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BEFORE THE HON'BLE MADHYA PRADESH ELECTRICITY REGULATORY COMMISSION, BHOPAL (M.P.)

CASE NO. .... /2026

Madhya Pradesh Urja Vikas Nigam Ltd. **.......PETITIONER**

Versus

Madhya Pradesh Power Management Company Ltd. & Others **......RESPONDENTS**

INDEX

RO

Place : Bhopal
Date : 11.02.2026

Petitioner
M.P. Urja Vikas Nigam Ltd.

Assistant Engineer
M.P. Urja Vikas Nigam Ltd.
Bhopal

4576550
12/02/26

M.P.E.R.C. Bhopal
Recd. Date 12/02/26
Sign. Inward Clerk

NOTARY Reg. No. 49992/2025 AWADHESH KUMAR SAVITA DISTT. BHOPAL (M.P.) VALID UPTO 27.03.2030 GOVT. OF INDIA

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BEFORE THE HON'BLE MADHYA PRADESH ELECTRICITY REGULATORY COMMISSION, BHOPAL (M.P.)

CASE NO. .... /2026

IN THE MATTER OF:

Petition under **Para 1(b) of Appendix-K of Madhya Pradesh Grid Code, 2024, read with section 86(1)(e) of the Electricity Act, 2003,** for determination of reactive power compensation for RE Generators injecting in the distribution grid at HT level.

Madhya Pradesh Urja Vikas Nigam Ltd.,
Urja Bhawan, Link Road No. 2 Shivaji Nagar,
Bhopal, Madhya Pradesh – 462 016 **.......PETITIONER**

Versus

Madhya Pradesh Power Management Company Ltd.
Shakti Bhawan, Rampur,
Jabalpur, Madhya Pradesh – 482008 ......Respondent No.1

Madhya Pradesh Power Transmission Company Ltd.,
Shakti Bhawan, Rampur,
Jabalpur, Madhya Pradesh – 482008 ......Respondent No.2

Madhya Pradesh State Load Dispatch Centre
Shakti Bhawan, Rampur,
Jabalpur, Madhya Pradesh – 482008 ......Respondent No.3

PETITION

MOST RESPECTFULLY SHOWETH THAT:

1. That, Madhya Pradesh Urja Vikas Nigam Ltd. ("**MPUVNL**"), the Petitioner, has filed the instant Petition under Para 1(b) of Appendix-K of Madhya Pradesh Grid Code, 2024 seeking determination of reactive power compensation for RE Generators injecting in the intra-State transmission grid or distribution grid at HT level, including inter alia for the projects being implemented under PM-KUSUM Scheme notified by the Ministry of New

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and Renewable Energy, Government of India and Surya Mitra Krishi Feeder Scheme (**"Projects"**), but excluding Prosumers as covered under MPERC (Grid Interactive Renewable Energy Systems and Related Matters) Regulations (Revision II), 2024, as amended (hereinafter, referred as "Prosumers"). The instant petition is in compliance to order of Hon'ble Commission dated 19.11.2025 against Petition no. 39 of 2025 filed in same matter.

Factual Background

2. That, Petitioner MPUVNL has been established by the Government of Madhya Pradesh in 1982 as the Nodal Agency for implementing various programs and policies of the Government of India, focusing on renewable energy and energy efficiency. The main objective of MPUVNL is to promote implementation of and create awareness about Solar, Wind, Biomass, Biogas, Renewable Energy and energy efficient products based on various technologies. MPUVN is implementing various RE projects, including PM KUSUM Scheme, Surya Mitra Krishi Feeder Scheme and other DRE projects

3. That, Respondent No. 1, Madhya Pradesh Power Management Company Limited (MPPMCL) is a company incorporated under the Companies Act, 2013. It is a distribution licensee within the meaning of the Electricity Act, 2003 and is engaged inter alia in the business of supply of electricity to the consumers through distribution licensees Madhya Pradesh Poorv Kshetra Vidyut Vitran Company Limited (MPPoKVVCL), Madhya Pradesh Madhya Kshetra Vidyut Vitran Company Limited (MPMKVVCL) and Madhya Pradesh Paschim Kshetra Vidyut Vitran Company Limited (MPPKVVCL), within their respective areas of supply.

4. That, the Government of Madhya Pradesh (**"GoMP"**) has been earnestly exploring different sources of clean energy to meet its increasing energy requirements, diversify sources of energy, bring down the cost of power and address climate change. The state of MP has fairly good potential for solar power generation with an average solar radiation of about 4.5 to 5.5 kWh/sq.m/day. Further, based on the Renewable Purchase Obligations (**"RPO"**) trajectory prescribed by Hon'ble MPERC, the State plans several projects to meet RPO (other RE) requirements of MP Discoms. Given that the state of MP's RPO (other RE) is rising each year and the same would predominantly be met through solar based generation, a significant demand

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for solar power generation is expected in MP. The RPO (other RE) for the years 2022-23 to 2029-30, as prescribed by MPERC, are set out as below:

Table – I

Financial Year	Solar RPO (before amendment in regulation dated 16.01.2023)	Other RPO (predominantly Solar) after amendment in regulation dated 16.01.2023)
2022-23	9%	23.44%
2023-24	10%	25.13%
2024-25	11%	25.63%
2025-26	-	26.13%
2026-27	-	26.63%
2027-28	-	27.13%
2028-29	-	27.63%
2029-30	-	28.13%

5. That, the Cabinet Committee on Economic Affairs, Government of India approved the Pradhan Mantri Kisan Urja Surkasha Evam Utthan Mahaabhiyan Scheme ("**PM-KUSUM Scheme**") in its meeting dated 19.2.2019. The PM-KUSUM Scheme consists of three components, viz., the Component-A to include installation of Decentralized Ground Mounted Grid Connected Renewable Power Plants, Component-B to include installation of standalone Solar Powered Agriculture Pumps and Component-C to support solarization of grid connected agriculture pumps.

6. That, MNRE issued detailed guidelines for implementation of PM KUSUM Scheme on 22.07.2019 followed by its amendments, till comprehensively revised guidelines for implementation of PM KUSUM Scheme were issued on 17.01.2024.

7. That, in pursuance of the same, MNRE has designated Madhya Pradesh Urja Vikas Nigam Limited (MPUVNL), the Petitioner, as the State Implementing Agency (SIA) vide letter No: F.No. 32/54/2018 – SPV Division dated 26.11.2019 for the state of Madhya Pradesh. A Copy of MNRE's order dated 26.11.2019 designating MPUVNL as the SIA is marked hereto and annexed as **Annexure P-1**.

8. That, "Surya Mitra Krishi Feeder Scheme" is being implemented in the state for solarisation of feeders with focus on agricultural feeders.

