Consultation Paper

Methodology for Determination of Banking Charges for Renewable Energy Open Access Consumers under provisions of GERC (Green Energy Open Access) Regulations, 2024

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1. Introduction

1.1. Background

1.1.1. The Ministry of Power (MoP), Government of India, has been at the forefront of promoting renewable energy through strategic regulatory frameworks. In August 2021, the MoP released the draft Electricity (Promoting Renewable Energy through Green Energy Open Access) Rules, which laid the groundwork for allowing Banking of Renewable Energy:

"(1) Banking may be permitted on monthly basis on payment of charges to compensate additional costs, if any, to the distribution licensee by the Banking. The appropriate Commission shall fix the applicable charges.

(2) The quantum of banked energy by the green open access consumers shall not be more than ten percentage of the total annual consumption of electricity from the Distribution licensee by the consumers."

1.1.2. These draft Rules initially proposed that banking be permitted on a monthly basis, with charges set to compensate distribution licensees for any additional costs incurred. The quantum of banked energy was capped at 10% of the total annual consumption from the distribution licensee, a limitation that was perceived as potentially discouraging for renewable energy developers due to the intermittent nature of renewable sources.

1.1.3. Recognizing the need for a more supportive framework, the MoP notified the Electricity (Promoting Renewable Energy Through Green Energy Open Access) Rules, 2022, on June 6, 2022. Rule 8 of these Rules significantly enhanced the banking provisions by allowing at least 30% of the monthly consumption to be banked, thereby providing a more robust mechanism for integrating renewable energy into the grid. These Rules also mandated that the Appropriate Commission shall fix the applicable charges, ensuring a fair compensation structure for distribution licensees:

"Banking.– (1) Banking shall be permitted at least on a monthly basis on payment of charges to compensate additional costs, if any, to the distribution licensee by the Banking and the Appropriate Commission shall fix the applicable charges.

(2) The permitted quantum of banked energy by the Green Energy Open Access consumers shall be at least thirty percent of the total monthly consumption of electricity from the distribution licensee by the consumers."

1.1.4. Following the notification of the Electricity (Promoting Renewable Energy Through Green Energy Open Access) Rules, 2022 by the Ministry of Power (MoP), the Forum of Regulators (FOR) was assigned the task of creating Model Regulations for the calculation of open access and banking charges. Based on the abovesaid MoP Rules and FOR's recommendations and Model Regulations, many State Electricity Regulatory Commissions (SERCs) have introduced new regulations and amendments concerning banking charges.

1.1.5. Different State Electricity Regulatory Commissions (SERCs) have implemented varying approaches to banking charges for renewable energy, reflecting their unique regulatory environments and energy policies.

1.2. GERC's Regulatory Framework

1.2.1. Gujarat Electricity Regulatory Commission (GERC), aligning with the MoP Rules and FOR's recommendations, notified the GERC (Terms and Conditions for Green Energy Open Access) Regulations, 2024, on February 20, 2024.

1.2.2. It has been noticed that there is significant variance in banking regulatory practices across States, on key parameters like - in allowable banking percentages, settlement periods, and charges. Each state's approach reflects its own energy mix, regulatory priorities, and goals for renewable energy integration. States are continuously evolving their policies and regulatory frameworks to balance the encouragement of renewable energy with the financial health of distribution companies and grid stability.

1.2.3. However, to further standardize and regulate the banking of renewable energy across States, Ministry of Power, Government of India issued a clarification in a letter dated 21.08.2024.

1.2.4. This clarification emphasized that:

- **Minimum Threshold**: The permissible quantum of banked energy should be a minimum of 30% of the total monthly consumption of energy that is directly procured from the distribution licensee. This sets a baseline for the minimum energy which can be banked, ensuring that renewable energy producers have a clear guideline for their banking activities.
- **Objective for Minimum Threshold**: This minimum threshold is intended to support the integration of renewable energy into the grid while maintaining a balance between energy generation and consumption. By establishing a minimum standardized percentage, the MoP aims to encourage the use of renewable energy, reduce wastage, and promote financial viability for both producers and distribution companies.
- **Impact on Policy and Regulations**: This clarification provides a consistent framework for the State Electricity Regulatory Commissions (SERCs) to follow when formulating or revising their own banking regulations. It helps to align state-level policies with national renewable energy goals, facilitating smoother implementation across different States.

1.2.5. Implications for Renewable Energy Stakeholders:

- **For Renewable Energy Generators**: This clarification provides a more predictable and stable environment for planning and investment, as RE generators can better anticipate the amount of energy they are allowed to bank.
- **For Distribution Licensees**: The standardized 30% threshold helps distribution licensees manage their grids more effectively, ensuring that they can accommodate banked energy while planning for energy supply and demand.

- **For Policymakers and Regulators**: The clarification aids in the development of coherent policies that support renewable energy growth, aligning national and state-level regulations to promote a unified approach to energy banking.

1.2.6. During the public consultation for the draft GERC (Terms and Conditions for Green Energy Open Access) Regulations, 2024, several stakeholders proposed reducing the banking charges to 8% in alignment with the FOR's Model Regulations. After thorough deliberation, the Commission concluded that banking charges should be determined by considering their impact on grid management and the commercial implications for licensees and other consumers. In the Statement of Reasons (SOR), the Commission addressed the diverse suggestions and objections regarding banking charges, ultimately deciding on a temporary rate in the final notified Regulations. The Commission also committed to revisiting the aspects of banking charges separately, ensuring future decisions align with legal requirements.

1.2.7. Regulation 17.6 of the notified GERC (Terms and Conditions for Green Energy Open Access) Regulations, 2024, outlines the banking facility and charges. Specifically, point (viii) under Regulation 17.6 provides for the rate of banking charges and its validity, beyond which, the Commission will determine same. The Regulation 17.6 (viii) is reproduced here under:

"The Banking Charge at rate of Rs. 1.50 per unit shall be effective from the date of notification of these Regulations up to 30th September 2024. Thereafter, the banking charge for the period starting from 1st October 2024 and onwards as decided by the Commission and separately notified by the Regulation, shall be applicable."

1.2.8. In accordance with the Commission's decision in the SOR and the Regulation 17.6 of the above said, an exercise was conducted to establish a methodology for calculating banking charges. However, challenges in acquiring accurate data necessitated extending the Rs. 1.50 per unit banking charge beyond 01.10.2024. The Commission vide GERC (Terms and Conditions for Green Energy Open Access) (First Amendment) Regulations, 2024 continued Banking Charge of Rs. 1.50 per unit till 31.03.2025.

1.2.9. Subsequently, GERC (Terms and Conditions for Green Energy Open Access) (Second Amendment) Regulations 2025, GERC (Terms and Conditions for Green Energy Open Access) (Third Amendment) Regulations 2025 and GERC (Terms and Conditions for Green Energy Open Access) (Fourth Amendment) Regulations 2025 has continued Banking Charge of Rs. 1.50 per unit till 30.09.2025, 31.03.2026 and 30.06.2026 respectively, due to ongoing study for determination of framework for banking charges.

1.2.10. Recently, the Commission has again published draft GERC (Terms and Conditions for Green Energy Open Access) (Fifth Amendment) Regulations 2026 for continuing the Banking Charge of Rs. 1.50 per unit till 31.08.2026, as the completion of the study and public consultation on the outcome of the same would take some more time.

1.2.11. This Consultation Paper discusses the methodology adopted by the Commission to analyze banking charges and evaluates the results achieved, providing stakeholders with a comprehensive understanding of the methodology and also propose to determine the banking charges in accordance with the same.

1.2.12. The Commission presents this Consultation Paper as part of the regulatory process for inviting comments from the stakeholders for determination of banking charges in accordance with Regulation 17.6 (viii) of the GERC (Terms and Conditions for Green Energy Open Access) Regulations, 2024, as amended from time to time. The Commission has duly considered the various provisions of the Statutory / Policy documents, while preparing the present Consultation Paper.

2. Methodology for Calculating Banking Charges

2.1. Introduction

2.1.1. The objective of this Consultation Paper is to develop a methodology for calculating the banking charges that can be levied on renewable energy open access consumers in the State of Gujarat, with consideration given to the state's broader economic development and investment landscape for the renewable energy generation and consumption, as well as balancing its impact on the grid. Two primary approaches to calculating banked energy are outlined:

2.1.1.1. **Cumulative Banking:** This approach is similar to a savings account for electricity. It starts with a zero balance at the beginning of the billing cycle and accumulates surplus energy as it is injected into the grid by renewable energy generators. Energy can be withdrawn up to the amount banked, with the total banked energy currently fixed at 30% of the monthly consumption from the distribution companies (Discoms), the minimum level specified in the Commission's Green Energy Open Access Regulations.

2.1.1.2. **Non-Cumulative Banking:** This method functions like a ledger, recording both debit and credit entries for energy. The total banked energy is considered up to 30% of the monthly electricity consumption from the distribution company, the minimum level specified in the Commission's Green Energy Open Access Regulations, beyond which the energy is considered lapsed. Banked energy is then offset against the energy consumed from the distribution company.

