File No.CEA-GO-17-13(12)/1/2023-NRPC

भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
उत्तर क्षेत्रीय विद्युत समिति
Northern Regional Power Committee

सं. उ.क्षे.वि.स./प्रचालन/107/01/2023/ दिनाँक: .06.2023

सेवा में / To,

प्रणाली अध्ययन उप-समिति के सभी सदस्य (संलग्न सूचीनुसार)
Members of System Studies Sub-Committee (As per List)

विषय: प्रणाली अध्ययन उप-समिति की 2वीं बैठक की कार्यवृत्त।
Subject: MoM of 2nd meeting of System Studies Sub-Committee-reg

महोदय / Sir,

प्रणाली अध्ययन उप-समिति की 2वीं बैठक दिनांक **05 अप्रैल, 2023** को **1100** बजे विडियो कोंफ्रेंसिंग के माध्यम से आयोजित किया गया था। बैठक की कार्यवृत्त संलग्न है।

The 2nd meeting of System Studies Sub-Committee was held at **1100 Hrs** on **05th April, 2023** via video conferencing. Minutes of Meeting for the same is attached.

भवदीय
Yours faithfully,

Signed by Santosh Kumar
Date: 19-06-2023 13:16:22
Reason: Approved

(संतोष कुमार)
अधीक्षण अभियंता
(प्रणाली अध्ययन)

Members of System-Study Sub-Committee of NRPC

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19	Sh. Sandeep Kumawat	Chief Manager		sandeepk@powergrid.in

Contents

प्रणाली अध्ययन उप-समिति की 2 वीं बैठक

2nd MEETING OF SYSTEM STUDIES SUB-COMMITTEE

Time & Date of meeting: 11:00 HRS; 5th April 2023

Venue: Video Conferencing

Minutes of Meeting

The meeting was started with an opening remark by MS, NRPC. He stressed upon the fact that the system-studies sub-committee is an important forum and there is need to conduct its meeting regularly. There are lot of issues such as capacitor study, islanding, voltage issues that may be taken up here and solution may be devised. He also added that this group may also look into the nuances of how best the evacuation system may be planned for proper evacuation of power from our generating units.

A.1 Installation of Automatic Capacitor Banks (APFC) on 11 KV side of 33/11 KV Substations of Ajmer Vidyut Vitaran Nigam Ltd. (AVVNL) for Reactive Power Compensation under Power system Development Fund (PSDF)-Phase-I (Agenda by RVPN)

A.1.1 AEE (SS) NRPC apprised the forum that due to the spread of population in the remote areas of Rajasthan in recent years, meeting power demand, distribution of electricity and maintaining quality power for every category of consumers has always remained a challenge. The state is primarily agricultural based; and power is supplied to the domestic, non-domestic and industrial sector too. It has been identified that these loads are highly inductive in nature which need rectification.

A.1.2 In this regard, AVVNL has proposed to install dynamic/ automatic capacitor banks under which the capacitive load helps to adjust power factor as close to 'Unity Power Factor'. The implementation of the project/ scheme will limit the heavy drawl of reactive power from grid and mitigate the risk such as (a) Overloading of transmission lines; (b) Overloading of transformers at different voltage levels; and (c) Increase in system losses.

A.1.3 It has been learnt from Rajasthan that the power factor is ranging from 0.80 to 0.90 at urban feeder and 0.75 to 0.80 (or even less) at the rural feeders within the respective circles. In view of this, installation of capacitor banks on 11 kV side of 33/11 kV substations has been proposed at various circles having 'power factor less than 0.85.

A.1.4 AVVNL proposes installation of capacitor banks at 732 Nos. of 33/11 kV substations out of total 1974 Nos. of substations spread across 12 circles and 11 districts of Rajasthan. Total MVAR installation will be 1464.80 MVAR. Detailed list of these substations have been enclosed with DPR.

A.1.5 Methodology adopted by AVVNL consists of extracting previous year data from dedicated Feeder Monitoring System (FdrMS) to have greater insights about 'real time'

power supply of 11 kV feeders. The data was further analyzed and cross checked with the field on sample basis to arrive at the conclusion.

A.1.6 Approximately 20 lakh consumers at these 732 Nos. of substations along with the concerned STU (Rajasthan Rajya Vidyut Prasaran Nigam Ltd.) shall be benefitted with these measures.

A.1.7 Total cost of the scheme comes around 222.37 cr. for which detailed cost estimate have been enclosed with the Detailed Project Project (DPR). The same is placed as **Annexure-I.**

A.1.8 Scheme detailed as under, is proposed for approval of funding from PSDF-

S. No.	Scheme details	Approval from BoD	Estimated Amount (Rs. In Cr.)	A&FS issued on dated	Proposed Grant (%age)
1	Installation of Capacitor Banks on 11 KV side of 33/11 KV Substations of Ajmer Vidyut Vitran Nigam Limited (AVVNL)	Approved	222.37	Issued	90%

A.1.9 PSDF-NLDC in its 66th meeting of TESG held on dated 29.09.2022 has desired the appraisal from Regional Power Committee (NRPC) for the scheme to be funded from PSDF.

A.1.10 AVVNL representative apprised the forum that out of 1974 No. of substations, the proposal is submitted for 732 No. of 33/11 KV substation (719 No. of 3.15 MVA and 5 MVA + 13 No. of 8 MVA). He further added that the capacitor banks will be installed in automatic mode on 11 KV side at substations having power factor less than 0.85 .After installation, the power factor at these substations will improve to above 0.95.

A.1.11 EE (SS) asked RVPN to share with the forum about the effect on power factor at each substation of AVVNL under the scheme, before installation and after installation of capacitor banks.

A.1.12 MS, NRPC enquired about whether these 33/11 KV stations on which the capacitors are proposed are same/superimposing as previously approved DPR (of STU/RVPN) by NRPC on 33 KV side of 132/33 KV substations.

A.1.13 To this, RVPN representative replied that STU and DISCOM proposals have been prepared in isolated manner.

A.1.14 SE, NRPC advised that the scheme need to be taken up in a comprehensive manner and RVPN can look into the matter i.e. the capacitor banks which were previously approved (in 61st NRPC meeting held on 26.12.2022) is to be considered while planning for this new scheme of DISCOMs. This will give a true picture of the need of actual compensation required.

A.1.15 AVVNL representative clarified the forum that the capacitor banks which were previously installed at 33/11 KV substations were battery operated. So, as the battery system became in-operational, the capacitor banks got out of use.

A.2 Installation of Automatic Capacitor Banks (APFC) on 11 KV side of 33/11 KV Substations of Jodhpur Vidyut Vitaran Nigam Ltd. (JdVVNL) for Reactive Power Compensation under Power system Development Fund (PSDF) Phase-I (Agenda by RVPN)

A.2.1 AEE (SS) apprised the forum that due to the spread of population in the remote areas of Rajasthan in recent years, meeting power demand, distribution of electricity and maintaining quality power for every category of consumers has always remained a challenge. The state is primarily agricultural based; and power is supplied to the domestic, non-domestic and industrial sector too. It has been identified that these loads are highly inductive in nature which need rectification.

A.2.2 In this regard, JdVVNL has proposed to install dynamic/ automatic capacitor banks under which the capacitive load helps to adjust power factor as close to 'Unity Power Factor'. The implementation of the project/ scheme will limit the heavy drawl of reactive power from grid and mitigate the risk such as (a) Overloading of transmission lines; (b) Overloading of transformers at different voltage levels; and (c) Increase in system losses.