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9. That, the Petitioner conducts transparent process for selection of Renewable Power Generators ("**RPGs**") to implement RE systems injecting in distribution grid at HT level for sale of power to Respondent No. 1 MPPMCL at various locations in the state of Madhya Pradesh, including inter alia PM KUSUM Scheme and Surya Mitra Krishi Feeder Scheme. The RE systems being set up in the State are split into a number of decentralized projects injecting in distribution grid at HT level, which are developed at pre-identified locations (substations) in the State of Madhya Pradesh.

10. That, a pre-fixed levelized tariff for sale of power from decentralized Solar Power Plants having capacity of five hundred (500) kW to two (2) MW or such other capacity as per notification of Govt. of India, to be set up under Component-A of the PM-KUSUM Scheme introduced by Government of India (GoI), has been determined under Order of Hon'ble Commission in the matter of petition no. 13 of 2024. As regards grid connected solar PV systems being set up in the State for feeder level solarization, competitive bids are carried out and, after the completion of the process, an application for adoption of tariff is to be submitted before the Hon'ble Commission.

Details of the Procurer

11. That, Respondent No. 1 MPPMCL, a company incorporated under the laws of India, having its registered office at Shakti Bhawan, Rampur, Jabalpur–482008, MP, is the holding company of all the three (3) distribution licensees in the state of MP. Madhya Pradesh Poorv Kshetra Vidyut Vitaran Company Limited (MPPoKVVCL), Madhya Pradesh Madhya Kshetra Vidyut Vitaran Company Limited (MPMKVVCL) and Madhya Pradesh Paschim Kshetra Vidyut Vitaran Company Limited (MPPKVVCL) are the three power distribution licensees of Madhya Pradesh under ambit of Sections 2(17), 12 and 14 of the Act authorized to distribute and supply electricity to consumers of their respective areas.

12. That, MPPMCL has been authorized by the three (3) distribution licensees to procure power on behalf of them for retail supply to consumers. Therefore, in order to procure power on behalf of the state distribution licensees, to reduce the cost of power and to fulfil their RPO, Respondent No. 1 MPPMCL procures power from Projects implemented under component-A of PM KUSUM scheme and feeder solarization scheme. Further, Respondent No. 1 MPPMCL is taking steps to achieve the stated

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objective of Government of India and Government of Madhya Pradesh to reduce carbon emissions and to develop sustainable energy solutions for the future.

13. That, by the very scheme design, these Projects are supposed to be set up at tail ends of distribution grid, which have its share of challenges, especially, increasingly high inductive loads attributable to irrigation pumps. This poses not only operational challenges, but also commercial implications for solar Projects set up at tail end, including management of reactive power.

Statutory Framework

14. That, in exercise of the powers conferred under Section 178 read with clauses (h) and (i) of sub-section (1) of Section 79 of the Electricity Act, 2003, and all other powers enabling it in this behalf, the Central Electricity Regulatory Commission notified Central Electricity Regulatory Commission (Ancillary Services) Regulations, 2022 (the **"AS Regulations"**) which considers reactive power support as one of the ancillary services:

"Regulation 3(1)(c). Definition of Ancillary Services of AS:

> *"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".*

15. That, further, in exercise of powers conferred under clause (h) of sub-section (1) of Section 79 read with clause (g) of sub-section (2) of Section 178 of the Electricity Act, 2003 (36 of 2003), and all other powers enabling it in this behalf, the Central Electricity Regulatory Commission has specified Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2023, (the **"IEGC"**). Regulation 3 (1) (3) of these regulations define ancillary services:

"Regulation 3(1)(3). Definition of Ancillary Services:

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"Ancillary Services" in relation to power system operation, means the services 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 these regulations".*

16. That, Regulation 39 (6) of IEGC provides detailed provisions on reactive power (voltage, power factor and Q) management. Regulation 39 (11) specifically provides for commercial settlement for reactive power management, which is detailed at Annexure-4 of IEGC:

"Regulation 39(11). Reactive Power Management:

"Any commercial settlement for reactive power shall be governed as per the regulatory framework specified in Annexure–4 until the same is separately notified as part of the CERC Ancillary Services Regulations".

"Para 1(b) of Annexure-4 of IEGC

"The charge for VArh shall be at the rate of 5 paise/kVArh w.e.f. the date of effect of these regulations. This rate shall be escalated at 0.5paise/kVArh per year thereafter, unless otherwise revised".

These regulations have come into effect from 29.03.2023. Hence, the present charge for VArh would be 6.5 paisa per kVArh.

"Para 1(c) of Annexure-4 of IEGC

"All the Inverter Based Resources (IBRs) covering wind, solar and energy storage shall ensure that they have the necessary capability, as per CEA Connectivity Standards, all the time including non-operating hours and night hours for solar. The active power consumed by these devices for purpose of providing reactive power support, when operating under synchronous condenser/night-mode, shall not be charged under deviations and shall be treated as transmission losses in the ISTS".

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17. That, in exercise of powers under section 86(1)(h) of the Electricity Act, 2003, the Madhya Pradesh Electricity Regulatory Commission (MPERC) has notified Madhya Pradesh Electricity Grid Code (Revision- III), 2024 (MPEGC). These regulations provide, inter alia, "*the method by which all users of State transmission system cooperate with SLDC and STU in contributing towards effective control of the system frequency and managing the EHV voltage of the State transmission system*". However, these regulations do not provide equivalent treatment pertaining to users of and/ or Projects connected at distribution grid, which necessitates the instant Petition.

Chapter 10 of MPEGC deals with frequency and voltage management codes. Under chapter 10, Regulation 10.4.1 (c) provide for voltage control reserve through reactive power management. Further, Regulations 10.7 under chapter 10 of these regulations delves deeper into reactive power management, whereunder Regulation 10.7.11 provides for commercial settlement of reactive power as per detailed regulatory framework provided at Appendix-K of these regulations:

"Regulation 10.4.1(c). Voltage control reserves:

"Voltage control reserves shall be deployed for controlling the voltage at a bus or sub-system through reactive power injection or drawal".

"Regulation 10.7.11. Reactive Power Management:

"Any commercial settlement for reactive power shall be governed as per the regulatory framework specified in Appendix-K".

"Para 1(a) of Appendix-K of MPEGC

"Reactive power compensation should ideally be provided locally, by generating reactive power as close to the reactive power consumption as possible. The State entities are therefore expected to provide local VAr compensation or generation such that they do not draw VARs from the EHV grid, particularly under low-voltage condition. To discourage Var drawals by regional entities, VAr exchanges with intra-State transmission system shall be priced as follows:

a) The State entity pays for VAr drawal when voltage is below 97%;

b) The State entity gets paid for VAr return when voltage is below 97%;

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c) *The State entity gets paid for VAr drawal when voltage is above103%;*
d) *The State entity pays for VAr return when voltage is above 103%;*

Where all voltage measurements are at the interface point with Intra-State Transmission System".