2.1.2. Clause 17.6 (iv) of the GERC (Terms and Conditions for Green Energy Open Access) Regulations, 2024 states that:

> *"The consumption of banked energy shall be permitted on billing cycle basis in a manner specified as under:*
>
> *In the billing cycle, the banked energy, if any, available during peak period (i.e. Time of Use -ToU period specified in the Tariff Orders of the Commission for respective distribution licensees from time to time) shall be allowed to be utilized during the peak period and the off-peak period (i.e. period other than peak period) by the Green Energy Open Access consumer.*
>
> *Provided further that in case of the banked energy available during off-peak period (i.e. period other than the peak period) shall be utilized only during off-peak period by the green energy open access consumer."*

2.1.3. In the non-cumulative approach, there is an aggregation of surplus energy injected to and purchases from Discom across all billing cycle slots into peak and off-peak period banking categories. Therefore, it is not possible to utilize the banked energy available during the peak period in both the peak and off-peak period during the slots. Considering this limitation in the non-cumulative approach, we have considered the cumulative banking methodology for the determination of banking charges.

2.1.4. Considering the large-scale renewable energy generation, along with significant industrialization,

there is a decent number as well as volume of renewable energy open access in the State of Gujarat. These open access consumers have entered into open access agreements under various policy frameworks, meaning that the applicable banking regulations and charges will depend on the specific policies or regulations in effect at the time their open access agreements were executed. However, all new renewable energy open access agreements executed subsequent to the notification of the GERC (Terms and Conditions for Green Energy Open Access) Regulations, 2024, shall be governed by the provisions of these Regulations only, unless opted otherwise.

2.1.5. Under the provisions of GERC (Terms and Conditions for Green Energy Open Access) Regulations, 2024, all OA customers are required to install Availability Based Tariff (ABT) compliant meters, ensuring that their consumption and injection data is recorded in 15-minute intervals. The Commission has mandated that all Distribution Companies (Discoms) operating within Gujarat submit 15-minute block data on OA injection and consumption for consumers within their licensed areas. While private Discoms have not provided the requested data, the four state Discoms have complied, supplying the requisite data for approx. 165 consumers for whom they had 15-minute block OA injection and consumption records.

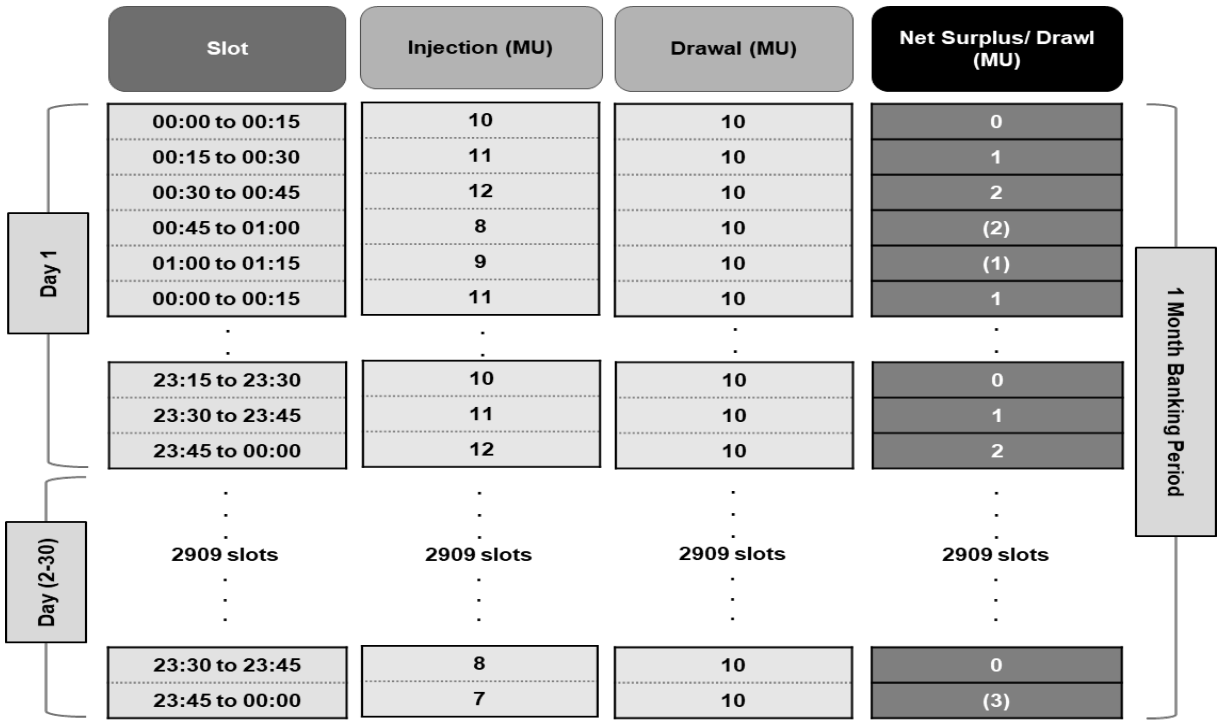
2.1.6. As a next step, it was important to fix the banking period. According to Regulation 17.6 (xi) of the GERC (Terms and Conditions for Green Energy Open Access) Regulations 2024:

" The credit for banked energy shall not be permitted to be carried forward to subsequent billing cycles and shall be adjusted during the same billing cycle in a manner specified under these Regulations."

2.1.7. Further, according to the Report by Forum of Regulators titled "Formulating Model Regulations for Calculating Open Access Charges and Banking Charges for Green Energy Open Access Consumers," it is recommended to consider a settlement period on a monthly basis (Billing Period).

2.1.8. Accordingly, for the purpose of simplicity of computation, the Banking Period has been considered as a calendar month, where any surplus (i.e., when generation > consumption) or net drawl (when generation < consumption) in any slot at the end of the month is accounted for according to the regulations formulated in this exercise.

Figure 2-1: Illustration of Monthly 15 min Slot-wise calculations of Net Surplus and Net Drawl



2.2. Methodology for financial impact on Discoms for providing Banking facility

2.2.1. This section outlines the methodology for estimating the cost and revenue implications for Distribution Companies (Discoms) when offering banking facilities to renewable energy OA consumers. The analysis is conducted on a monthly basis for approx 165 renewable energy OA consumers over the period starting from April 2025 to January 2026. Following nomenclature is used throughout the methodology:

Symbol	Component	Description	Unit
A_s	Injection of RE Power	Actual injection of RE power into the grid for each 15-minute time slot 's'	kWh
B_s	Adjusted RE Injection	Actual RE Injection net of Distribution Losses = As x (1 – Distribution Loss%)	kWh
C_s	Consumption / Drawl	Actual consumption by the RE OA consumer for each 15-minute time slot 's'	kWh
D_s	Net Surplus	Net surplus energy for slot 's' (when $B_s > C_s$)	kWh
E_s	Net Drawl	Net drawl energy for slot 's' (when $C_s > B_s$)	kWh
F_s	Cumulative Banking - Off-Peak	Cumulative banked energy during off-peak period for slot 's'	kWh
G_s	Cumulative Banking – Peak	Cumulative banked energy during peak period for slot 's'	kWh
H_s	Lapsed Energy	Surplus energy that is deemed lapsed for slot 's'	kWh
In	Intra-State Transmission Charges	Computed based on intra-state transmission charges approved in the GERC Tariff Order	Rs./kWh

Symbol	Component	Description	Unit
I	Inter-State Transmission Charges	Computed based on inter-state transmission charges approved in the GERC Tariff Order	Rs./kWh
J	Inter-State Transmission Losses	Average of weekly ISTS Losses as published by Grid Controller of India Limited	%
K	Intra-State Transmission Losses	As per GERC Tariff Order	%
L_s	IEX Market Clearing Price	Combination of Real-Time Market Clearing Price & Day-Ahead Market Clearing Price for slot 's' ((considered at combination of 10.5% and 89.5% respectively)	Rs./kWh
M	Variable Cost – Marginal Thermal Generating Station(s)	Variable cost of identified marginal thermal generating station(s)	Rs./kWh
N	Combination of Variable Cost – Marginal Thermal Generating Station(s) and Gas Generating Station(s)	Weighted average Variable Cost of identified Marginal Thermal and Gas Generating station(s), (considered at combination of 85% and 15% respectively)	Rs./kWh
O	Backing Down Cost	Cost of backing down marginal thermal generating station(s) [considered at 8% (as mentioned in CEA Report Flexibilisation of Coal Fired Power Plant) of the total cost of marginal Thermal Generating Station(s)]	Rs./kWh
P	Distribution Losses	As per the latest True-up order issued by GERC	%
Q_s	Cost to Discom	Cost to the discom for slot 's' as described in Step 3 calculation	Rs.
R_s	Revenue to Discom	Revenue earned by the discom for slot 's' as described in step 3 calculation	Rs.
S_s	Net Banking Cost to Discom	$S_s = (R_s – Q_s)$ Net Banking Cost after deducting cost to Discom from Revenue earned by Discom for slot 's'	Rs.
T	Tariff for Solar Energy	Levelized Solar Tariff without AD benefits as determined by GERC from time to time through order on Tariff Framework For Procurement of Power By Distribution Licensees and others from Solar Energy Projects and other Commercial Issues for the State of Gujarat.	Rs./kWh
U	BESS Charges	Average Landed Cost of Energy (LCoE) based on the BESS Bids without VGF component during the last year or any other period as may be decided by GERC	Rs./kWh
X	% of Net Surplus/Net Deficit	Probability of the Discom being able to clear the bid on the IEX when BESS is not involved	%

Symbol	Component	Description	Unit
	Sold/Purchased on IEX		
Y	% of Net Surplus/Net Deficit Sold/Purchased on IEX	Probability of the Discom being able to clear the bid on the IEX when BESS is involved	%
Z	% of Net Surplus Energy/Net Deficit energy for charging/discharging of the BESS	% of the Surplus/Deficit of energy used for the charging/discharging of the BESS	%

2.2.2. **Step 1:** Calculating Banked Energy for each Individual Consumer

2.2.2.1. RE Generation is intermittent in nature; for each 15 min slot there can be two scenarios:

Slot-wise Computation:

For each individual RE Open Access consumer, compute the net surplus or net drawl for every 15-minute time slot within the billing cycle (calendar month), and derive the cumulative banked energy (peak and off-peak) and lapsed energy.