A.2.3 It has been noticed that the power factor is ranging from 0.80 to 0.90 at urban feeder and 0.75 to 0.80 (or even less) at the rural feeders within the respective circles. In view of this, installation of capacitor banks on 11 kV side of 33/11 kV substations has been proposed at various circles having 'power factor less than 0.85.

A.2.4 JdVVNL proposes installation of capacitor banks at 911 Nos. of 33/11 kV substations out of total 2337 Nos. of substations spread across 12 circles and 10 districts of Rajasthan. Total MVAR installation will be 1829.52 MVAR. Detailed list of these substations have been enclosed with DPR.

A.2.5 Methodology adopted by JDVVNL consists of extracting previous year data from dedicated Feeder Monitoring System (FdrMS) to have greater insights about 'real time'

power supply of 11 kV feeders. The data was further analyzed and cross checked with the field on sample basis to arrive at the conclusion.

A.2.6 Approximately 30 lakh consumers at these 911 Nos. of substations along with the concerned STU (Rajasthan Rajya Vidyut Prasaran Nigam Ltd.) shall be benefitted with these measures.

A.2.7 Total cost of the scheme comes around 296.85 cr. for which detailed cost estimate have been enclosed with the Detailed Project Project (DPR). The same is placed as **Annexure-II**.

A.2.8 Scheme detailed as under is proposed for approval of funding from PSDF-

S. No.	Scheme details	Approval from BoD	Estimated Amount (Rs. In Cr.)	A&FS issued on dated	Proposed Grant (%age)
1	Installation of Capacitor Banks on 11 KV side of 33/11 KV Substations of Jodhpur Vidyut Vitran Nigam Limited (JdVVNL)	22.08.2022	296.85	22.08.2022	90%

A.2.9 PSDF-NLDC in its 66th meeting of TESG held on dated 29.09.2022 has desired the appraisal from Regional Power Committee (NRPC) for the scheme to be funded from PSDF.

A.2.10 Representative from Jodhpur DISCOM was absent in the meeting, therefore no specific discussion on Jodhpur scheme was done.

A.3 Installation of Automatic Capacitor Banks (APFC) on 11 KV side of 33/11 KV Substations of Jaipur Vidyut Vitaran Nigam Ltd. (JVVNL) for Reactive Power Compensation under Power System Development Fund (PSDF) Phase-I (Agenda by RVPN)

A.3.1 AEE (SS) apprised the forum that due to the spread of population in the remote areas of Rajasthan in recent years, meeting power demand, distribution of electricity and maintaining quality power for every category of consumers has always remained a challenge. The state is primarily agricultural based; and power is supplied to the domestic, non-domestic and industrial sector too. It has been identified that these loads are highly inductive in nature which need rectification.

A.3.2 In this regard, JVVNL has proposed to install dynamic/ automatic capacitor banks under which the capacitive load helps to adjust power factor as close to ‘Unity Power Factor’. The implementation of the project/ scheme will limit the heavy drawl of reactive power

from grid and mitigate the risk such as (a) Overloading of transmission lines; (b) Overloading of transformers at different voltage levels; and (c) Increase in system losses.

A.3.3 It has been noticed that the power factor is ranging from 0.80 to 0.90 at urban feeder and 0.75 to 0.80 (or even less) at the rural feeders within the respective circles. In view of this, installation of capacitor banks on 11 kV side of 33/11 kV substations has been proposed at various circles having 'power factor less than 0.85.

A.3.4 JVVNL proposes installation of capacitor banks at 577 Nos. of 33/11 kV substations out of total 1893 Nos. of substations spread across 13 circles and 12 districts of Rajasthan. Total MVAR installation will be 1159.176 MVAR. Detailed list of these substations have been enclosed with DPR.

A.3.5 Methodology adopted by JVVNL consists of extracting previous year data from dedicated Feeder Monitoring System (FdrMS) to have greater insights about 'real time' power supply of 11 kV feeders. The data was further analyzed and cross checked with the field on sample basis to arrive at the conclusion.

A.3.6 Approximately 20 lakh consumers at these 577 Nos. of substations along with the concerned STU (Rajasthan Rajya Vidyut Prasaran Nigam Ltd.) shall be benefitted with these measures.

A.3.7 Total cost of the scheme comes around 180.47 cr. for which detailed cost estimate have been enclosed with the Detailed Project Project (DPR). The same is placed as **Annexure-III.**

A.3.8 Scheme detailed as under is proposed for approval of funding from PSDF-

S. No.	Scheme details	Approval from BoD	Estimated Amount (Rs. In Cr.)	A&FS issued on dated	Proposed Grant (%age)
1	Installation of Capacitor Banks on 11 KV side of 33/11 KV Substations of Jaipur Vidyut Vitran Nigam Limited (JVVNL)	08.08.2022	180.47	08.08.2022	90%

A.3.9 PSDF-NLDC in its 66th meeting of TESG held on dated 29.09.2022 has desired the appraisal from Regional Power Committee (NRPC) for the scheme to be funded from PSDF.

A.3.10 JVVNL representative apprised the forum that at present, no capacitor banks are installed on 33/11 KV substation. The shunt capacitors, which were locally purchased and installed in past, are now in damaged/non-operational condition.

A.3.11 Based on the feeder monitoring system of JVVNL, details of real time voltage and power factor were taken. After studying on the nodes at which power factor is less than 0.85, JVVNL had submitted its feeder wise report.

A.3.12 Based on this, JVVNL had proposed the Automatic power factor controller (APFC) at selected substations. He highlighted that the scheme is similar to one prepared by ERDA for UPCL. Therefore, methodology is proven.

A.3.13 APFC gets in ON condition, when the power factor goes below 0.85 and under OFF condition, when the power factor improves above 0.94. He also stressed upon the fact that there will be no problem of over compensation since the capacitors automatically turn OFF when not required and will turn ON when the need arises.

A.3.14 MS, NRPC enquired regarding the AMC of the shunt capacitors so that they remain in working condition. He asked about whether the PSDF funding is for composite tendering i.e. both CAPEX and OPEX or the tendering is for CAPEX only.

A.3.15 To this, JVVNL replied that, in the revised DPR, the total cost estimation for the scheme is 132 Cr (excluding maintenance cost) and the cost of maintenance will be borne by JVVNL.

A.3.16 Detailed justification as apprised by JVVNL representative is attached as **Annexure-IV**.

A.3.17 NRLDC representative stated that performance of APFC viz-a-viz voltage based operation of capacitor bank may be analysed.

A.3.18 It was also apprised by JVVNL that CTU has given remarks on the scheme that provision of capacitor at 11kV side of 33/11kV substation wouldn't be very effective for controlling voltage at 11 kV feeder end. Capacitor at the end of radial 11 kV feeder and capacitor bank at 33/11 kV substation would be better proposal for control of voltage and of losses as done by Telangana.

A.3.19 On CTU comment, JVVNL apprised that from 2016-17 onwards, JVVNL has installed approx 5,62,323 nos of LT Shunt Capacitors (3 kVAr 6 kVAr 9 kVAr), however, due to smaller impact of power factor improvement, burning/ failure and theft related issues, JVVNL has resorted for installation of APFC at substation level so as to avoid the challenges associated with the installation at load end. Therefore, even though capacitor at the end of Radial 11 KV Feeder and Capacitor Bank at 33 11 KV substation would be better proposal for control of voltage and losses, however, based on past experience of JVVNL, it is also imperative to address the challenges associated with wide scale of maintenance requirement, equipment safety and effective monitoring Therefore, it is recommended that the committee may consider the

proposal of JVVNL for installation of capacitor bank on the 11 kV side of 33 11 kV Sub stations only.