"Para 1(b) of Appendix-K of MPEGC

"Charges for VArh shall be approved by Commission vide separate order/ notification from time to time. However, Reactive Power Compensation (VArh) for RE generators shall be governed with tariff orders issued by the Commission for respective category time to time".

18. That, for reference, summary of key relevant provisions of IEGC regulations are tabulated below:

Comparative Parameter	IEGC
Capacity	Minimum 50 MW
Existing mandate regarding reactive power	Nominal voltage at PCC
Operation monitoring/ reactive power accessibility	RLDC or SLDC
Commercial settlement	Regulatory framework
Mandate test	Mandate tests for reactive power capability are required for generators and FACTS devices.
Required capability for REGs (wind and solar)	0.95 lagging to 0.95 leading pf limits
The voltage level at which REGs are required to regulate the voltage	Below 97% and above 103%
Charges for reactive power compensation	Charge @ 5 paisa per kVArh with escalation of 0.5 paisa per year (These charges became effective from 29.03.2023)

19. That, in furtherance of the above provisions of IEGC and MPEGC, a pragmatic compensation mechanism at State level is necessary for reactive power management support provided by Projects, i.e., RE Generators injecting in the intra-State transmission grid or distribution grid at HT level, including inter alia those being implemented under component-A of PM KUSUM scheme and feeder solarization scheme but excluding Prosumers covered under MPERC (Grid Interactive Renewable Energy Systems and Related Matters) Regulations [Revision II], 2024, as amended (hereinafrer, referred as "Prosumers").

Background and Context

20. That, in Madhya Pradesh, STU have developed relatively satisfactory systems for reactive power management; hence they have to make hardly any payments to CTU under IEGC. However, the ISTS-MP STU interface points, that have traditionally seen high voltages on account of the geographical location of the state, have seen lower voltage in the last few years, especially at 132 kV sub-stations where both reactive load and RE generation are high. Further, future studies indicate that problems of low voltage are foreseen in certain pockets of the transmission network in the state. The low voltages, mainly in the area between Rajgarh to Neemuch district, was recognized as a major concern for grid security in the coming years. Having said that, improving voltage level at 132 kV substations or below by strengthening the transmission system is neither technically nor commercially feasible.

21. That, DISCOMs have yet to address the issue of reactive power management as comprehensively as MP TRANSCO, on account of the limitations in ability to make investment in setting up capacitor banks as also challenges faced in management of these capacitor banks. As a result, the distribution system experiences pronounced voltage variability, manifesting as low-voltage conditions in several rural and remote areas with high inductive loading—particularly from agricultural pump sets—as well as high-voltage conditions in some parts of the state during periods of low demand or high local generation. This coexistence of both under-voltage and over-voltage conditions underscores the inadequacy of static

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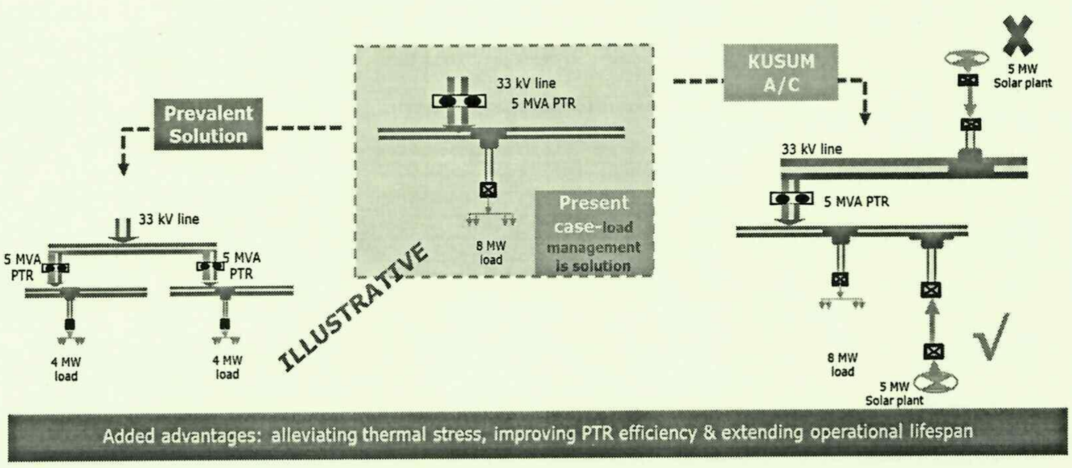
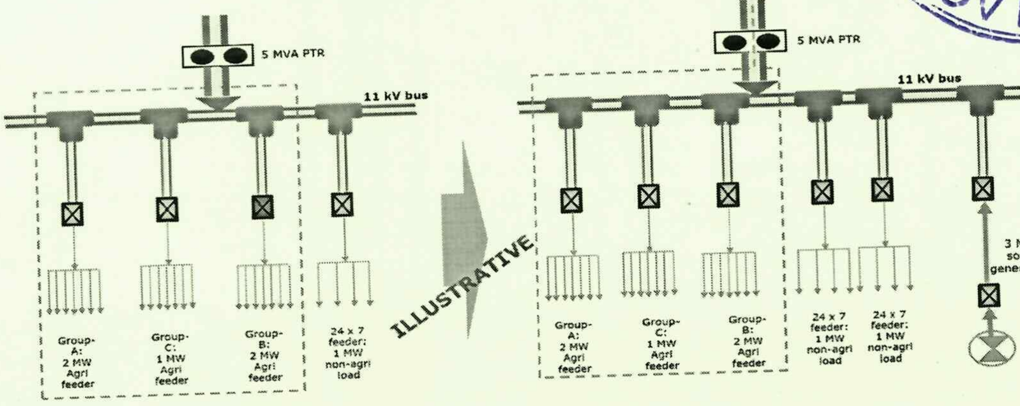
reactive power solutions and highlights the need for dynamic, decentralised reactive power management at the distribution level.