The Adjusted RE Injection for each 15-minute slot is computed as:

$$\mathbf{B_s = A_s \times (1 - \text{Distribution Loss\%})}$$

Where A_s is the actual injection of RE power into the grid for slot 's' and Distribution Loss% includes applicable Inter-State Transmission Losses (J), Intra-State Transmission Losses (K), and Distribution Losses (P).

For each slot, the following is computed:

(a) Net Surplus (D_s): Where the adjusted RE injection (B_s) exceeds the actual consumption (C_s):

$$\mathbf{D_s = B_s - C_s}$$

The surplus energy D_s is deemed to be 'Banked' with the Distribution Licensee for that slot, subject to the 30% cumulative banking limit. The treatment of such surplus energy shall depend upon:

1. whether the slot falls in the **peak period** or **off-peak period**; and
2. whether the IEX Market Clearing Price is higher or lower than the variable cost of the marginal thermal generating station plus applicable inter-state transmission charges.

The following sub-scenarios shall apply.

Scenario 1A: Net Surplus — IEX MCP > (VC of Marginal Generating Station(s) + Inter-state Transmission Charges)

Where:

$$L_S > (M + I)$$

the IEX price is considered attractive for sale of surplus energy on the Power Exchange.

During Peak Period

During peak period, a specified percentage $X\%$ (assumed at 70% for the Period of April 2025 to January 2026) of the surplus energy shall be assumed to be sold on the Power Exchange. The remaining surplus energy shall be assumed to be utilised by the Distribution Licensee for supplying its own consumers by backing down scheduled generation from the marginal thermal generating station.

During Off-Peak Period

During off-peak period, a specified percentage $Y\%$ (assumed at 50% for the Period of April 2025 to January 2026) of the surplus energy shall be assumed to be sold on the Power Exchange. Further, $Z\%$ (assumed at 20% for the Period of April 2025 to January 2026) of the surplus energy shall be considered as utilised for charging of the BESS. The remaining surplus energy shall be utilised by the Distribution Licensee for supplying its own consumers by backing down scheduled generation from the marginal thermal generating station.

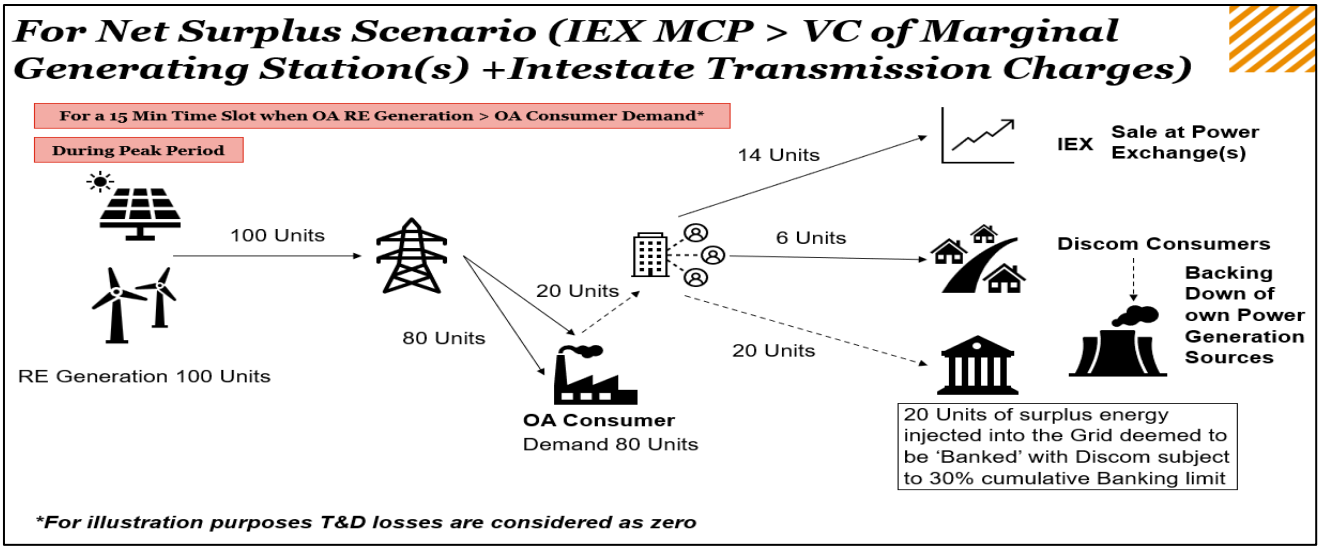
Illustration

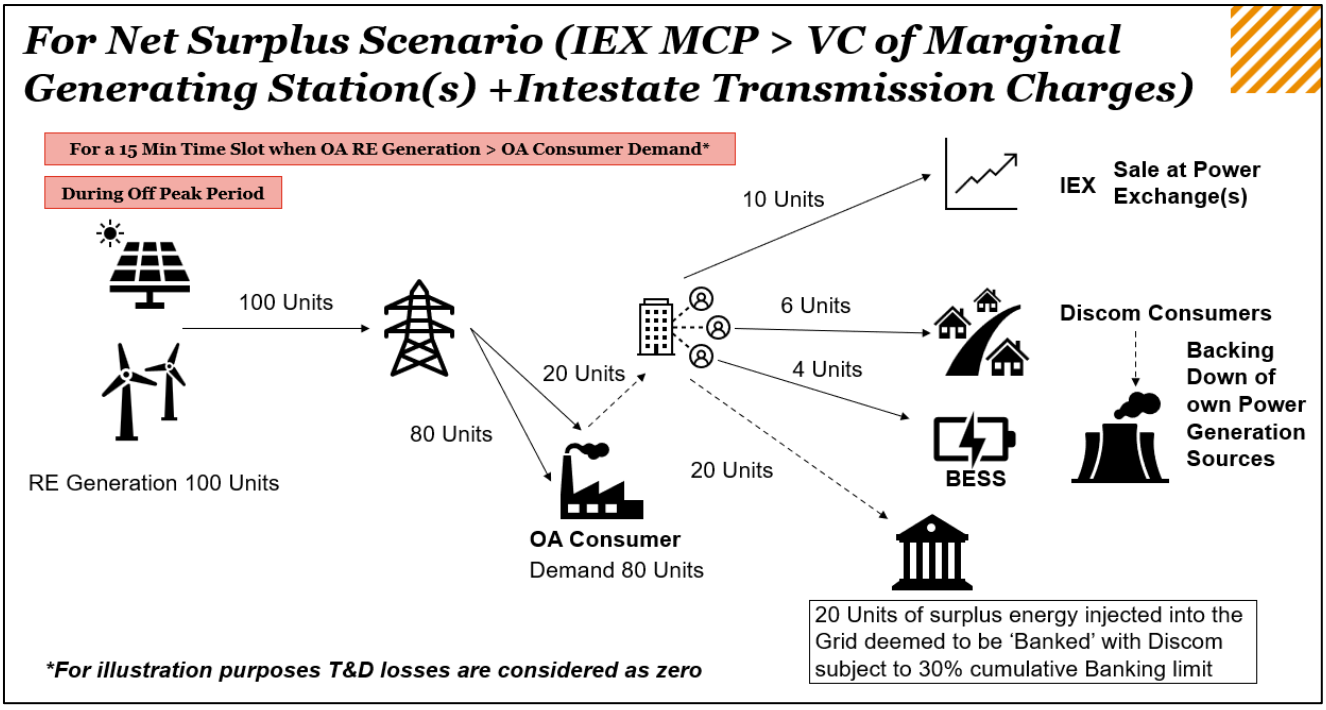
During Peak Period: The RE generator generates 100 Units in a particular 15-minute slot and the OA Consumer has a demand of 80 Units. In such situation, an additional energy of 20 Units is injected by the RE generator into the Grid. Since the IEX Market Clearing Price (MCP) is higher than the Variable Cost (VC) of the Marginal Generating Station(s) + Inter-State Transmission Charges, it is beneficial for the Distribution Licensee to sell the surplus energy on the Power Exchange. However, all the bids put up by Discom will not get cleared on exchange therefore, it is assumed that 70% of the surplus energy (i.e. 14 Units) will be sold on the Power Exchange (IEX), while the remaining 30% of the surplus energy (i.e. 6 Units) will be utilised for supplying the Discom's own consumers by backing down scheduled generation from a Marginal Generating Station(s). The 20 Units of surplus energy injected into the Grid are deemed to be 'Banked' with the Distribution Licensee, subject to the 30% cumulative banking limit.