Decision of forum:

After deliberation of above 3 agenda regarding proposals of AVVNL, JdVVNL, JVVNL, following were decided:

i. *Revised DPRs, submitted by Rajasthan to PSDF Sectt, may be submitted to NRPC Sectt. also.*
ii. *Rajasthan shall inform the status of defective capacitors out of already installed capacitors at respective sub-stations.*
iii. *Rajasthan shall inform whether the already installed capacitors (at a sub-station) has been included while planning the proposed scheme.*
iv. *Rajasthan shall submit the performance/study of APFC viz-a-viz voltage based operation of capacitor bank and appropriate location. Case of Telangana may be referred in this regard as suggested by CTU.*
v. *A comprehensive study may be done by Rajasthan for both STU (approved in 61st NRPC meeting) and DISCOMs proposal so that any case of over-compensation may be avoided and PSDF Fund may be granted rationally.*
vi. *AVVNL shall submit the power factor pre-installation and post-installation of capacitor banks at the substations.*
vii. *After submission of above documents, the matter may be put up to NRPC Sectt. again.*

The meeting ended with thanks to the chair.

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RAJASTHAN RAJYA VIDYUT PRASARAN NIGAM LIMITED.
[Corporate Identity Number (CIN):U40109RJ2000SGC016485]
(Regd. Office: Vidyut Bhawan, Jan Path, Jyoti Nagar, Jaipur - 302 005)
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RVPN
An ISO 9001:2015 Certified Company

15 YEARS OF CELEBRATING THE MAHATMA

No. RVPN/SE(P&P)/XEN -2/AE-III/ F. /D 1712 Jaipur, Dt. 13/12/2022

Member Secretary
Northern Regional Power Committee,
18-A, Shaheed Jeet Singh Marg, Katwaria Sarai,
New Delhi-110016

Sub: Submission of agenda note for consideration and approval of Installation of Capacitor Banks on 11 KV Side 33/11 KV Substations of Ajmer DISCOM (Rajasthan) for Reactive Power Compensation under Power system Development Fund (PSDF)-Phase 'I'.

Dear Sir,

On the above captioned subject, kindly find enclosed herewith the agenda note for Installation of Capacitor Banks on 11 KV Side 33/11 KV Substations of Ajmer DISCOM (Rajasthan) for Reactive Power Compensation under Power system Development Fund. Summary of the scheme is mentioned below:-

S. No.	Scheme details	Estimated Amount (Rs. In Cr.)
1	Installation of Capacitor Banks on 11 KV Side 33/11 KV Substations of Ajmer Vidyut Vitran Nigam Limited (AVVNL)	222.37

Enclosure:

1. Agenda Note of AVVNL
2. Annexure A- DPR provided by AVVNL
3. Annexure B- RERC Order dated 24.03.2001
4. Annexure-C- Rajasthan Electricity Grid Code, 2008
5. Annexure-D- Format A5: Appraisal by STU

(S.C.Meena)
Chief Engineer (PP&D)

Brief Details of the Project Appraisal by CTU / STU / RPC

The applicant utility shall submit project appraisal by CTU / STU / RPC in the given format and a copy of the Appraisal Report should be attached at Annexure.

Item	Details to be filled by Applicant Utility	
Appraisal By:	STU [■] CTU [ ] RPC [ ]	
Date of Submission to CTU / STU / RPC for approval	Scheme was submitted to Rajasthan Rajya Vidyut Prasaran Nigam Ltd. (STU) by AVVNL on dated 01.12.2022.	
Name of the Scheme	Installation of Dynamic/Automatic capacitor banks on 11 kV side of 33/11 kV substations of Ajmer Vidyut Vitran Nigam Limited (AVVNL) under PSDF-Phase-I	
Copy of the Appraisal Report by CTU / STU / RPC is Attached at Annexure	Yes [■] No [ ] **[DPR enclosed at Enclosure-1)]**	
Summary of observations from CTU/ STU/RPC Appraisal Report	Summary of Proposal Appraised	The DPR has been prepared so as to improve & strengthen the operational reliability, enhancement of system, real-time data capturing and better management of reactive power.
	Technical Observations	As per the order of Rajasthan Electricity Regulatory Commission (RERC) dated 24.03.2001, 50% of the total MVAR requirement (presently approx. 10000 MVAR) shall be compensated by RVPN, while remaining 50% shall be compensated by remaining DISCOMs (16.6% by each DISCOM). This project report proposes installation of 1465 MVAR which is justified given their target of 1660 MVAR for operational reliability and effective voltage control.
	Financial Observations	As per guideline/procedure for disbursement of funds from PSDF in category 5.1(b), this scheme may be posed for funding/ grant from PSDF fund on 90% basis.
	Compliance of Grid Standards / Codes by the Applicant	All the grid standards, IS, IEC required, shall be followed for implementation of the scheme
	Limitations / Shortcomings pointed out by CTU/STU/RPC if any	NIL
	Recommendations of CTU/STU/RPC	The scheme may be posed for funding/ grant from PSDF fund.

Date:-

Chief Engineer (PP&D)
RVPN, Jaipur

Item No.
Agenda note for decision.

Agenda note for consideration and approval of Installation of Capacitor Banks on 11 KV Side 33/11 KV Substations of Ajmer DISCOM (Rajasthan) for Reactive Power Compensation under Power system Development Fund (PSDF)-Phase 'I'.

I

The proposal herein is to accord approval of Installation of Capacitor Banks on 11 KV Side 33/11 KV Substations of Ajmer DISCOM (Rajasthan) for Reactive Power Compensation under Power system Development Fund (PSDF)-Phase 'I'.

II

Power System Development Fund (PSDF) provides grant for improvement of Transmission System. PSDF provides fund for the following categories-

a) Creating necessary transmission system of strategic importance based on operational feedback by load dispatch centers for relieving congestion in interstate transmission system and intrastate system which are incidental to ISTS.
b) Installation of shunt capacitor, series compensators and other reactive energy generators including reactive energy absorption, dynamic reactive support etc. for improvement of voltage profile in the Grid.
c) Installation of standard and special protection schemes, pilot and demonstrative projects, projects for setting right the discrepancies identified in the protection audit on regional basis, any communication/ measurement / monitoring schemes including installation of Phasor Measurement Units (PMUs) etc.
d) Renovation & Modernization of transmission and distribution system for relieving congestion.
e) Any other scheme/project in furtherance of the above objectives, such as conducting technical studies and capacity building etc.
f) Other schemes benefitting large number of utilities collectively and having a significant impact towards the power system development and Grid operation, on case to case basis.

Presently, scheme detailed as under are posed for approval of funding from PSDF.

S. No.	Scheme details	Approval from BoD	Estimated Amount (Rs. In Cr.)	A&FS issued on dated	Proposed Grant (%age)
1	Installation of Capacitor Banks on 11 KV Side 33/11 KV Substations of Ajmer Vidyut Vitran Nigam Limited (AVVNL)	Approved	222.37	Issued	90%

PSDF-NLDC in its 66th meeting of TESG held on dated 29.09.2022 has desired the appraisal from regional power committee (NRPC) for the scheme to be funded from PSDF.

