiable variables (many times consumers decision to buy an appliance/device/equipment are based on factors such as discount offered, features, brand value, initial cost, etc.), this test may not fully represent the benefits and costs of a programme to a consumer.

1.1. Costs

In its simplest form, the costs in this test are the programme costs paid by the participant. In addition, any increase in electricity bill of the participant as a result of the DSM programme is also to be considered as costs under this test. Thus the "Cost" elements usually associated with this test are:

- The cost of efficient device/equipment/appliance/ technology or practice, including the applicable taxes, duties, levies, etc. paid for or to the extent paid for by the participant;

- Installation, trial and commissioning costs associated with efficient device/equipment / appliance/practice/technology paid or to the extent paid by the participant;
- Annual operation and maintenance costs over the life of the measure/programme paid for or to the extent paid for by the participant;
- Old inefficient equipment removal costs (if the DSM measure/programme involves replacement or retrofitting) paid for or to the extent paid for by the participant;
- Programme administration, monitoring and evaluation costs paid for or to the extent paid for by the participant;
- Programme marketing costs, including incentives, if any, paid or to the extent paid for by the participant;
- Increase in participant electricity bill due to the DSM programme.

If there is old equipment/device / appliance / technology etc. that is being replaced; the salvage value of this old equipment or device is considered as a reduction in the cost. Similarly, if there is tax credit or incentive offered to the consumer the same can be treated as reduction in cost. Conventionally, the same will be treated as benefits accruing to the participant as a result of DSM programme under PCT.

1.2. Benefits

Benefits under this test are the reduction in consumer's electricity bills, tax credit received by the consumer, and incentives received by the consumer.

1.3. Escalation Rates

The ad-hoc recommended escalation rate for power tariff is as per Regulation 11 of these Regulations.

1.4. Discount Rate

The discount rate for this test should ideally be the rate at which banks and financial institutions would lend to consumers. Thus, depending upon the credit standing of the consumer the rate is likely to vary. For households, it is likely to be higher than for commercial sector or industrial sector consumers. However, a discount rate as per Regulation 11 of these Regulations may be taken for all categories of consumers.

1.5. Test Results

The NPV will be used as the primary evaluation criterion. An NPV value of zero or above will indicate that PCT test has been passed. It would also mean that the DSM programme is beneficial for an "average" participating consumer. On the other hand, a NPV value of less than zero will indicate that the DSM measure/programme being evaluated for PCT has failed the PCT, i.e. participation in a DSM programme is not beneficial for the consumer.

Tax credits and incentives appear on the benefit side of the NPV equation under this test. Thus, the benefit side of the DSM programme can be boosted by offering

incentives or tax credits. For DSM programmes that show negative NPV values, the PCT test can help identify the threshold level of tax credit/incentive that would need to be offered to make the DSM programme beneficial from participant perspective. Such threshold value will be the tax credit/incentive values for which NPV is zero. Sensitivity analysis with respect to various assumptions should also be conducted in order to understand the level of influence of each assumption on the NPV value.

A.2. Societal Cost Test (SCT)

The Societal Cost Test is structurally similar to the Total Resource Cost Test. However, since the SCT goes beyond the TRC test in that it attempts to quantify the change in the total resource costs to society as a whole rather than to only the service territory (the licensee and its consumers), it would be necessary to consider different values for some of the input variables such as power purchase rate, discount rate, etc. More specifically, the Societal Test differs from the TRC Test in the following ways:

- The value of power purchase rate will need to be the "social cost of power" which could be considered as the consumers' willingness to pay for power or the price the consumers are willing to pay for power. In the Indian context, ceiling rate for Day Ahead market set by the CERC can be used as a proxy for consumers' willingness to pay for power, and thus the social cost of power can be taken as per Regulation 11 of these Regulations.
- Since taxes, duties, levies, tax credits etc. are treated as a transfer payment in the Societal Test, they should be excluded from the calculations.
- The value of the discounting rate under SCT should be the societal discount rate. In the context of DSM programmes, the licensees could use the societal discounting rate as per Regulation 11 of these Regulations.

Certain indirect benefits such as reduction in greenhouse gases that takes place as an effect of implementing a DSM measure should be considered while calculating SCT.

29. Annexure 3: IPMVP Measurement & Verification methodologies and recommended selection process

The four IPMVP Options provide a flexible set of methods (Options A, B, C, and D) for evaluating energy savings in facilities with varying levels of savings certainty and cost. A brief description of each Option is provided here:

- Option A involves using a combination of both stipulations and measurements of the key factors needed to calculate savings in engineering models.
- Options B and C involve using spot, short-term, or continuous measurements in engineering models (Option B) or regression analyses (Option C).
- Option D may include spot, short-term, or continuous measurements to calibrate computer simulation models.

A particular option is chosen based on various features of each project. One criterion that works across all of the approaches is IVA's experience and expertise. For more details

the reader is directed to the full IPMVP documentation available from the website - http://www.evo-world.org.

Mumbai **Secretary,**

Dated: 27August 2024 **Maharashtra Electricity Regulatory Commission**