During Off-Peak Period: The RE generator generates 100 Units in a particular 15-minute slot and the OA Consumer has a demand of 80 Units. In such situation, an additional energy of 20 Units is injected by the RE generator into the Grid. Since the IEX Market Clearing Price (MCP) is higher than the Variable Cost (VC) of the Marginal Generating Station(s) + Inter-State Transmission Charges, it is beneficial for the Distribution Licensee to sell the surplus energy on the Power Exchange. It is assumed that 50% of the surplus energy (i.e. 10 Units) will be sold on the Power Exchange (IEX), while 20% of the surplus energy (i.e. 4 Units) will be used for charging of the BESS and the remaining 30% of the surplus energy (i.e. 6 Units) will be utilised for supplying the Discom's own consumers by backing down scheduled generation from a Marginal Generating Station(s). The 20 Units of surplus energy injected into the Grid are deemed to be 'Banked' with the Distribution Licensee, subject to the 30% cumulative banking limit.

Assumption for the % of energy sold on IEX to be reviewed every year based on the % times bid put up by discom gets cleared on IEX for 15 min slots.

Figure 2-2: Graphic Representation of a Net-Surplus Scenario with IEX MCP > VC of Marginal Generating Station(s)





Scenario 1B: Net Surplus — IEX MCP < (VC of Marginal Generating Station(s) + Inter-state Transmission Charges)

Where:

$$L_s < (M + I)$$

the IEX price is not considered attractive for sale of surplus energy on the Power Exchange.

During Peak Period

During peak period, the entire surplus energy shall be assumed to be utilised by the Distribution Licensee for supplying its own consumers by backing down the marginal thermal generating station.

During Off-Peak Period

During off-peak period, $Z\%$ (assumed at 20% for the Period of April 2025 to January 2026) of the surplus energy shall be considered as utilised for charging of the BESS. The remaining surplus energy shall be

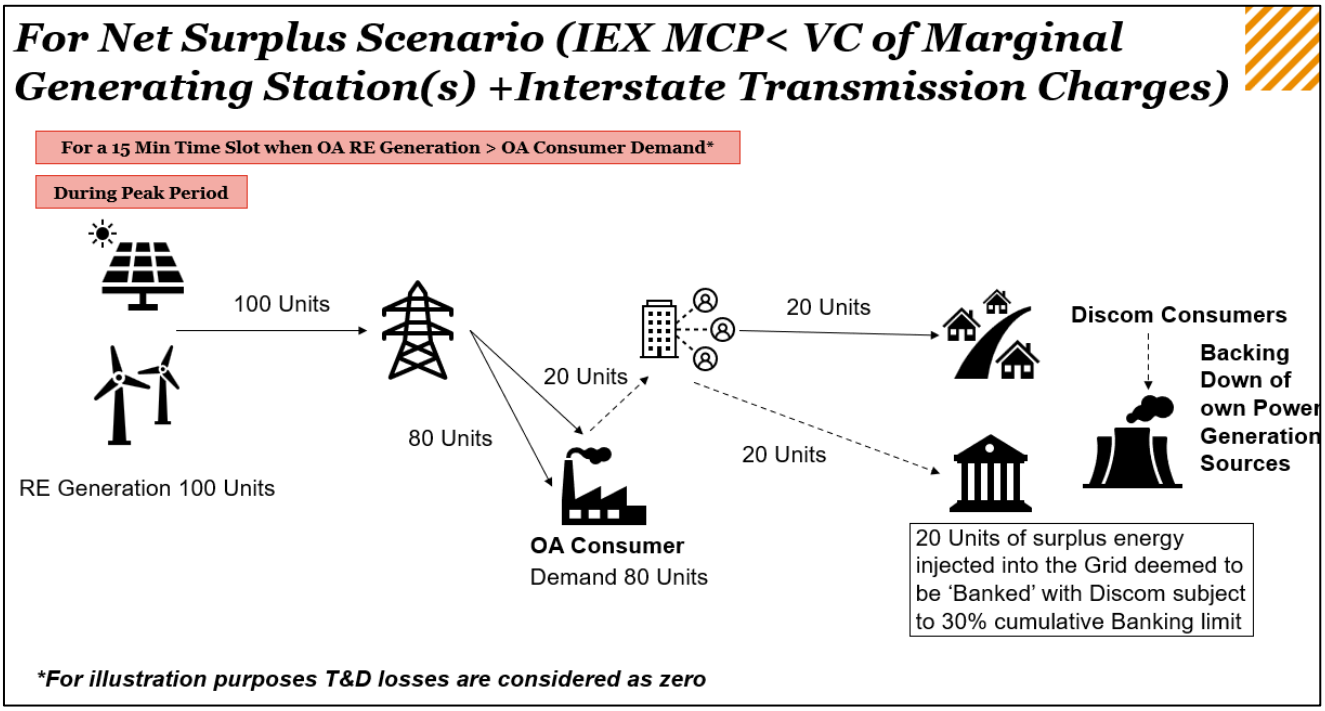
utilised by the Distribution Licensee for supplying its own consumers by backing down scheduled generation from the marginal thermal generating station.

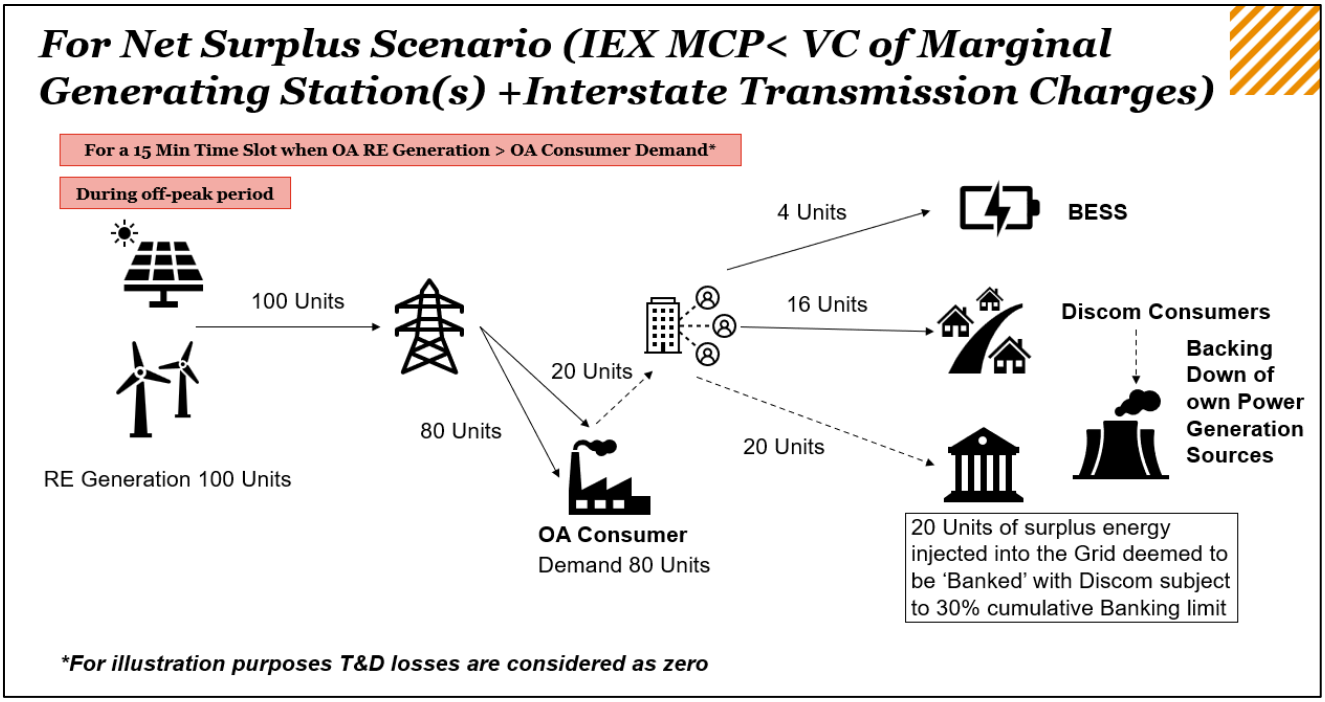
Illustration

During Peak Period: The RE generator generates 100 Units in a particular 15-minute slot and the OA Consumer has a demand of 80 Units. In such situation, an additional energy of 20 Units is injected by the RE generator into the Grid. Since the IEX Market Clearing Price (MCP) is lower than the Variable Cost (VC) of the Marginal Generating Station(s) + Inter-State Transmission Charges, it is not beneficial for the Distribution Licensee to sell the surplus energy on the Power Exchange. Accordingly, the entire surplus energy (i.e. 20 Units) will be utilised for supplying the Discom's own consumers by backing down the Marginal Generating Station(s). No energy is sold on the Power Exchange in this scenario. The 20 Units of surplus energy injected into the Grid are deemed to be 'Banked' with the Distribution Licensee, subject to the 30% cumulative banking limit.