Brief note on the scheme-

1. Due to the spread of population in the remote areas of Rajasthan in recent years, meeting power demand, distribution of electricity and maintaining quality power for every category of consumers has always remained a challenge. The state is primarily agricultural base; and power is supplied to the domestic, non-domestic and industrial sector too. It has been identified that these loads are highly inductive in nature which need rectification.

2. In this regard, AVVNL has proposed to install dynamic/ automatic capacitor banks under which the capacitive load helps to adjust power factor as close to 'Unity Power Factor'. The implementation of the project/ scheme will limit the heavy drawl of reactive power from grid and mitigate the risk such as (a) Overloading of transmission lines; (b) Overloading of transformers at different voltage levels; and (c) Increase in system losses.

3. It has been noticed that the power factor is ranging from 0.80 to 0.90 at urban feeder and 0.75 to 0.80 (or even less) at the rural feeders within the respective circles. In view of this, installation of capacitor banks on 11 kV side of 33/11 kV substations has been proposed at various circles having 'power factor less than 0.85.

4. AVVNL proposes installation of ***capacitor banks at 732 Nos. of 33/11 kV substations*** out of total 1974 Nos. of substations spread across 12 circles and 11 districts of Rajasthan. ***Total MVAR installation will be 1464.80 MVAR.*** Detailed list of these substations have been enclosed with DPR.

5. Methodology adopted by AVVNL consists of extracting previous year data from dedicated Feeder Monitoring System (FdrMS) to have greater insights about ***'real time'*** power supply of 11 kV feeders. The data was further analyzed and cross checked with the field on sample basis to arrive at the conclusion.

6. Approximately 20 lakh consumers at these 732 Nos. of substations along with the concerned STU (Rajasthan Rajya Vidyut Prasaran Nigam Ltd.) shall be benefitted with these measures.

7. Total cost of the scheme comes around 222.37 cr. for which detailed cost estimated have been enclosed with the DPR.

Detailed Project Project (DPR) is placed as Annexure-A.

Appraisal by the STU (Rajasthan Rajya Vidyut Prasaran Nigam Ltd. (RVPNL))-

RVPNL understands that proposal by AVVNL to install 732 Nos. of capacitor banks at 11 kV side on their 33/11 kV substations in technically and financially justified.

As per the order of Rajasthan Electricity Regulatory Commission (RERC) dated 24.03.2001, 50% of the total MVAR requirement (presently approx. 10000 MVAR) shall be compensated by RVPN, while remaining 50% shall be compensated by remaining DISCOMs (16.6% by each DISCOM). (Copy of the order enclosed as Annexure-B).

Further**,** The clause no. 11.4 of Rajasthan Electricity Grid Code, 2008 states that *"The DISCOMs shall participate in voltage management by providing Local VAR compensation as far as possible, in low voltage system close to load points not depending on EHV Grid for reactive support."* (Copy of the clause enclosed as Annexure-C).

This project report proposes installation of approx. 1465 MVAR which is justified given their target of 1660 MVAR for operational reliability and effective voltage control. Thus, as per appraisal of RVPN (STU), this scheme is technically & commercially justified. (Appraisal by STU in Format-A5 has been enclosed as Annexure-D).

III

The agenda is hereby placed before NRPC for approval, after appraisal of RVPN (STU) in Annexure A5 of following scheme for further submission to NLDC-PSDF for availing 90% grant:

S. No.	Scheme details	Estimated Amount (Rs. In Cr.)
1	Installation of Capacitor Banks on 11 KV Side 33/11 KV Substations of Ajmer Vidyut Vitran Nigam Limited (AVVNL)	222.37

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Format A1
Page 1 of 1

SUMMARY OF PROPOSAL

For Official Use - To be filled by the Nodal Agency	
Project Proposal Number : _____	Date of Receipt : _____

To be filled by the Requesting Organization / Project Entity	
1. Name of the requesting Organization / Utility :	**Ajmer Vidyut Vitran Nigam Limited**
2. Short Summary of Project / Scheme / Activity	
a. Name and location of the Project / Scheme / Activity :	**Provision of 11 kV Dynamic/ Automatic Switched Capacitor Bank at various 33/11 kV Sub-stations**
b. Objective of the Project / Scheme / Activity :	**To improve power factor and hence reduce reactive current (reduction of T&D Loss), improvement in voltage profile, reduction in demand at various 33/11 kV Power Transformers**
c. Authorized Person For this Project / Scheme / Activity	Name : **Mr. M C Baldi (Add. Chief Engineer – Projects))** E-mail ID : **ceprojectavvnl2022@gmail.com** Land line No : **-NA-** Mobile No. : **+91-95303 90999** Fax No : **NA**
d. Nature of the Project / Scheme / Activity: Inter – State / Intra – State (Please Specify)	**Inter State**
e. Identified Beneficiaries	**Rajasthan State (in particular) & Nation (in general)**
f. Merits of the scheme	**With implementation of the scheme , overall redundancy in the system will be provided.**
g. Limitations, if any	**No limitation envisaged**
h. Time frame for Implementation	**The scheme is scheduled to be completed within 15 months progressively from date of receipt of sanction of grant/ fund.**
i. Estimated Cost of Project / Scheme / Activity	**Rs 222.37 Crores**
j. Category under which the project is classified (Please refer Para 5.1 of the Guidelines/Procedure)	**5.1 (b) of Guidelines/ Procedure (PSDF)**

Signature: _____

Date: 08 SEP 2022

Name: **M C Baldi**

(Authorized Representative)

DETAILED PROPOSAL (DP)

1. Details of the Requesting Organization / Project Entity

1.1 Details of Organization / Entity

Name of Organization / Entity	**Ajmer Vidyut Vitran Nigam Limited**
Acronym or Abbreviation (if applicable)	**AVVNL**

1.2 Details of Head of the Organization

Name (Mr / Ms / Mrs)	**Mr. N S Nirwan**
Designation	**Managing Director, AVVNL, Ajmer, Rajasthan**
E-mail Address	**md.avvnl@rajasthan.gov.in**
Landline No.	**0145-2644551**
Fax No.	**-NA-**
Address	**Vidyut Bhawan, Panchsheel Nagar, Makarwali Road, Ajmer (Raj)**
City	**Ajmer**
Postal Code	**305001**

1.3 Details of Project Incharge/ Project Manager (Authorized Person) for this project/ scheme/ activity (Not below the rank of Dy. General Manager/ Superintending Engineer)

Name (Mr / Ms / Mrs)	**-Mr. M C Baldi**
Designation	**Add. Chief Engineer - Projects**
E-mail Address	**-ceprojectavvnl2022@gmail.com**
Landline No.	**NA**
Mobile No.	**+91-95303 90999**
Fax No.	**-**
Address	**Vidyut Bhawan, Panchsheel Nagar, Makarwali Road, Ajmer (Raj)**
City	**Ajmer**
Postal Code	**-**

Any Change in above mentioned details may be notified to the Nodal Agency of PSDF immediately.

2. Justification of the Proposal

2.1 Analysis of the Objective

Rajasthan is the largest state in the country, in terms of area, spreading across 3,42,239 Sq. km, which is 10.41% of the nation area. The total population of Rajasthan is nearly 8.1 Crores spread across 33 Districts, of which 75% is rural population. The density of population in Rajasthan is 200 per sq.km which is much lower than the national average of 382 per sq.km. The state is, predominantly, an agrarian society with majority (45%) of the population depending on agriculture activities as source of income, which accounts for around 29.5% of Gross State Domestic Product (GSDP).