22. That, decentralized renewable energy (DRE) generation, especially solar based generation in the distribution grid, brings many advantages to stakeholders across the value chain. The prominent among those being avoidance of network losses for equivalent generation, deferment of substation augmentation and associated cost, day time electricity supply and improvement in grid voltage at tail end. However, to maximize this benefit, the injection should take place on the LV side of PTRs of the distribution system as illustrated below:



23. That, Madhya Pradesh has about 7900 power transformers (PTRs) at 33/11 kV substations. About 1100 of these are overloaded by more than 80% and would require immediate upgradation to meet immediate future demand. To manage with such situations, power distribution companies of Madhya Pradesh (MP Discoms) practice load rostering in groups for agricultural consumer, in order to help meet electricity requirements of agricultural as well as non-agricultural consumers with limited system capacity. However, if DRE project is injected at LV side (11 kV bus) of 33 kV substation, possibly all demand on such substations may be met simultaneously as typically illustrated below:



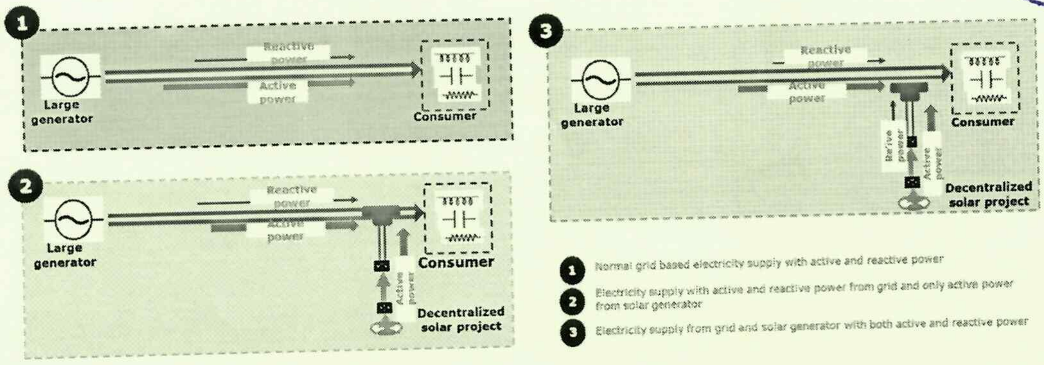
24. That, the increased injection from DRE projects would lead to greater absorption of solar energy in the grid, which is the cheapest form of power available. This would benefit the Discoms, which otherwise schedule about 40% of their total portfolio at variable cost of energy (VCoE) more than INR 3.00 per kWh, i.e., more than the expected cost of solar based electricity generation. Thus, it makes commercial sense for MP Discoms to utilize available leg room and harness maximum possible solar based electricity generation during day time by shifting load to solar hours:

Sl no	Plant	Avg. VC (Rs./kWh)	% of scheduled energy w.r.t. to entitled energy
1	Soxxxx	4.82	51.84%
2	Khaxxxxx	4.41	68.40%
3	BLAxxxxx	4.06	53.59%
4	Gadarxxxxxx	3.97	75.57%
5	Mouxxxxxx	3.55	75.79%
6	Moudxxxxx	3.49	76.90%
7	DVxxxxxx	3.44	58.27%

ILLUSTRATIVE

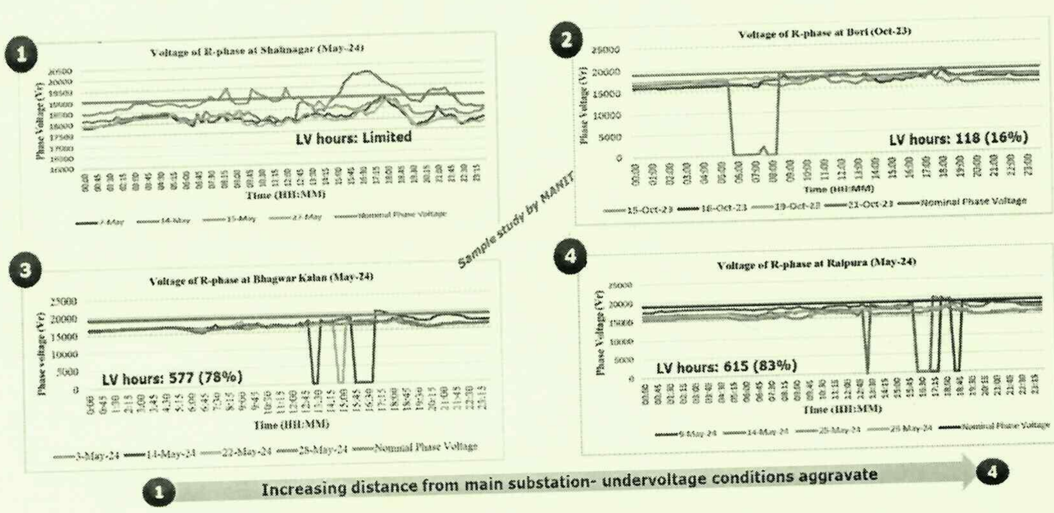
Sl no	Plant	Avg. VC (Rs./kWh)	% of scheduled energy w.r.t. to entitled energy
8	SSTxxxxxxx	3.41	89.39%
9	JPxxxxxx	3.38	76.25%
10	SSTxxxxxx	3.18	93.46%
11	M.B.xxxxxxx	3.13	90.28%
12	SGTxxxxxxxx	3.08	95.84%
13	Jhabxxxxxx	3.06	89.75%
14	Kahaxxxxxx	3.04	89.92%

25. That, traditionally, however, decentralized solar projects, including inter alia those under component-A of PM KUSUM scheme and feeder solarization scheme, have been set up to inject power at unity power factor. RE generators connected to the distribution grid inject power at unity power factor, exacerbating the problem of poor power factor. Though there are directions that PF should be between 0.95 lag and 0.95 lead, but there are no commercial implications. Presently, the only commercial implication is that RE generators are charged for reactive power drawn at the rate of 27 paise/kVArh. Presently, there is not much attention on possible benefits from such DRE projects, including reactive power management and associated benefits as well as commercial mechanism to incentivise generators to help grid/ system manage grid quality:



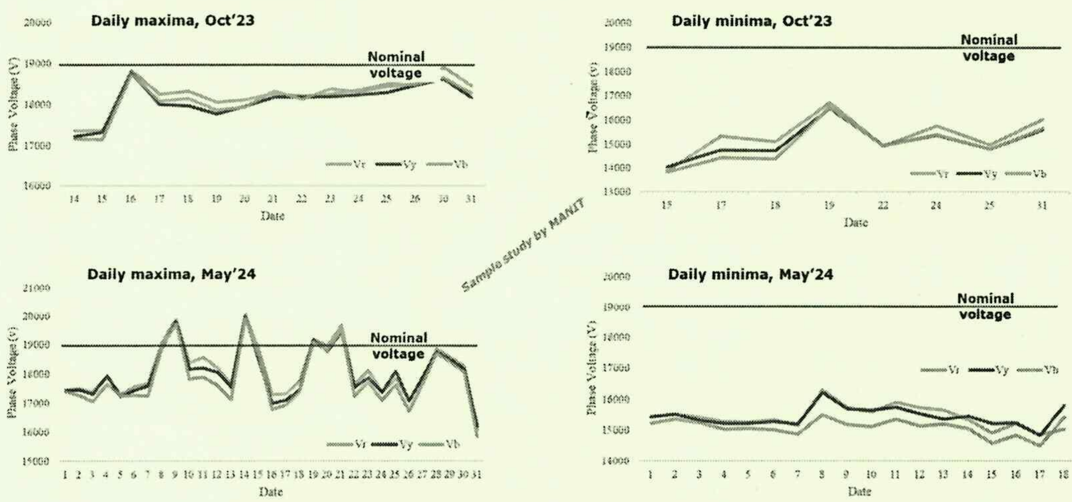
The recent M.P. Electricity Grid Code (Revision-III), 2024 becomes especially relevant in this context since, in clause 1 (b) of Annexure K, it provides for compensation mechanism (Incentive & Penalty) for drawl/injection of reactive power by RE generators. A meeting on the topic "Reactive Power Management in RE Intensive Grid" was held under the chairpersonship of Additional Chief Secretary (Energy and New and Renewable Energy) with the various stakeholders on 13th May 2024, whose Minutes are annexed as **Annexure P-2**. The Petition is being filed in this context.