During Off-Peak Period: The RE generator generates 100 Units in a particular 15-minute slot and the OA Consumer has a demand of 80 Units. In such situation, an additional energy of 20 Units is injected by the RE generator into the Grid. Since the IEX Market Clearing Price (MCP) is lower than the Variable Cost (VC) of the Marginal Generating Station(s) + Inter-State Transmission Charges, it is not beneficial for the Distribution Licensee to sell the surplus energy on the Power Exchange. Accordingly, the 20% of the surplus energy (i.e. 4 Units) will be utilised for charging of the BESS and rest of the surplus energy (i.e. 16 Units) is utilized for supplying the Discom's own consumers by backing down the Marginal Generating Station(s). No energy is sold on the Power Exchange in this scenario. The 20 Units of surplus energy injected into the Grid are deemed to be 'Banked' with the Distribution Licensee, subject to the 30% cumulative banking limit.

Figure 2-3: Graphic Representation of a Net-Surplus Scenario with IEX MCP < VC of Marginal Generating Station(s)





(b) Net Drawl (E_s): Where the actual consumption (C_s) exceeds the adjusted RE injection (B_s):

$$E_s = C_s - B_s$$

The consumer draws additional energy E_s from the grid from previously banked energy for that slot, subject to peak/off-peak ToD restrictions. The source of such deficit energy shall depend upon:

1. whether the slot falls in the **peak period** or **off-peak period**; and
2. whether the IEX Market Clearing Price, after considering inter-state transmission charges, is higher or lower than the applicable marginal variable cost.

Scenario 2A: Net Drawl — (IEX MCP – Inter-state Transmission Charges)> VC of Marginal Generating Station(s)

Where:

$$(L_s - I) > N$$

the variable cost of the Distribution Licensee's own marginal generating station is lower than the effective cost of procurement from the Power Exchange.

During Peak Period

During peak period, $Z\%$ (assumed at 20% for the Period of April 2025 to January 2026) of the deficit energy shall be assumed to be supplied through BESS. The remaining deficit energy shall be assumed to be supplied through ramping up of the marginal generating station.

During Off-Peak Period

During off-peak period, the entire deficit energy shall be assumed to be supplied through ramping up of the marginal generating station.

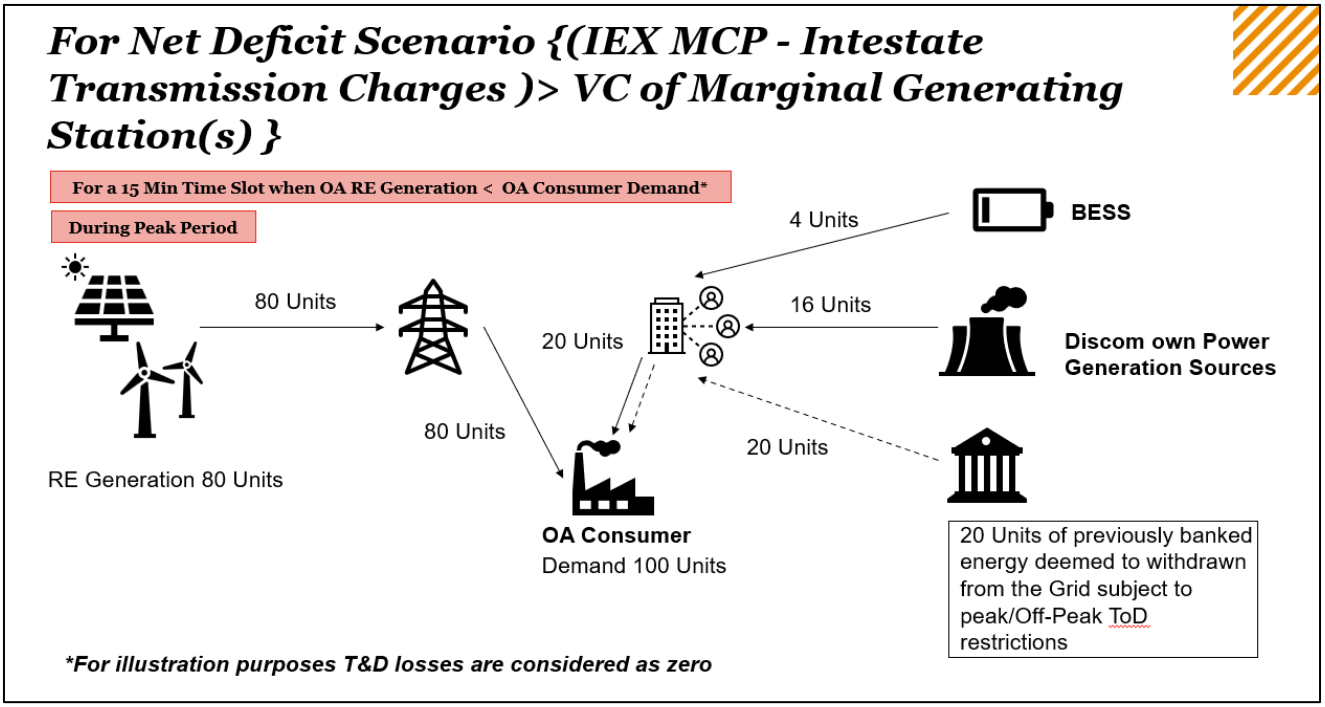
Illustration

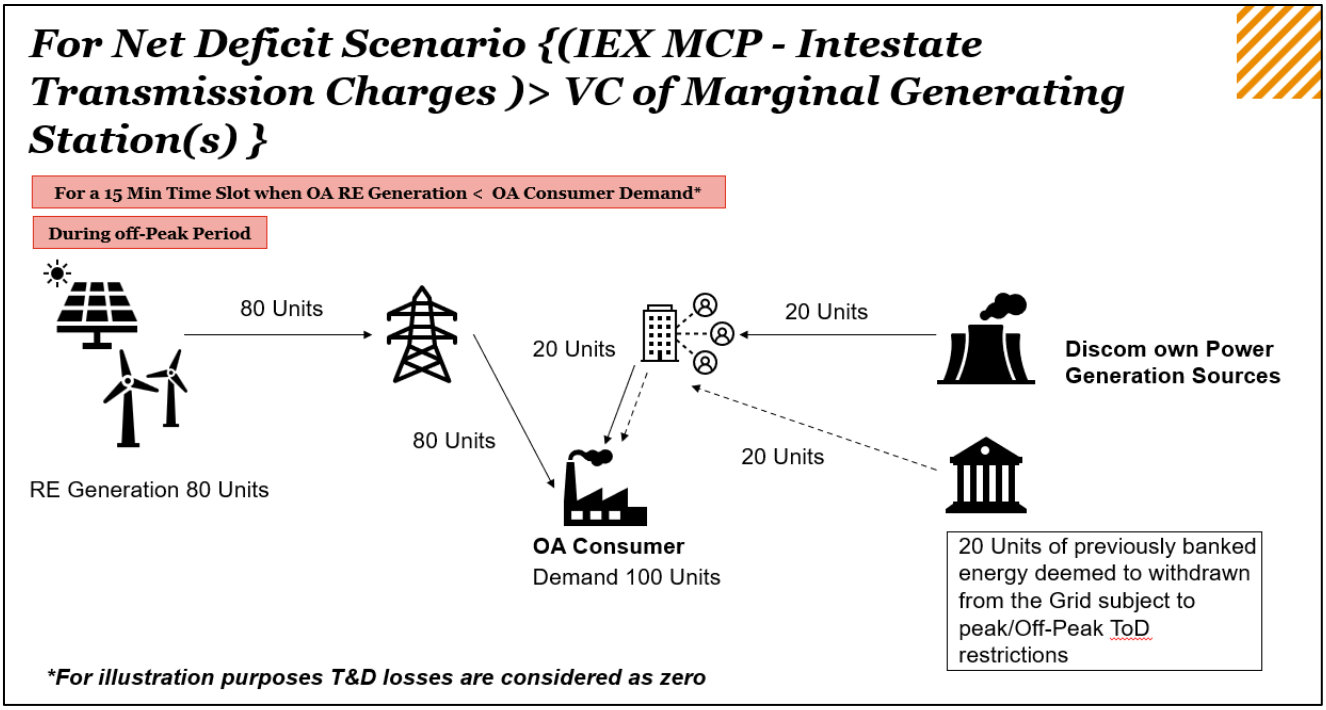
During Peak Period: The RE generator generates 80 Units in a particular 15-minute slot and the OA Consumer has a demand of 100 Units. In such situation, the OA Consumer will draw the remaining 20

Units from the Grid from the previously banked energy. Since the IEX Market Clearing Price (after deducting Inter-state Transmission Charges) is greater than the Variable Cost of the Marginal Generating Station(s), it is beneficial for the Distribution Licensee supply it from the BESS (previously charged during off-peak period) or by ramping up its own Marginal Generating Station(s) to meet the additional demand rather than procuring from the Power Exchange. Accordingly, the 20% deficit energy (i.e. 4 Units) is assumed to be supplied through BESS and rest of the deficit energy (i.e. 16 Units) by ramping up of the Marginal Generating Station(s). No energy is purchased from the Power Exchange in this scenario. The 20 Units of previously banked energy are deemed to be withdrawn from the Grid, subject to peak/off-peak ToD restrictions.