- Due to this spread of population, meeting power demand, distribution of electricity and maintaining quality power for every category of consumers has always remained a challenge. The state is primarily agricultural base; however, the intensive power is too supplied to the domestic, non-domestic and industrial sector. It has been identified that these loads are highly inductive in nature which need rectification. In this regard, AVVNL has **proposed to install dynamic/ automatic capacitor bank** under

which the capacitive load helps to adjust power factor as close to **'Unity Power Factor'**. The implementation of the project/ scheme will limit the heavy drawal of reactive power from grid and mitigate the risk such as **(a) Overloading of transmission lines; (b) Overloading of transformers at different voltage levels; and (c) Increase in system losses.**

Under AVVNL Discom, efforts have continuously been made to provide requisite reactive power compensation; however, the challenge associated with low voltage at the load end and drawl of heavy reactive power from the grid still persists due to fast growing load demand. Additionally, it has been noticed that the power factor is ranging from 0.80 to 0.90 at urban feeder and 0.75 to 0.80 (or even less) at the rural feeders within the respective circles. In view of this, the provision for the installation of shunt capacitor has been proposed at various circles having power factor less than 0.85 so that it would result in following advantages as stated below.

1. **Advantages to the Consumers**
   - A substantial reduction in the power cost, due to reduced kVA demand and elimination of penalty for low power factor *(where tariff is based on kVA demand)*.
   - Reduced over-loading means reduced losses and less heating in consumer's equipments, such as, cables, motors etc.
   - A more stable voltage, which means a better and more efficient performance of the motors.
   - Connection of more consumers' equipment to the same installation.

2. **Advantages to Power Supply Utility**
   - Reduction of losses in lines and transformers.
   - Release of power system capacity enables additional load to be connected on the same system without capital investment on additional equipment.
   - Improvement in Voltage Level.
   - Reduction of over loading means less heating of cables, conductors, transformers etc.
   - A better utilization of the capacity of the generators, transformers, switchgear, cables, lines, etc., means increase in efficiency of the system.
   - Reduced depreciation charges on capital outlay and less capital investment.
   - Reduced reactive power drawn charges to NRLDC.

3. **Reduction of Overall Technical & Commercial Losses**

2.2 Identified Beneficiaries of the Project

Adequate reactive power compensation offered salient benefits to the power system which includes voltage regulation (i.e., voltage control within acceptable limits), system power losses reduction brought about by power factor improvement and it increases the utilization of connected equipments at the consumer end, improves reliability of transmission system and more importantly efficiency of real power made available at the consumer end. Hence, the identified beneficiaries of the project shall be (a) Rajasthan State (in particular), including Rajasthan Rajya Vidyut Prasaran Nigam Limited & Ajmer Vidyut Vitran Nigam Limited *(Approx. 20 Lakhs Consumers under 12 Circles)* and Nation (in general).

2.3 *Identified Source of Funding*

90% of the total project cost estimate is to be funded through grant from PSDF, balance amount will be contributed from internal resources.

2.4 Details of Activities for Project/ Scheme/ Activity

After getting approval of the project towards funding, the following activity will be undertaken to achieve desired results:

1. Identification of phases (I & II) based on total number of 33/11 kV sub-stations and approved/ sanctioned amount.
2. Formulation and conduct of tendering process on turnkey basis and from reputed manufacturer.
3. Issuance of LoI/ LoA/ work order to L1 (lowest) bidder/ contractor/ vendor etc.
4. Placement of erection & commissioning order.
5. Regular monitoring & controlling of technical and financial aspects.

The project incharge/ project manager/ area manager in the rank of superintending engineer will supervise the overall project work in their respective jurisdiction, further progresses of work are being reviewed monthly at head quarter by the Manging Director, AVVNL with representation from all authorised person.

2.5 Executing Agency

The project will be implemented at different 33/11 kV sub-stations located at different circles under AVVNL jurisdiction, as such it will be implemented by contracting agency to whom work order is awarded.

2.6 Timeline for Implementation of Project/ Scheme/ Activity

Timeline for implementation of the proposed project/ scheme is provided below under considering date of receipt of PSDF grant approval as 'Zero Date':

1. **Finalization of Tender Documents & Issuance of Work Order:** 03 Months
2. **Procurement, Installation, Commissioning & Testing of Equipments:** 12 Months (Progressive Basis)
3. **Cost Benefit Analysis & Report Submission on Improved Power Factor:** Last Month

Timeline of the Project/ Scheme/ Activity	
Duration of Project (in Months)	15 Months (3 Months - Preparation + 12 Months - Implementation)
Likely Start Date	Date of Receipt of Approval from PSDF Funding
Likely Completion Date	31 October 2023

Sr. No.	Description	Detailed Timeline of the Project/ Scheme/ Activity														
		FY 2022-23								FY 2023-24						
		Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23
Finalization of Tender Documents & Issuance of Work Order																
1	Project Approval															
2	Conduct of Committee Meeting															
3	Preparation & Release of Tender Document															
4	Evaluation, Contract Award and Mobilization															
Procurement, Installation, Commissioning & Testing of Equipments																
5	1st Disbursement (30% of Grant)				D1											
6	Procurement, Installation, Commissioning & Testing of Equipments				Progressive Basis											
7	Bi-monthly Review Meeting															
8	Monthly Report Submission															
9	2nd Disbursement (60% of Grant) i.e. After Utalization of 30% Grant + 10% Self-contribution (JVVNL)						D2									
Cost Benefit Analysis & Report Submission on Improved Power Factor																
10	Final Report Submission															
11	3rd Disbursement (10% of Grant) i.e. On Completion of Scheme															D3

Date: 08 SEP 2022

Signature: _____

Name: **M C Baldi**

(Authorized Representative)

Summary of Detailed Project Report (DPR)

The scheme is to provide an effective control of capacitor bank installations in sub-stations to maintain power factor under varying load conditions, for any sub-station load on transformer changes during a 24 hours daily load cycle. This variation of load depends upon type of load i.e. urban, rural, agricultural, industrial load etc. The load pattern will be different for different loads. Thus, load variation will follow certain pattern, and which could be divided into four or six periods in a 24 hours daily load cycle. Power factor would also vary and at the same time actual requirement of Capacitors in circuit will also vary. If steps are provided with capacitor banks to switch them as required, it will help the Electricity Supply Authority to maintain the power factor at desired level throughout the day. This load variation has been observed to change from 8% to 100%.

Outdoor type H.T. capacitor bank with facility of automatic switching of required number of steps with the help of capacitor switch. The bank comprising of externally Single Star Connected Capacitor Bank, 0.2% Series Reactors for switching inrush current suppression at neutral end, Vacuum Contactor for capacitor switching, HRC Fuses , RVT for unbalance protection and CRCA cubicle panel to accommodates all components stated above.

Hence, AVVNL Discom has finalized and decided to install dynamic/ automatic capacitor bank on the various MVA ratings power transformer installed at various 33/11 kV sub-stations. The detailed list on which work will be carried out is enclosed under **Annexure – 'I'** of DPR.