26. That, in the mentioned situation, the World Bank supported Madhya Pradesh to undertake reactive power management studies as part of its efforts to address the growing challenges associated with integrating renewable energy sources, particularly solar power, into its distribution grid, especially at tail ends and substations which are overloaded. This brings many advantages, including deferment of 33/ 11 kV substation infrastructure augmentation cost and improvement of tail end voltage profile of grid, which otherwise face severe drops as typically illustrated below:



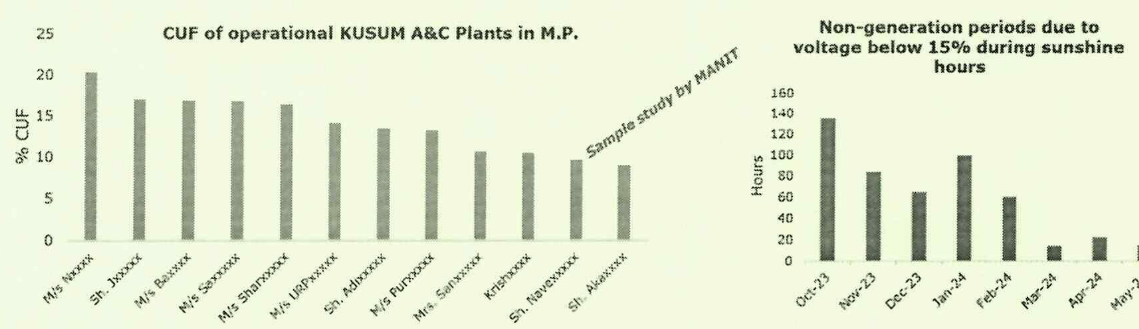
Picture courtesy: World Bank supported MANIT study

27. That, the exercise intends to help Madhya Pradesh in scaling up grid integration of DRE projects, especially solar based generation under component-A of PM KUSUM scheme and feeder solarization scheme, by addressing issues related to grid stability, voltage drops, loss of generation and reactive power imbalances, which are very common and severe at tail end of Discom network, especially pronounced due to inductive load of agricultural pumps during Rabi season (Oct-Feb).



Picture courtesy: World Bank supported MANIT study

28. That, alongside Discoms, active participation of solar project proponents in management of reactive power and regulation of grid voltage helps them to improve their CUF that is often low due to unavailability of grid due to frequent tripping attributable to low to severely low or high voltages:



<u>*Technical study by MANIT*</u>

29. That, in above context, Maulana Azad National Institute of Technology, Bhopal (MANIT) conducted studies with support of the World Bank. The

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study aimed to evaluate and optimize the integration of solar PV into the grid, while ensuring that the voltage and reactive power dynamics are managed effectively, as well as assess various strategies to improve voltage profiles, using methods such as adjusting inverter settings, employing capacitor banks, using smart inverters and exploring other reactive power compensation techniques.

30. That, relevant excerpts from MANIT report are produced as below:

Using solar generators at lower voltage levels for dynamic reactive compensation presents a sustainable and economically viable alternative to traditional capacitor banks. The reactive power output of capacitor banks is directly proportional to the voltage at the bus to which they are connected. During low voltage conditions, the effectiveness of these capacitor banks in supplying reactive power diminishes significantly. This limitation is particularly critical as the capacitor banks are least effective precisely when their reactive power support is most needed, thereby compromising the stability and efficiency of the power system.

Further, the study underscores some key comparatives of solar inverter based reactive power management over traditional capacitor bank are as follows:

A. *The reactive power compensation functionality of inverters can be utilized not only during solar energy generation but also during non-generation hours (evenings and nights). This makes them a viable alternative to capacitor banks, which are traditionally used by utilities to improve power factors.*

B. *Capacitor banks offer reactive power compensation in only one direction—typically providing reactive power to support voltage levels. The superior bidirectional reactive power management capability of the solar inverter, therefore, highlights its effectiveness in addressing both high and low voltage conditions, offering a more versatile solution.*

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C. *At a power factor of 0.8, a 1MVA inverter can deliver a maximum active power output of 800 kW and a maximum reactive power output of 600 kVAr. Consequently, at these operational limits, the inverter can either inject or absorb up to 600 kVAr of reactive power. This functionality is akin to connecting a capacitor bank and a reactor, allowing for reactive power variation from 0 to 600 kVAr in either direction. This [inverter based] setup offers a considerable advantage over connecting fixed 600 kVAr capacitor banks, as it enables smooth, real-time control across the entire reactive power range.*

D. *The capacitor bank's reactive power generation is highly sensitive to voltage variations, with a marked decrease as voltage levels drop. Conversely, the solar inverter demonstrates a robust performance, maintaining a nearly consistent reactive power output despite fluctuations in voltage.*

E. *While both the capacitor bank and the solar inverter contribute to voltage enhancement, the solar inverter demonstrates superior efficacy, particularly under lower voltage conditions.*

F. *As the feeder voltage decreases, particularly at the tail-end substation, the voltage improvement achieved by the solar inverter operating in ARPI mode becomes more pronounced compared to API mode with a capacitor bank. [In API (Active Power Injection) mode, the inverter operates at unity power factor without reactive power injection, whereas in ARPI (Active-Reactive Power Injection) mode, the inverter supplies both active and reactive power. The dynamic nature of solar inverters allows for more responsive voltage regulation and loss minimization, particularly under low-voltage conditions, where their reactive power injection capabilities outperform the static compensation offered by capacitor banks.*