During Off-Peak Period: The RE generator generates 80 Units in a particular 15-minute slot and the OA Consumer has a demand of 100 Units. In such situation, the OA Consumer will draw the remaining 20 Units from the Grid from the previously banked energy. Since the IEX Market Clearing Price (after deducting Inter-state Transmission Charges) is greater than the Variable Cost of the Marginal Generating Station(s), it is beneficial for the Distribution Licensee supply it by ramping up its own Marginal Generating Station(s) to meet the additional demand rather than procuring from the Power Exchange. Accordingly, entire deficit of energy is supplied by ramping up of the Marginal Generating Station(s). No energy is purchased from the Power Exchange in this scenario. The 20 Units of previously banked energy are deemed to be withdrawn from the Grid, subject to peak/off-peak ToD restrictions.

Figure 2-4: Graphic Representation of a Net-Deficit Scenario with IEX MCP > VC of Marginal Generating Station(s)





Scenario 2B: Net Drawl — (IEX MCP – Inter-state Transmission Charges) < VC of Marginal Generating Station(s)

Where:

$$(L_s - I) < N$$

procurement from the Power Exchange is considered economically preferable.

During Peak Period

During peak period, $Y\%$ (assumed at 50% for the Period of April 2025 to January 2026) of the deficit energy shall be assumed to be procured from the Power Exchange. Further, $Z\%$ (assumed at 20% for the Period of April 2025 to January 2026) of the deficit energy shall be assumed to be supplied through BESS. The remaining deficit energy shall be supplied through ramping up of the marginal generating station.

During Off-Peak Period

During off-peak period, $X\%$ (assumed at 70% for the Period of April 2025 to January 2026) of the deficit energy shall be assumed to be procured from the Power Exchange. The remaining deficit energy shall be supplied through ramping up of the marginal generating station.

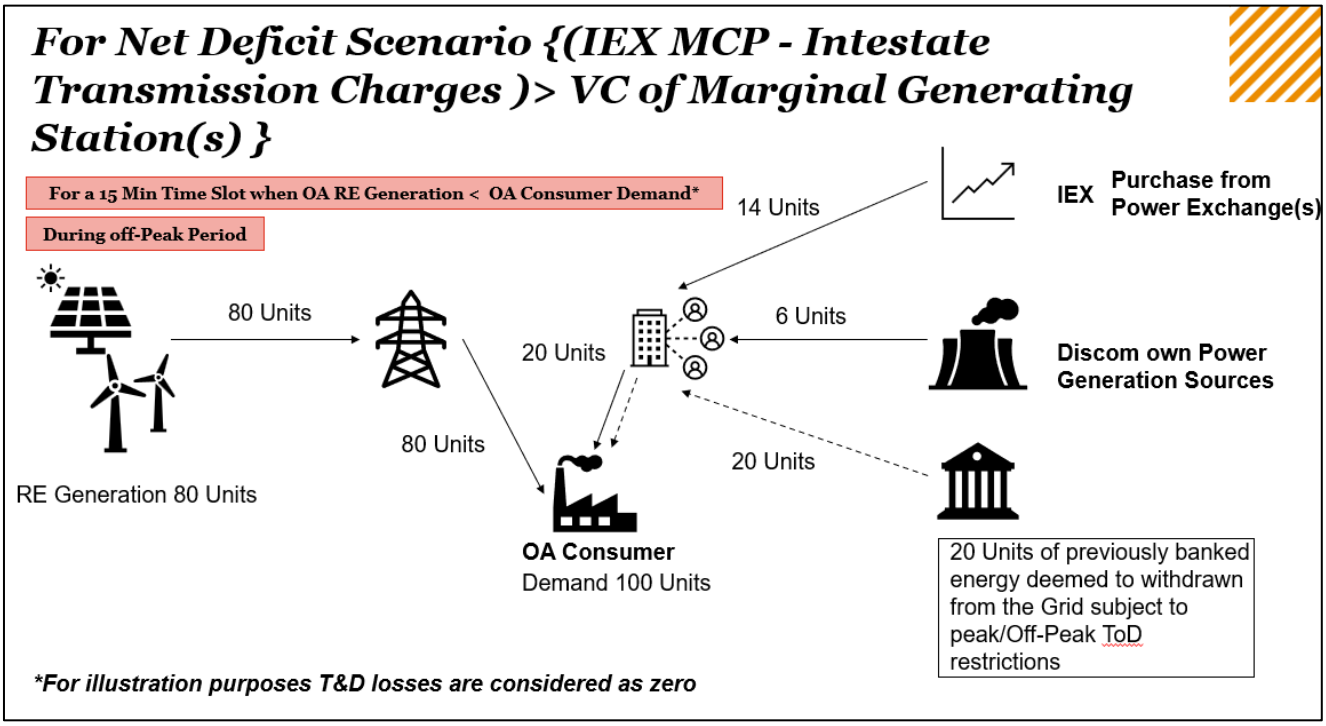
Illustration

During Peak Period: The RE generator generates 80 Units in a particular 15-minute slot and the OA Consumer has a demand of 100 Units. In such situation, the OA Consumer will draw the remaining 20 Units from the Grid from the previously banked energy. Since the IEX Market Clearing Price (after deducting Inter-State Transmission Charges) is lower than the Variable Cost of the Marginal Generating Station(s), it is beneficial for the Distribution Licensee to procure power from the Power Exchange and BESS (previously charged using surplus energy during off-peak period) rather than ramping up its own Marginal Generating Station(s). However, all the bids put up by Discom will not get cleared on exchange therefore, it is assumed that 50% of the deficit energy (i.e. 10 Units) will be procured from the Power Exchange (IEX), while the 20% of the deficit energy (i.e. 4 Units) will be supplied through BESS and the remaining deficit energy will be supplied through ramping up of the Marginal Generating Station(s). The

20 Units of previously banked energy are deemed to be withdrawn from the Grid, subject to peak/off-peak ToD restrictions.

During Off-Peak Period: The RE generator generates 80 Units in a particular 15-minute slot and the OA Consumer has a demand of 100 Units. In such situation, the OA Consumer will draw the remaining 20 Units from the Grid from the previously banked energy. Since the IEX Market Clearing Price (after deducting Inter-State Transmission Charges) is lower than the Variable Cost of the Marginal Generating Station(s), it is beneficial for the Distribution Licensee to procure power from the Power Exchange rather than ramping up its own Marginal Generating Station(s). However, all the bids put up by Discom will not get cleared on exchange therefore, it is assumed that 70% of the deficit energy (i.e. 14 Units) will be procured from the Power Exchange (IEX), while the remaining 30% of the deficit energy (i.e. 6 Units) will be supplied through ramping up of the Marginal Generating Station(s). The 20 Units of previously banked energy are deemed to be withdrawn from the Grid, subject to peak/off-peak ToD restrictions.

Figure 2-5: Graphic Representation of a Net-Deficit Scenario with IEX MCP < VC of Marginal Generating Station(s)