Sr. No.	Transformer Capacity (In MVA)	Proposed Quantity (In Nos.)
1	3.15/ 5	719
2	8	13
Total		**732**

Summary of DPR given - Yes **Copy of the DPR attached – Yes**

Cost Break-up of Sub-station Equipment

Name of the Substation : -NA-

Sr. No.	Description of the Equipment to be replaced (rating, type)	Unit (Nos./Set)	Quantity	Rate including taxes	Total	Spares	Erection/ Civil Works	Total
400 kV	-NA-							
220 kV	-NA-							

Note : One table for each substation

	Abstract Cost Estimate Sub-station (Rs. In Lacs)						
Sr. No.	Description of Equipment	Sub-station Name-1	Sub-station Name-2	Sub-station Name-3	.	.	Total
400 kV	-NA-						
220 kV	-NA-						

Details of Existing Equipment

Name of the Substation : -NA-

Sl. No.	Name of Feeder	Equipment Name	Year of Manufacturing and make	Date of Commissioning	Voltage	No. of cores available (in case of CT/PT)	Type of insulation /operation	Tagged for replacement (yes/no)	Reason for replacement
400 kV	-NA-								
220 kV	-NA-								

Note : One table for each substation

Abstract Quantity Estimate Sub-station							
Sr. No.	Description of Equipment	Sub-station Name-1	Sub-station Name-2	Sub-station Name-3	.	.	Total
400 kV	-NA-						
220 kV	-NA-						

Implementation Schedule/ *Milestones

Particular	Total	Quarter 1	Quarter 2	Quarter 3	Quarter 4
1980 kVAr	719	250	200	150	119
3168 kVAr	13	-	-	-	13

For Financial Milestone

Particular	Total (Rs. Cr.)	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Power Factor Improvement Cost	222.37	75.72	60.58	45.43	40.64

***Note:** The above implementation schedule/ milestones are tentative and may vary during the tender period.

Date: 08 SEP 2022

Signature: 

Name: **M C Baldi**

(Authorized Representative)

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Total Page 3

Financial Implication of the Scheme

*(**Guidelines:** The financial implications of the proposal may be worked out as accurately as possible and should be detailed in this section. Further, the manner in which the expenditure is proposed to be borne may also be clearly indicated. Please provide the project cost estimate for its scheduled duration along with a break-up of year-wise, component-wise expenses segregated into non-recurring and recurring expenses.)*

1. Summary

S.No.	Item	Amount (Rs. Cr.)
1.	Total Cost Estimate	**222.37**
2.	Funding Proposed from PSDF	**200.13**
3.	Contribution from Internal Sources	**22.24**
4.	External Borrowings	**-NIL-**

2. Details

2.1 Cost Estimate

Cost break-up of 11 kV Switched Capacitor Bank at 3.15 / 5 MVA Power Transformer

Sl. No.	Name of Items	Unit	Qty.	Unit FOR Destination Supply Prices including GST (Rs.)	Unit Erection & Maintenance Charges Incl. GST (Rs.)
1	2	3	4	5	6
1	12.65 kV, **1980 kVAr**, 3-Phase, 50 C/s housed in Outdoor Type CRCA Panel, Capacitor Bank having two variable step of 792 kVAr & one variable steps of 396 kVAr. Bank shall be complete with capacitor units of 264/132 kVAr, aluminium busbars, pin & post insulators, HRC fuses, surge arrestor etc. with details as under.	Nos.	1	17,50,000	5, 50,000
	11 kV, Aluminum Wound, Dry type Series Reactors				
a)	0.26 kVAr for 396 kVAr step	Nos.	3		
b)	0.52 kVAr for 792 kVAr step	Nos.	6		
c)	11 kV, 3-Phase dry type RVT	No.	1		
d)	12 kV 3 Phase Indoor type metal enclosed Vacuum Capacitor Switches.	Nos.	3		

e)	Indoor Type Automatic Control Unit	No.	1		
f)	IP 55 , Outdoor CRCA cubicle panel for accommodating capacitors, series reactor, vacuum contactor, surge arrestor fuses along with canaopy	Set	1		
2	11 kV, 400 Amp, Off Load Isolator with earth switch and mounting structure.	No.	1	40,000	5,000
3	9 kV, 10 kA, Station Class, Lightning Arrestors	Nos.	3	15,000	2,000
4	Control cables, lugs/thimble, Junction Box etc.	Set	1	35,000	-
5	11 kV XLPE insulated 3x185 mm^2 Armoured	Mtr.	50	18,770	5,000
6	**Heat Shrinkable Jointing kit for 11 kV 3x185 Sq. mm. XLPE Cable**				
a)	Indoor termination kit	No.	2	12,000	5,000
b)	Outdoor termination kit	No.	2	12,000	5,000
7	11 kV VCB (Kiosks) Switchgear with complete arrangement with adopter panel for connection with existing 11 kV bus bar.	No.	1	3,80,355	40,000
8	Casting of Civil foundation	Set	1	-	75,000
9	Cable trench for laying of power/control cables.	Rmt	25	-	4,000
10	Earthing for Panel and LAs by pipe in pipe earthing	Nos.	2	-	25,000
11	24 Volt Battery with Battery Charger	No	1	50,000	-
			TOTAL	**23,13,125**	**7,16,000**
	Grand Total (In Words: Thirty Lakhs Twenty Nine Thousand One Hundred Twenty Five Rupees Only)				**30,29,125**

Cost break-up of 11 kV Switched Capacitor Bank at 8 MVA Power Transformers

Sl. No.	Name of Items	Unit	Qty.	Unit FOR Destination Supply Prices with all taxes Supply (Rs.)	Unit Erection & Maintenance Charges Incl. Service Tax (Rs.)
1	**2**	**3**	**4**	**5**	**6**
1	12.65 kV, **3168 kVAr**, 3-Phase, 50 C/s housed in Outdoor Type CRCA Panel, Capacitor bank having three variable step of 792 kVAr & two variable steps of 396 kVAr. Bank shall be complete with Capacitor units of 264/132 kVAr, Aluminum busbars, Pin & Post insulators, HRC fuses, Surge arrestor etc. with details as under.	Nos.	1	22,15,000	5, 70,000
	11 kV, Aluminum Wound, Dry type Series reactors				

a)	0.52 kVAr for 792 kVAr step	Nos.	9		
b)	0.26 kVAr for 396 kVAr step	Nos.	6		
c)	11 kV, 3-Phase dry type RVT	No.	1		
d)	12 kV 3 Phase Indoor type metal enclosed Vacuum Capacitor switches.	Nos.	4		
e)	Indoor Type Automatic Control Unit	No.	1		
f)	IP 55 , Outdoor CRCA cubicle Panel for accommodating capacitors, Series Reactor, Vacuum contactor, Surge arrestor, Fuses along with Canaopy	Set	1		
2	11 kV, 400 Amp, Off Load Isolator with earth switch and mounting structure.	No.	1	40,000	5,000
3	9 kV, 10 kA Station Class, Lightning Arrestors	Nos.	3	15,000	2,000
4	Control cables, lugs/ thimble, Junction Box etc.	Set	1	35,000	-
5	11 KV XLPE insulated 3x185 mm^2 Armoured	Mtr.	50	18,770	5,000
6	**Heat Shrinkable Jointing kit for 11 kV 3x185 Sq. mm. XLPE Cable**				
a)	Indoor termination kit	No.	2	12,000	5,000
b)	Outdoor termination kit	No.	2	12,000	5,000
7	11 kV VCB (Kiosks) Switchgear with complete arrangement with adopter panel for connection with existing 11 kV bus bar.	No.	1	3,80,355	40,000
8	Casting of Civil foundation	Set	1	-	90,000
9	Cable trench for laying of power/control cables.	Rmt	25	-	4,000
10	Earthing for Panel and LA by pipe in pipe earthing	Nos.	2	-	25,000
11	24 V Battery with Battery Charger	No	1	50,000	-
			TOTAL	**27,78,125**	**7,51,000**
Grand Total (In Words: Thirty-Five Lakhs Twenty Nine Thousand One Hundred Twenty Five Rupees Only)					**35,29,129**

3. Funding

3.1 **Funding Proposed from PSDF as grant:** Rs. 200.13 Cr.