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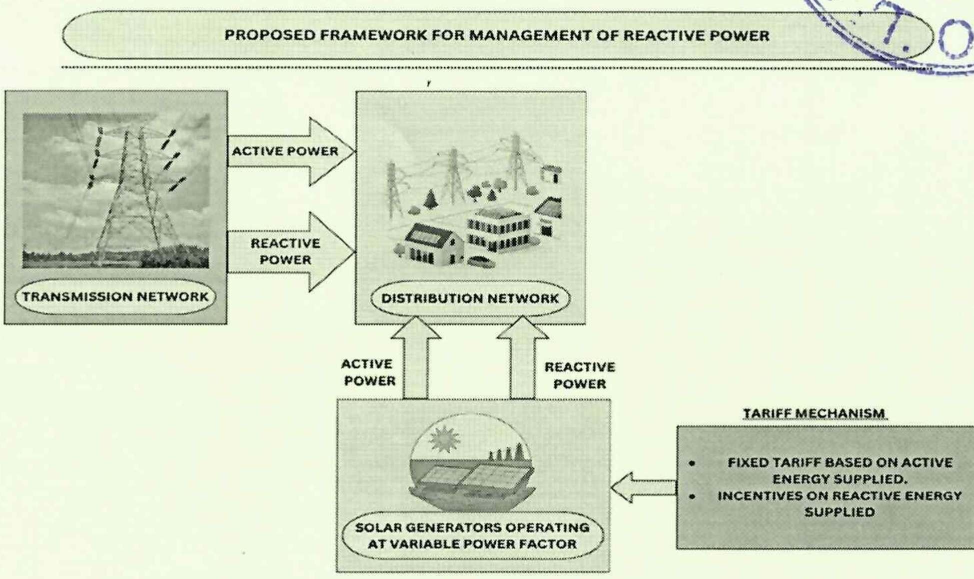
It [inverter based reactive power management] optimizes grid performance, avoids capital expenditure, reduces operational costs; and maximizes the utilization of renewable energy assets, contributing to a more resilient and efficient power system overall. Some of the key benefits are:

A. ***Dynamic control:*** *Unlike capacitor banks, which provide reactive power compensation in discrete steps, solar inverters offer instantaneous response to voltage fluctuations and reactive power demands. This real-time, dynamic response allows solar inverters to align more effectively with grid conditions, offering continuous and precise voltage regulation, thereby surpassing the static and delayed compensation of traditional capacitor banks.*

B. ***Utilization of existing infrastructure:*** *Utilizing solar generators for dynamic reactive compensation maximizes the utilization of existing infrastructure. It makes use of the underutilized capacity of solar installations during periods of varying irradiance and non-generation hours at night-time. This approach aligns with modern grid management strategies focused on integrating renewable energy sources effectively while minimizing the need for additional infrastructure investments.*

C. ***Reduction in operational and maintenance costs:*** *The approach reduces the operational costs associated with maintaining and replacing capacitor banks.*

To help achieve these benefits, a high-level framework for reactive power management is depicted in schematic diagram as below:



As the penetration of inverter-based resources capable of managing reactive power increases, the recruitment of traditional reactive power-generating devices will no longer be a primary concern. Instead, the challenge of maintaining grid stability in an inverter-rich environment hinges on effectively utilizing the abundant available resources and designing corresponding payment structures to incentivize reactive energy generation. This operational shift implies that generators offering such additional flexibility must be appropriately compensated through a market mechanism. The study suggests following two potential operational strategies:

(a) First, where the solar inverter is configured to manage reactive power exclusively during sunshine hours:

In this operational strategy, the solar inverter is configured to manage reactive power exclusively during sunshine hours. This approach is particularly beneficial in locations where voltage levels tend to dip during the day due to significant power consumption, while night-time voltage levels remain relatively stable. By focusing on reactive power support during periods of high demand, the inverter helps stabilize voltage levels when they are most prone to fluctuations. This targeted strategy not only optimizes the performance of the solar inverter but also enhances the overall grid stability during critical daytime operations, without unnecessary reactive

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power interventions during night-time when voltage conditions are adequate.

Responsibility allocation for active power required in providing reactive power support: Allocation of the responsibility for supplying the active power necessary to support reactive power during sunshine hours is assigned to the SPP. The rationale for the allocation decision is outlined below:

i. *Risk of inverter cut-off due to low voltage conditions: Under very low voltage conditions on the feeder, there is a risk of the inverter experiencing thermal overload, which could trigger a cut-off. In such scenarios, the SPP would face significant financial losses due to the interruption of active power injection. Consequently, even if there is some loss of power in providing voltage support, it is in the SPP's best interest to ensure voltage stability. This proactive approach mitigates the risk of inverter shutdown and helps secure consistent revenue from active power generation.*

ii. *Voltage improvement and impact on active power injection: Enhanced voltage levels at the inverter terminal can lead to a reduction in active power injection losses. This improvement directly benefits the SPP by increasing the efficiency of power delivery to the grid. Therefore, maintaining optimal voltage levels at the inverter terminal is strategically advantageous, as it minimizes losses and maximizes the financial return from active power generation.*

iii. *Marginal increase in losses due to reactive current: The solar plant is primarily responsible for supplying the active power component to the grid. The introduction of reactive power injection leads to only a slight increase in system losses due to the additional reactive current. If the cost associated with these increased losses is lower than the revenue generated from the sale of reactive energy, the SPP stands to gain additional profit without incurring a significant operational burden.*

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(b) *Second, where the inverter is proposed to operate continuously, providing reactive power support during both sunshine and non-sunshine hours:*

In this operational strategy, the solar inverter is configured to provide reactive power management not only during sunshine hours but also throughout non-sunshine hours. This approach is particularly well-suited for locations that experience persistent low voltage issues across both day and night. By ensuring continuous reactive power support, the inverter helps stabilize voltage levels around the clock, thereby enhancing grid reliability and minimizing voltage fluctuations. To successfully implement this strategy, the solar inverter must be equipped with the capability to operate during night-time hours. Given the absence of solar generation during these periods, the inverter will require active power from the grid to sustain its operation.