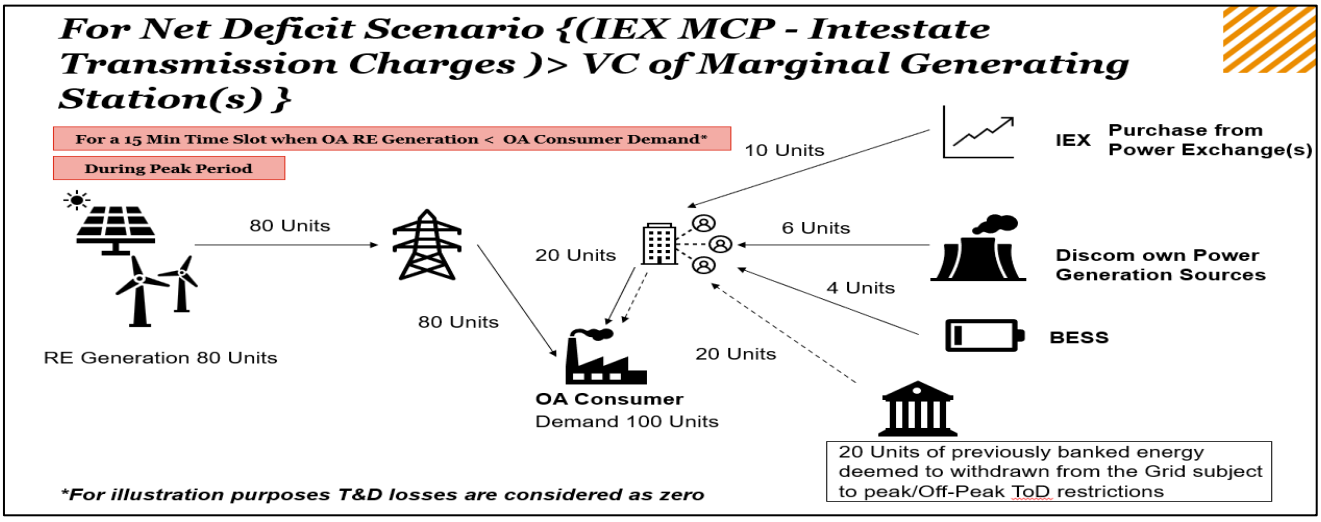


Table 2-1: Summary of Sub-Scenarios for each 15-minute Slot

Scenario	Condition	Action — Power Exchange	Action - BESS	Action — Own Generating Station(s)	Rationale
1A (Net Surplus) (Peak Period)	$L_s > (M + I)$	Sell X(%) of the surplus energy on IEX	-NA-	Back down for remaining surplus energy	IEX price attractive after transmission charges
1A (Net Surplus) (Off-Peak Period)	$L_s > (M + I)$	Sell Y(%) of the surplus energy on IEX	Use Z(%) of the Surplus energy for charging of the BESS	Back down for remaining surplus energy	IEX price attractive after transmission charges
1B (Net Surplus) (Peak Period)	$L_s < (M + I)$	No sale on IEX	-NA-	Back down for 100%	Not viable to sell; use internally
1B (Net Surplus) (Off-Peak Period)	$L_s < (M + I)$	No sale on IEX	Use Z(%) of the Surplus energy for charging of the BESS	Back down for remaining surplus energy	Not viable to sell; use internally
2A (Net Drawl) (Peak Period)	$(L_s – I) > N$	No purchase from IEX	Supply Z(%) of the deficit energy from the BESS	Ramp up for remaining deficit energy	Marginal Thermal Generating Station(s) cheaper than Exchange after transmission cost
2A (Net Drawl) (Off-Peak Period)	$(L_s – I) > N$	No purchase from IEX	-NA-	Ramp up for 100% of the deficit energy	Marginal Thermal Generating Station(s) cheaper than Exchange after transmission cost
2B (Net Drawl) (Peak Period)	$(L_s – I) < N$	Purchase Y(%) of the deficit energy from IEX	Supply Z(%) of the deficit energy from the BESS	Ramp up for remaining deficit energy	Exchange after transmission costs cheaper than Marginal Thermal Generating Station(s)
2B (Net Drawl) (Off-Peak Period)	$(L_s – I) < N$	Purchase X(%) of the deficit energy from IEX	-NA-	Ramp up for remaining deficit energy	Exchange after transmission costs cheaper than Marginal Thermal

Scenario	Condition	Action — Power Exchange	Action - BESS	Action — Own Generating Station(s)	Rationale
					Generating Station(s)

2.2.2.2. Restrictions applied based on the GERC GEOA Regulations, 2024:

(i) Cumulative banking is presently considered up to 30% (the minimum limit) of the monthly energy consumption from Discom for each consumer. Any surplus energy injected into the grid beyond this 30% limit is considered lapsed, for the purpose of computation.

(ii) Net surplus energy banked during off-peak periods cannot be utilized during peak periods.

(iii) At the conclusion of the banking period, any remaining cumulative banked energy is deemed lapsed.

Figure 2-6: Illustrative snap-shot from excel worksheet showing slot wise calculation of banked energy of an Individual consumer

	Slot			Injection	Actual Injection (Injection minus T&D Losses)	Drawal	Net Surplus	Net Drawal	Cumulative Banking Off Peak Period	Cumulative Banking Peak Period	Lapsed Energy
									0	0	
	1	0:00	0:15	138.66	117.86	70.89	46.97	0.00	46.97	0.00	0.00
	2	0:15	0:30	138.66	117.86	70.89	46.97	0.00	93.93	0.00	0.00
	.	.	.	.	.	.	.	.	.	.	.
Off-Peak to Peak Slot Transition	28	6:45	7:00	277.31	235.71	324.21	0.00	88.50	724.66	0.00	0.00
	29	7:00	7:15	277.31	235.71	341.01	0.00	105.30	724.66	0.00	0.00
	30	7:15	7:30	277.31	235.71	338.13	0.00	102.42	724.66	0.00	0.00
	.	.	.	.	.	.	.	.	.	.	.
Peak to Off-Peak Slot Transition	44	10:45	11:00	277.31	235.71	326.79	0.00	91.08	724.66	0.00	0.00
	45	11:00	11:15	277.31	235.71	318.27	0.00	82.56	642.11	0.00	0.00
	46	11:15	11:30	277.31	235.71	320.01	0.00	84.30	557.81	0.00	0.00

2.2.3. **Step 2:** Calculating Consolidate Banked Energy at Discom level

2.2.3.1. The next step involves aggregating the slot-wise net surplus and net drawl, cumulative banking, and lapsed energy calculated for individual consumers to the Discom level. This is achieved through aggregation of slot-wise values for each individual renewable energy open access consumer within the Discom.

Table 2-2: Parameters calculated in Step 1 for Individual consumers

Particulars	Description
Net Surplus (D_s)	Net Surplus of Individual Consumer 15 Min Block Basis calculated in Step (1)
Net Drawl (E_s)	Net Drawl of Individual Consumer 15 Min Block Basis calculated in Step (1)

Particulars	Description
Cumulative Banking off Peak Period (F_s)	Cumulative Banking off Peak Period of Individual Consumer 15 Min Block Basis calculated in Step (1)
Cumulative Banking Peak Period (G_s)	Cumulative Banking Peak Period of Individual Consumer 15 Min Block Basis calculated in Step (1)
Lapsed Energy (H_s)	Net Surplus of Individual Consumer 15 Min Block Basis calculated in Step (1)

Table 2-3: Consolidation of various parameters calculated in Step 1 for Individual consumer at Discom level

Particulars	Description
Σ(Net Surplus (D_s))	Sum of Net Surplus of every consumer for each 15 min block of billing cycle
Σ(Net Drawl (E_s))	Sum of Net Drawl of every consumer for each 15 min block of billing cycle
Σ(Cumulative Banking off Peak Period (F_s))	Sum of Cumulative Banking off Peak Period of every consumer for each 15 min block of billing cycle
Σ(Cumulative Banking Peak Period (G_s))	Sum of Cumulative Banking Peak Period of every consumer for each 15 min block of billing cycle
Σ(Lapsed Energy (H_s))	Sum of Lapsed energy of every consumer for each 15 min block of billing cycle.

2.2.4. **Step 3:** Calculating Cost & Revenue for each 15 min slot

2.2.4.1. After consolidating Net Surplus/Net Drawl, Cumulative Banked energy and Lapsed energy for each 15-minute slot in Step 2, the next step is to calculate the cost and revenue impact of Injection and Drawl of the Banked energy on the Distribution Licensee. The cost and revenue computation is based on the sub-scenario applicable for each 15-minute slot, as determined by the comparison of the IEX Market Clearing Price (MCP) with the Variable Cost (VC) of the Marginal Generating Station(s), adjusted for Inter-State Transmission Losses and Transmission Charges. The formulas are set out in Table 2-4 below.

Table 2-4: Formula for calculating Cost and Revenue impact of the Banked Energy

Component	Injection of Banked Energy (IEX Price > Marginal Generating Station(s)) Scenario 1A	Injection of Banked Energy (IEX Price < Marginal Generating Station(s)) Scenario 1B	Drawl of Banked Energy (IEX Price > Marginal Generating Station(s)) Scenario 2A	Drawl of Banked Energy (IEX Price < Marginal Generating Station(s)) Scenario 2B
Cost (Q_s)	**Peak Period** {O × (1-X%) of Surplus	**Peak Period** {O × (100%) of the	**Peak Period** {N × (1 – Z%) of the deficit	**Peak Period** {(L_s) × (Y% of the deficient

Component	Injection of Banked Energy (IEX Price > Marginal Generating Station(s)) Scenario 1A	Injection of Banked Energy (IEX Price < Marginal Generating Station(s)) Scenario 1B	Drawl of Banked Energy (IEX Price > Marginal Generating Station(s)) Scenario 2A	Drawl of Banked Energy (IEX Price < Marginal Generating Station(s)) Scenario 2B
	Energy used for Discom consumption} **Off-Peak Period** {O × (1-Y%-Z%) of Surplus Energy used for Discom consumption}	Surplus energy used for Discom consumption} **Off-Peak Period** {O × (1 - Z%) of the Surplus energy used for Discom consumption}	energy by ramping up the Generating Station(s) + U x (Z%) of the deficit energy supplied from the BESS } **Off-Peak Period** {N × (100%) of the deficient energy}	energy procured from IEX + U × (Z%) of the deficit energy supplied from the BESS + N × (1-Y% - Z%) of the deficit energy by ramping up the Generating Station(s) } **Off-Peak Period** {(L_s) × (X% of the deficit energy procured from IEX) + N × (1-X%) of the deficit energy by ramping up the Generating Station(s)}
Revenue (R_s)	**Peak Period** {(L_s) × X% Units of net Surplus energy sold on IEX + M × (1-X%) of the Surplus energy used by Discom} **Off-Peak Period** {(L_s) × Y% Units of net Surplus energy sold on IEX + T × (Z%) of the Surplus energy used for charging of the BESS + M × (1-Y% - Z%) of the Surplus energy used by Discom }	**Peak Period** N × (100%) of the Surplus energy used for Discom consumption **Off-Peak Period** {T × (Z%) of the Surplus energy used for charging of the BESS + M x (1-Z%) of the surplus energy used for Discom consumption}	Nil	Nil
Net Banking Cost (S_s)	S_s = R_s – Q_s (Revenue to Discom minus Cost to Discom for each 15-min slot)			

Note: Cost and Revenue is adjusted with appropriate T&D Losses, and Transmission Charges. The values of X%, Y%, and Z% are 70%, 30%, and 20%, respectively. This fixed assumption is applied consistently across different scenarios as applicable for this calculation. Surplus Energy/Deficit Energy for slot s = Sum of Cumulative Banking - Off-Peak/Peak Current Slot - Sum of Cumulative Banking - Off-Peak/Peak (previous slot) = Sum(F_s) - Sum(F_s-1) or Sum(G_s) – Sum (G_s-1) depending upon whether the current slot is for peak or off-peak.