3.2 **Contribution from Internal Sources:** Rs. 22.24 Cr.

3.3 External Borrowings: -NIL-

Signature: MBaldi

Name: **M C Baldi**

(Authorized Representative)

Date: 08 SEP 2022

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Page 1 of 1

Brief Details of the Project Appraisal by CTU / STU / RPC

The applicant utility shall submit project appraisal by CTU / STU / RPC in the given format and a copy of the Appraisal Report should be attached at Annexure.

Item	Details to be filled by Applicant Utility	
Appraisal By:	**CTU** ☐ **STU** ☐ **RPC** ☐	
Date of Submission to CTU / STU / RPC for approval		
Name of the Scheme	**Installation of Capacitor Banks on 11 kV Side of 33/11 kV Substations for Reactive Power Compensation under Power System Development Fund (PSDF)**	
Details of the Appraisal Report by CTU / STU / RPC (Attached at Annexure)	**Reference. No :** _____ **Date:** _____	
Summary of observations from CTU/ STU/RPC Appraisal Report	Summary of Proposal Appraised	
	Technical Observations	
	Financial Observations	
	Compliance of Grid Standards / Codes by the Applicant	
	Limitations / Shortcomings pointed out by CTU/STU/RPC if any	
	Recommendations of CTU/STU/RPC	

Signature: _____

Date: 08 SEP 2022

Name: **M C Baldi**

(Authorized Representative)

UNDERTAKING

(On a Non-judicial Stamp paper of Rs. 50 only duly notarized and attested)

I, **Mr. Mukesh Chandra Baldi** son of **Shri** M.C. Baldi **resident of 701, CMD Tower, Civil Lines, Ajmer Rajasthan** and presently working as Add. Chief **Engineer (Projects)** in the **Ajmer Vidyut Vitran Nigam Limited, Jaipur (Rajasthan)** hereby undertake to comply with the following terms and conditions with regard to funding of the **"Installation of Capacitor Banks on 11 kV Side of 33/11 kV Substations for Reactive Power Compensation under Power System Development Fund (PSDF)** (name of the scheme) with disbursement from PSDF:

- **No tariff shall be claimed for the portion of the scheme funded from PSDF.**
- **Amount of grant shall be refunded in case of transfer/ disposal of the facility being created under this proposal to any other scheme for funding.**
- **Shall specifically mention if for the scheme under the proposal, the grant from any other agency is being taken/ proposed to be taken.**
- **The grant shall be refunded back to PSDF in case of non-utilisation of the grant within one year of release of instalment.**

Signature: _____

Date: 08 SEP 2022

Name: **M C Baldi**

(Authorized Representative)

AJMER VIDYUT VITRAN NIGAM LIMITED
Corporate Identification Number (CIN)- U40109RJ2000SGC016482
Regd. off. Vidyut Bhawan, Panchsheel Nagar, Makarwali Road, ajmer-305004
Office of the Add. Chief Engineer (Projects)
Phone:- 0145-2644551, Email Id:- ceprojectavvnl2022@gmail.com, Website –http://energy.rajasthan.gov.in/avvnl

No. AVVNL/ACE(Projects)/Ajmer/F.PSDF/D- 545 **Dt.** 08 SEP 2022

Sh. Debasis De
Executive Director, NLDC
Member Secretary of the Appraisal Committee of PSDF
Power System Operation Corporation Ltd.
B-9, Qutub Institutional Area, Katwaria Sarai,
New Delhi-110016

Sub: Submission of DPR for installation of dynamic/ automatic Capacitor Banks on 11 kV Side of selected 33/11 kV sub-stations of AVVNL under Power System Development Fund (PSDF Scheme)

Kindly find enclosed herewith the DPR for installation of dynamic/ automatic Capacitor Banks on 11 kV Side of selected 33/11 kV sub-stations of AVVNL under Power System Development Fund (PSDF Scheme) amounting to Rs 222.37 Cr for your further needful at your level and fund approval.
The DPR has been approved by the Board of Directors (BoD) of AVVNL.

Enclosed: Approved DPR in original

(M C Baldi)
Add. Chief Engineer (Projects)
AVVNL, Ajmer

Copy submitted / forwarded to the following:

1. The TA to Chairman Discoms for kind perusal of Chairman Sb.
2. The TA to Managing Director, AVVNL, Ajmer for kind perusal of MD Sb.
3. The PA to Director (Tech/Fin), AVVNL, Ajmer for kind perusal of Director Sb.

Add. Chief Engineer (Projects)
AVVNL, Ajmer

ANNEXURE 'B'

DETAILED PROJECT REPORT (DPR)

FOR

System Improvement Scheme

Installation of Capacitor Banks on11 kV Side of 33/11kV Substations for Reactive Power Compensation under Power System Development Fund (PSDF) – Phase 'I'

Estimated Cost: Rs. 222.37 Cr.

AJMER VIDYUT VITRAN NIGAM LIMITED

Corporate Identification Number (CIN): U40109RJ2000SGC016482
Office of the Add. Chief Engineer (Projects)
VidyutBhawan, Panchsheel Nagar, Makarwali Road, Ajmer-305004

Email –ceprojectavvnl2022@gmail.com

Website:www.energy.rajasthan.gov.in/avvnl

DETAILED PROJECT REPORT

INTRODUCTION

Rajasthan is the largest state in the country, in terms of area, spreading across 3,42,239 Sq. km, which is 10.41% of the nation area. The total population of Rajasthan is nearly 8.1 Crores spread across 33 Districts, of which 75% is rural population. The density of population in Rajasthan is 200 per sq.km which is much lower than the national average of 382 per sq.km. The state is, predominantly, an agrarian society with majority (45%) of the population depending on agriculture activities as source of income, which accounts for around 29.5% of Gross State Domestic Product (GSDP).

Due to this spread of population, meeting power demand, distribution of electricity and maintaining quality power for every category of consumers has always remained a challenge. The state is primarily agricultural base; however, the intensive power is too supplied to the domestic, non-domestic and industrial sector. It has been identified that these loads are highly inductive in nature which need rectification. In this regard, AVVNL has proposed to install dynamic/ automatic capacitor bank under which the capacitive load helps to adjust power factor as close to **'Unity Power Factor'**. The implementation of the project/ scheme will limit the heavy drawal of reactive power from grid and mitigate the risk such as **(a) Overloading of transmission lines; (b) Overloading of transformers at different voltage levels; and (c) Increase in system losses.**

Under AVVNL Discom, efforts have continuously been made to provide requisite reactive power compensation; however, the challenge associated with low voltage at the load end and drawl of heavy reactive power from the grid still persists due to fast growing load demand. Additionally, it has been noticed that the power factor is ranging from 0.80 to 0.90 at urban feeder and 0.75 to 0.80 (or even less) at the rural feeders within the respective circles. In view of this, the **provision through submission of detailed project report has been proposed at various circles having 'power factor less than 0.85'**. The report shall consist of brief background of AVVNL Discom, geographical maps, operational profile, objective, beneficiaries, recent initiatives, technology, cost estimates, timeframe, success criteria etc.