Responsibility allocation for active power usage in providing reactive power support:

The responsibility for sunshine hours could be assigned to the SPP, with the underlying rationale detailed in the previous section. For non-sunshine hours, responsibility is assigned to the utility grid. The justification for this allocation is outlined as follows:

i. *Alignment with IEGC regulations on active power consumption for reactive power support: According to the IEGC, "The active power consumed by Renewable Energy Generators (REGs) to provide reactive power support, when operating under synchronous condenser/night-mode, shall not be charged under deviations and shall be treated as transmission losses in the Inter-State Transmission System (ISTS)." In alignment with this regulation, state grids should similarly facilitate the active power consumption by solar inverters during night-time operations without*

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imposing deviation charges, recognizing it as a necessary component of grid support.

ii. *Independence in reactive power management for Solar feeders: Without reactive power management via solar inverters, the reactive power demand of a solar feeder is typically met by the utility grid, with no charges levied on the SPP. The proposed solution enables the solar feeder to autonomously manage its reactive power requirements, reducing dependency on the utility grid. The savings in operational expenses achieved through this independence can be reallocated to support the developer's active power consumption during night-time operations, thereby enhancing the overall economic viability of the solar project.*

iii. *Cost savings for DISCOMs through avoidance of additional capacitor bank installations: In the absence of reactive power management provided by solar inverters, DISCOMs would need to invest in and maintain capacitor banks to meet the reactive power demands of the grid. By shifting this responsibility to the solar inverters, DISCOMs can avoid these capital and operational expenditures. The financial resources saved from not having to install and maintain capacitor banks could be redirected to support the SPP's night-time active power consumption, creating a more balanced and cost-effective grid management strategy.*

iv. *Equitable distribution of operational responsibilities: This model provides a fair and logical distribution of operational responsibilities between the SPP and DISCOMs. By allowing the SPP to manage reactive power locally, the utility grid is relieved of this burden, while also ensuring that the developer is supported in maintaining grid stability, even during night-time operations. This balanced approach not only enhances system efficiency but also fosters a collaborative relationship between SPP and DISCOMs, leading to more sustainable and reliable grid operations.*

31. That, the study further evaluated various potential mechanisms for incentivizing RE generators to actively participate in reactive power management. By encouraging such participation, these mechanisms aim to enhance grid stability, improve voltage control, and optimize the overall performance of the electrical system.

Further, it is also inferred from the study that while IEGC has provisions for reactive power management applicable on renewable energy generators connected at ISTS (inter-State transmission) network, the MPERC need to issue order/ notification for charges to suit various scenarios of reactive power management at for projects injecting in intra-State transmission grid or in distribution grid at HT level, excluding Prosumers, and encourage RE generators to participate in improvement of grid quality by playing a role in reactive power management. Therefore, it necessitates the current Petition.

As per the MANIT study, incentivization of RE generators could be achieved in two ways:

(a) *First, Power Factor-Based Incentive (PFBI): The conceptualization of this mechanism is based on the established incentive-based system currently in place for industrial consumers. Industrial consumers receive incentives for maintaining a specific power factor range and are penalized for deviating from the limits. A similar concept is applied to generating units with slight modifications. The incentives shall be provided to RE generators for operating at power factors other than unity. The greater the deviation from unity, the higher the incentive award. No incentive will be paid to RE generators when they operate at a unity power factor, which indicates that they are only injecting real power into the grid. However, it comes with certain limitations.*

   i. *Absence of penalties for non-compliance: The current framework does not include penalties for deviations or non-compliance. Without penalties, there may be less motivation for SPP to adhere to optimal reactive power management practices.*

ii. *Disregard for reactive power exchange: The framework overlooks the actual exchange of reactive power between the generator and the grid. By not accounting for reactive power flows, the method may not fully capture the implications of reactive power management on grid stability.*

iii. *Failure to address voltage violations: Instances of voltage violations resulting from reactive power imbalances are not considered within this method. As a result, potential issues related to voltage regulation and grid reliability may not be effectively managed or mitigated.*

(b) *Second, Voltage-Based Incentive (VBI): To address the limitations of the Power Factor-Based Incentive (PFBI) mechanism, the Voltage-Based Incentive (VBI) mechanism is proposed. To enhance the understanding of the Voltage-Based Incentive (VBI) mechanism, the relevant IEGC regulations are reproduced below:*

i. *According to IEGC regulations, the regional entities are expected to provide local VAr compensation or generation such that they do not draw VAr from the EHV grid, particularly under low-voltage conditions. To discourage VAr drawls by regional entities, VAR exchanges with ISTS shall be priced as follows:*

a. *The regional entity pays for VAr drawl when voltage is below 97%*
b. *The regional entity gets paid for VAr return when the voltage is below 97%.*
c. *The regional entity gets paid for VAr drawl when voltage is above 103%.*
d. *The regional entity pays for VAr return when the voltage is above 103%.*

Where all voltage measurements are at the interface point with ISTS.

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The charge for VArh shall be at the rate of 5 paise/ kVArh w.e.f. the date of effect of these regulations. This rate shall be escalated at 0.5 paise/ kVArh per year thereafter unless otherwise revised.

All the Inverter Based Resources (IBRs) covering wind, solar and energy storage shall ensure that they have the necessary capability, as per CEA Connectivity Standards, all the time including non-operating hours and night hours for solar. The active power consumed by these devices for the purpose of providing reactive power support, when operating under synchronous condenser/night mode, shall not be charged under deviations and shall be treated as transmission losses in the ISTS.

The VBI mechanism will monitor voltage conditions in accordance with IEGC guidelines, providing incentives for compliance and penalties for non-compliance. The specifics are as follows:

i. *Low voltage conditions: The developer is incentivized for VAr injection and penalized for VAR absorption.*
ii. *High voltage conditions: The developer is incentivized for VAr absorption and penalized for VAR injection.*
iii. *Nominal voltage conditions: The developer will be penalized for both VAr injection and absorption.*

This framework ensures that voltage regulation is maintained within optimal limits by aligning developer actions with grid stability requirements.

Copy of the MANIT report is annexed hereto and marked as **Annexure P-3 (Colly).**

32. That, from the MANIT study, it is inferred that leveraging solar inverters, with inherent capability to both generate and absorb reactive power, for reactive power management in intra-State transmission grid or distribution grid at HT level, excluding Prosumers, could be an alternative to traditional capacitor banks. While capacitor banks are useful only in low voltage

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situations, inverter-based reactive power support would be potent both in low and high voltage situations. By utilizing these inverters to provide reactive power support, the grid would achieve a more balanced and stable voltage profile. As the penetration of renewable energy sources continues to grow, the role of inverter-based reactive power support would become increasingly critical for maintaining voltage regulation and power quality across the network. Unlike traditional reactive power compensation methods, such as capacitor banks, solar inverters would provide a dynamic and adaptable solution that responds in real-time to system voltage variations.