Step 4: Calculating Banking Charges

2.2.4.2. To calculate Banking charges aggregation of Net Surplus energy calculated in Step (b) and Net Revenue (S_s) in Step (c) for the entire Banking Period (1 Month). Then Banking Charges are calculated using ratio of the two as shown in the explanation below:

Table 2-5: Calculation of Banking Charges for the one Banking Period

Particulars	Explanation
Total Banked Energy	Aggregation of {**Σ(Net Drawl (E_s))** - **Σ(Lapsed Energy (H_s)}** for each 15 min slots for the billing cycle.
Aggregate Net Banking Cost (S_s)	Aggregation of Net Banking Cost for each 15 min slot for the billing cycle.
Banking Charges	= Aggregate Net Banking Cost / Total Banked Energy

2.2.4.3. Detailed Banking Charges computations have been carried out for each of the State Discom for 10 (Months) from April 2025 to January 2026. The values of the Banked energy calculated using this methodology and the analysis of the Banking charges are discussed in the next section.

3. Analysis

3.1. Introduction

3.1.1. The methodology outlined in the previous section was applied to the data received from State Discoms to calculate banking charges based on the data for over a 10-month period, from April 2025 to January 2026. The results, categorized by each Discom, are detailed in the subsequent sections of this chapter.

3.2. Results of the computations

3.2.1. Power generation from the Renewable Energy (RE) sources is intermittent influenced by various factors such as daylight hours, solar angle, weather conditions, temperature variations, location of the Generating Station(s), wind patterns, etc. This intermittent nature of generation impacts the banking patterns by renewable energy OA consumers and hence may result in significant variation in the corresponding banking charges computed for a month or quarter. Consequently, after determining the monthly banked energy and banking charges, the same is also calculated quarterly and annual banking charges for the state Discoms. To effectively account for seasonal variations, a weighted average formula was employed in calculating the quarterly banking charges. This comprehensive approach ensures a nuanced understanding of the financial implications of energy banking across different timeframes and seasonal conditions.

3.3. Banking Charges for DGVCL

3.3.1. DGVCL provided data for 28 RE Open Access consumers, and calculating banking charges over the period from April 2025 to January 2026 has presented with following results:

Table 3-1: Banking Charges Calculated for DGVCL

Month	Banked Energy (Units)	Banking Charges (Rs./kWh)	Quarterly Consolidated (Rs./kWh)	Yearly Consolidated (Rs./kWh)
Apr 2025	1,132,652	1.78		
May 2025	1,263,509	1.48	1.62	
Jun 2025	847,819	1.63		
Jul 2025	387,954	2.13		
Aug 2025	546,941	1.82	1.68	
Sep 2025	723,061	1.34		1.30
Oct 2025	1,827,135	0.74		
Nov 2025	2,044,847	1.14	1.07	
Dec 2025	2,241,602	1.28		
Jan 2026	1,220,287	1.07		
Feb 2026			1.07	
March 2026				

3.4. Banking Charges for MGVCL

3.4.1. MGVCL provided data for 22 RE Open Access consumers, and calculating banking charges over

the period from April 2025 to January 2026 has presented with following results:

Table 3-2: Banking Charges Calculated for MGVCL

Month	Banked Energy (Units)	Banking Charges (Rs./kWh)	Quarterly Consolidated (Rs./kWh)	Yearly Consolidated (Rs./kWh)
Apr 2026	314,412	1.38	0.70	0.91
May 2025	452,421	0.82		
Jun 2025	636,860	0.28		
Jul 2025	297,495	1.23	1.21	
Aug 2025	450,084	0.99		
Sep 2025	627,079	1.36		
Oct 2025	2,094,063	0.61	0.91	
Nov 2025	1,623,725	1.16		
Dec 2025	1,735,251	1.05		
Jan 2026	244,505	0.53	0.53	
Feb 2026				
March 2026				

3.5. Banking Charges for PGVCL

3.5.1. PGVCL provided data for 90 RE Open Access consumers, and calculating banking charges over the period from April 2025 to January 2026 has presented with following results:

Table 3-3: Banking Charges Calculated for PGVCL

Month	Banked Energy (Units)	Banking Charges (Rs./kWh)	Quarterly Consolidated (Rs./kWh)	Yearly Consolidated (Rs./kWh)
Apr 2025	5,190,600	1.04	0.94	0.94
May 2025	6,058,707	0.86		
Jun 2025	3,872,771	0.91		
Jul 2025	2,616,316	0.91	0.71	
Aug 2025	4,048,061	0.66		
Sep 2025	5,681,269	0.66		
Oct 2025	7,669,085	0.97	0.98	
Nov 2025	8,343,647	0.97		
Dec 2025	9,548,242	1.00		
Jan 2026	12,319,734	1.08	1.08	
Feb 2026				
March 2026				

3.6. Banking Charges for UGVCL

3.6.1. UGVCL provided data for 25 RE Open Access consumers, and calculating banking charges over the period from April 2025 to January 2026 has presented with following results:

Table 3-4: Banking Charges Calculated for UGVCL

Month	Banked Energy (Units)	Banking Charges (Rs./kWh)	Quarterly Consolidated (Rs./kWh)	Yearly Consolidated (Rs./kWh)
Apr 2025	758,465	1.76	0.86	1.37
May 2025	1,528,477	0.72		
Jun 2025	1,468,086	0.55		
Jul 2025	1,031,441	1.99	1.68	
Aug 2025	1,569,169	1.71		
Sep 2025	2,008,736	1.49		
Oct 2025	2,756,851	1.18	1.42	
Nov 2025	2,651,100	1.57		
Dec 2025	3,373,280	1.50		
Jan 2026	3,745,440	1.38	1.38	
Feb 2026				
March 2026				

3.7. Banking Charges at State Discoms Level

3.7.1. Result obtained at State Discoms level analysis were further aggregated using weighted average formula to determine Banking Charges at the state level:

Table 3-5: Banking Charges Calculated at State Level

Month	Banked Energy (Units)	Banking Charges (Rs./kWh)	Quarterly Consolidated (Rs./kWh)	Yearly Consolidated (Rs./kWh)
Apr 2025	7,396,129	1.24	1.01	1.06
May 2025	9,303,114	0.92		
Jun 2025	6,825,536	0.86		
Jul 2025	4,333,206	1.30	1.05	
Aug 2025	6,614,255	1.03		
Sep 2025	9,040,145	0.95		
Oct 2025	14,347,134	0.93	1.07	
Nov 2025	14,663,319	1.12		
Dec 2025	16,898,375	1.14		
Jan 2026	17,529,967	1.13	1.13	
Feb 2026				
March 2026				

3.8. Analysis of the Banking Charges and way forward

3.8.1. As may be noted from the above Table, the banking charges based on the data from April 2025 to January 2026 are calculated at Rs. 1.06 per unit.

3.8.2. However, there are few factors for consideration. Firstly, the computation is based on only 165 RE OA consumers only, majority of which are from one State Discom, i.e. PGVCL only. Secondly, the computation based on the proposed methodology is based on the data for 10 months (i.e. April 2025 to January 2026) only. Further, it is also important to note that apart from the State of Gujarat, most of other States are still continuing with the regime of banking charges recovered in kind and not in terms of Rs. per kWh and thus, there is no benchmark available for comparison with the other States also. Therefore, following approach is proposed for determination of banking

charges:

(i) For the period from 01.09.2026 to 31.03.2027, the banking charges will be determined taking into consideration the methodology provided in this Consultation Paper and stakeholders' inputs on the same.

(ii) For the period from 01.09.2026 to 31.03.2027, banking charges will be applied uniformly across the State, on all Discoms.

(iii) All Discoms shall be directed to provide energy injection, drawl and banking data for RE Open Access consumers governed by the provisions of GERC (Terms and Conditions for Green Energy Open Access) Regulations, 2024 on quarterly basis in the prescribed format. The data shall be provided to the Commission within 30 days of completion of the respective quarter. This exercise of providing data for all RE open access consumers by the Discoms shall commence from the quarter commencing from January 2026.

(iv) For FY 2027-28 the Commission will consider Banking Charges calculated for the calendar year 2026 as Banking Charges or any other period as the Commission may decide in this regard.

(v) For FY 2028-29 the Commission will consider Weighted Average of Banking Charges calculated for calendar years 2026 and 2027 as Banking Charges or any other period as the Commission may decide in this regard.

(vi) For FY 2029-30 Weighted Average of Banking Charges Calculated for calendar years 2026, 2027 and 2028 as Banking Charges or any other period as the Commission may decide in this regard.

(vii) For subsequent financial years, i.e. FY 2030-31 onwards, the Commission will consider the RE open access consumer data provided by Discoms for the immediately preceding three calendar years on a rolling basis. For e.g. for the determination of banking charges for FY 2030-31, the Commission will take into consideration the RE open access data provided by Discoms for the calendar years 2027, 2028 and 2029 as specified above.

3.8.3. Accordingly, the Commission proposes to substitute clause 1 (4) and clause 17.6 (viii) of the Gujarat Electricity Regulatory Commission (Terms & Conditions for Green Energy Open Access) Regulations, 2024, through proposed GERC (Terms & Conditions for Green Energy Open Access) (Sixth Amendment) Regulations, 2026.