33. That, it may also be drawn from MANIT study that there should be thoughtfully crafted incentive and disincentive mechanism to encourage inverter based reactive power management. For dynamic voltage regulation using solar inverters, a deadband of ±3% is proposed, on lines of Para 1(a) of Appendix-K of MPEGC. Consequently, voltage regulation should be activated when the voltage falls below 97% or exceeds 103% of the nominal value. The proposed framework for penalties and incentives is outlined below:

Grid Voltage	Injected by RPG	Absorbed by RG	Decision
Higher than 103 percent	✓	X	Penalty
Higher than 103 percent	X	✓	Incentive
Higher than 103 percent	X	X	Neither Penalty, nor incentive
Between 103% and 97%	✓	X	Neither Penalty, nor incentive

Between 103% and 97%	X	✓	Neither Penalty, nor incentive
Between 103% and 97%	X	X	Neither Penalty, nor incentive
Lower than 97 percent	✓	X	Incentive
Lower than 97 percent	X	✓	Penalty
Lower than 97 percent	X	X	Neither Penalty, nor incentive

34. That, in view of the foregoing, Hon'ble Commission is requested to evaluate impact of reactive power compensation for the Projects, i.e., RE Generators injecting in intra-State transmission or the distribution grid at HT level, including inter alia those being implemented under component-A of PM KUSUM scheme and feeder solarization scheme but excluding Prosumers, and provide for compensation as under para 1(b) of Annexure-4 of IEGC, as applicable from time to time, during life of Projects, as compensation to be considered to compensate towards reactive power management being provided by Projects under the Scheme.

35. It is proposed that the active power drawn from the grid for reactive power management during non-solar hours shall not be charged by Discoms and shall be treated as losses in the State transmission and distribution network in accordance with para 1(c) of Annexure-4 of IEGC. As regards the power consumed by the renewable generator during non-solar hours for auxiliary and other internal requirements, it could be continued to be charged at Tariff Schedule - HV – 7; however, to distinguish the consumption from active power drawn from the grid for reactive power management, the auxiliary power consumed by the renewable generator shall be measured through a separate metre on the LV side of the project site.

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36. That, further, it is submitted that following may be prescribed as applicability of reactive power management mechanism for Grid Connected RE Generators injecting/ absorbing in the intra-State transmission grid or distribution grid at HT level, excluding Prosumers:

A. The RPG injecting/ absorbing reactive power in the distribution grid shall get paid for *VAr* return/ drawal at Delivery Point, including during non-sunshine hours, at the VArh charge determined in accordance with para 1(b) of Annexure-4 of IEGC as amended from time to time, in accordance with para 1(a) of Appendix-K of MPEGC as below:

i. gets paid for VAr return when voltage is below 97%;
ii. gets paid for VAr drawal when voltage is above103%;

B. The RPG injecting/ absorbing reactive power in the distribution grid shall pay for VAr return/ drawal at Delivery Point, including during non-sunshine hours, at the VArh charge determined in accordance with para 1(b) of Annexure-4 of IEGC as amended from time to time, in accordance with para 1(a) of Appendix-K of MPEGC as below:

i. pay for VAr drawal when voltage is below 97%;
ii. pay for VAr return when voltage is above103%

C. In case voltage at Delivery Point is between 97% and 103% of Nominal Voltage, RPG shall neither pay nor be paid for injection or absorption of reactive power.

D. There would be no penalty on RPG for not injecting/ absorbing any reactive power whatsoever, for voltage management support to the grid. This is so proposed since it is for the first time that voltage regulation is being proposed through reactive power management in the State. Thus, penalties for inaction might disincentivise active participation in realizing the proposed transition for distribution network.

E. The active power drawn from the grid for reactive power management during non-solar hours shall not be charged by Discoms and shall be treated as losses in the State

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transmission and distribution network in accordance with para 1(c) of Annexure-4 of IEGC. As regards the power consumed by the renewable generator during non-solar hours for auxiliary and other internal requirements, it could be continued to be charged at Tariff Schedule - HV – 7; however, to distinguish the consumption from active power drawn from the grid for reactive power management, the auxiliary power consumed by the renewable generator should be measured through a separate metre on the LV side of the project site.

37. That, it is respectfully submitted that the adoption of the above-mentioned reactive power compensation tariff and mechanism of its applicability by this Hon'ble Commission will be consistent with the provisions of IEGC and MPEGC, as amended from time to time.

38. That, the Petitioner had shared draft of the petition with Respondents 1,2 and 3 for consultation and opinion in compliance to the directives of Hon'ble Commission dated 19.11.2025 in the matter of Petition 39 of 2025. The response from Respondents 2 and 3 have been received and provided with this Petition as **Annexure P-4 (colly.).** The response from MPPMCL is awaited, which would be filed before the Commission during the course of the proceedings.

39. That, the Petitioner respectfully submits that this Hon'ble Commission, while disposing of Petition No. 39 of 2025 vide Order dated 19.11.2025, without touching upon the merits of the case, was pleased to direct the Petitioner to approach the Commission afresh after consulting the Respondents and along with a draft public notice seeking comments, suggestions and objections from all stakeholders containing the proposal for determination of reactive power compensation. The present Petition has been filed strictly in compliance with the said directions of this Hon'ble Commission, after undertaking consultation with the Respondents. It is further submitted that the Hon'ble Commission was pleased to direct that the fee paid in Petition No. 39 of 2025 shall be adjusted accordingly, and the Petitioner accordingly prays for adjustment of the said fee against the present Petition. Copy of the Order dated 19.11.2025 passed by the Hon'ble Commission is annexed as **Annexure P-5.** The draft public notice proposed

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to be issued in compliance with the said Order is annexed herewith and marked as **Annexure P-6.**

40. The Petition is bona fide and in the interest of justice.

41. An affidavit in support of the Petition is also filed.

PRAYER

In view of the afore-mentioned facts and in the interest of justice, it is most humbly prayed that this Hon'ble Commission may be pleased to:-

A. Admit the present petition and list the same for an early hearing;

B. Issue order/ notification that provide for reactive power management linked to grid conditions by distributed renewable energy projects injecting in Distribution grid at HT level, excluding Prosumers or intra-State transmission grid by adopting the charges for VArh under para 1(b) of Appendix-K of MPEGC as requested below:

a. The RPG shall get paid/ pay for *VAr* return/ drawal at Delivery Point, including during non-sunshine hours, in accordance with para 1(a) of Appendix-K of MPEGC, at the VArh charge determined under para 1(b) of Annexure-4 of IEGC, as applicable from time to time.

b. The active power drawn from the grid for reactive power management during non-solar hours shall not be charged by Discoms and shall be treated as losses in the State transmission and distribution network in accordance with para 1(c) of Annexure-4 of IEGC. As regards the power consumed by the renewable generator during non-solar hours for auxiliary and other internal requirements, it could be continued to be charged at Tariff Schedule - HV – 7; however, to distinguish the consumption from active power drawn from the grid for reactive power management, the auxiliary power consumed by the renewable generator should be measured through a separate metre on the LV side of the project site.

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C. Pass any such further orders/ directions as this Hon'ble Commission may deem fit and proper in the present facts and circumstances.

DATE : 11.02.2026
PLACE – BHOPAL

Authorized Signatory
For M.P. Urja Vikas Nigam Ltd.
Petitioner

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THROUGH COUNSEL