OUR PROPOSAL

1. BACKGROUND

1.1. Introduction

Ajmer Vidyut Vitran Nigam Limited (AVVNL) is a public utility company under the Department of Energy, Government of Rajasthan and is holder of the distribution and retail supply business licenses in the State of Rajasthan *(hereafter referred as "DISCOM")*. The Distribution Company came in to existence on 19 July 2000 pursuant to the "Rajasthan Power Sector Reforms Transfer Scheme, 2000" and restructuring undertaken in the State under which the vertically integrated Electricity Board *(Rajasthan State Electricity Board)* was unbundled and the power generation, transmission and distribution business was segregated to form 05 successor companies viz.

a) **Rajasthan Rajya Vidyut Utpadan Nigam Limited (RVUN)** to manage the electricity generation business of erstwhile RSEB.

b) **Rajasthan Rajya Vidyut Prasaran Nigam Limited (RVPN)** to manage the electricity transmission and bulk supply business of erstwhile RSEB.

c) **Ajmer Vidyut Vitran Nigam Limited (AVVNL)** to manage the electricity distribution and retail supply business of erstwhile RSEB in Ajmer City Circle, Ajmer District Circle, Bhilwara, Nagaur, Jhunjhunu, Sikar, Udaipur, Chittorgarh, Rajsamand, Banswara, Pratapgarh and Dungarpur Circles.

d) **Jaipur Vidyut Vitran Nigam Limited (JVVNL)** to manage the electricity distribution and retail supply business of erstwhile RSEB in Alwar, Bharatpur, Jaipur City, Jaipur District, Dausa, Kota, Jhalawar, Sawai Madhopur, Bundi, Baran, Tonk, Karauli and Dholpur Circles.

e) **Jodhpur Vidyut Vitran Nigam Limited (JdVVNL)** to manage the electricity distribution and retail supply business of erstwhile RSEB in Sriganganagar, Hanumangarh, Churu, Bikaner District, Bikaner City, Jaisalmer, Jalore, Barmer, Jodhpur City, Jodhpur District, Sirohi, Jalore, and Pali Circles.

1.2. Geographical Map of RajasthanDiscom

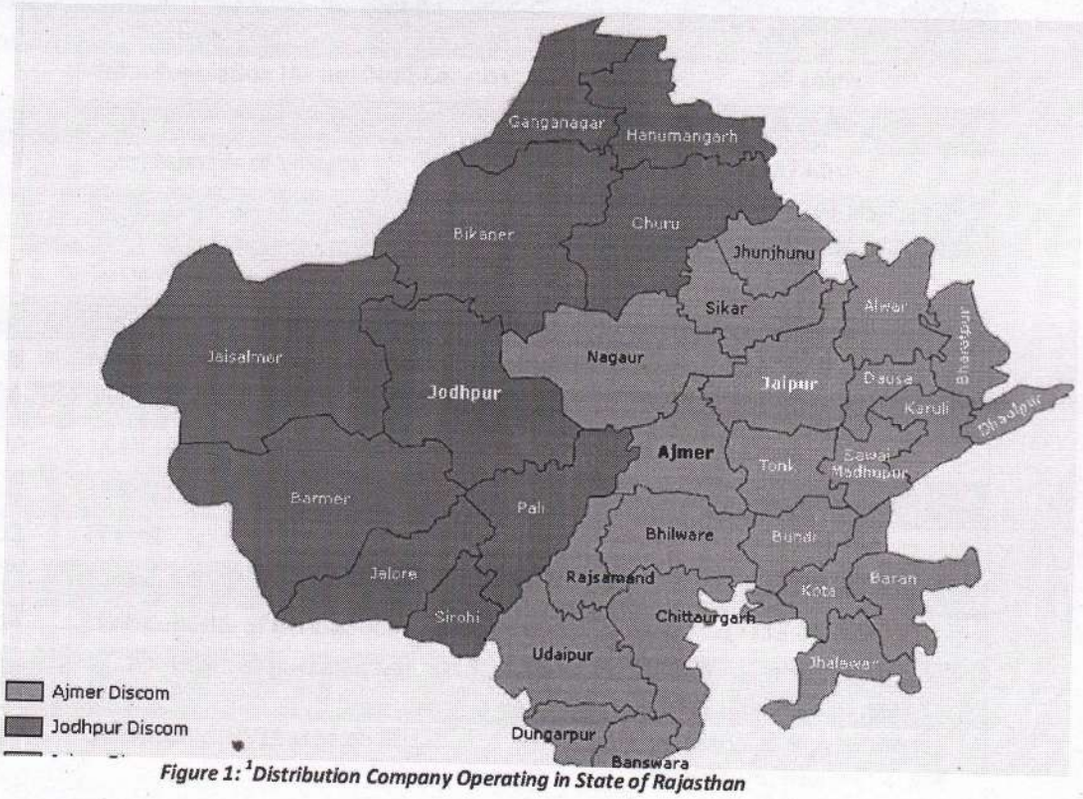

Figure 1: [1]Distribution Company Operating in State of Rajasthan

All the 03 Discoms have been established with the principal object of engaging inthe business of distribution andsupply ofuninterrupted and reliable quality electricity in differentdistricts (JVVNL – 12 Nos., AVVNL – 11 Nos. & JdVVNL – 10 Nos.) of Rajasthan. In view of above geographic locations, the proposal will mainly focus on'Installation of Capacitor Bank at the 11 kV Side of various 33/11 kV sub-stations' under various Circles of Ajmer Discom.

1.3. Operational Profile

The AVVNL Discom is responsible for operating the distribution assets within the areaofAjmer, Bhilwara, Nagaur, Jhunjhunu, Sikar, Udaipur, Chittorgarh, Rajsamand, Banswara, Pratapgarh and Dungarpur districts. Its scope of work and the electricity network *(as on Mar22)*are as presented below.

[1]Source: https://energy.rajasthan.gov.in/content/raj/energy-department/en/departments/avvnl/knowledge-base/discom-map.html

Table 1: Operational Profile of AVVNL Discom

Sr. No.	Parameters	AVVNL
1	Area of Operation	87,256 Sq. KM
2	Total Population (As per 2011 Census)	229 Lakhs
3	Total Number of Consumers	54.73 Lakhs (Regular)
4	Total Number of Villages	15379 Nos.
5	Electrified Villages	15272 Nos. (The balance 107 Nos. villages are unpopulated)
6	Circles	12 Nos.
7	33/11 kV Sub-stations	1974 Nos.
8	MVA Capacity of 33/11 kV Power Transformer	10276.70MVA
9	33 kV Line	16821.30 KM
10	11 kV Line	162143.59 KM
11	11 kV Feeders	9443 Nos.
12	LT Line	199117.66 KM
13	11/0.4, 6.35/0.24 kV Sub-station	537494 & 185452 Nos.
14	MVA Capacity of Distribution Transformer	17713.45MVA
15	Load Profile (LV) based on MU	Agriculture & Domestic loads are predominating
16	Load profile (HV) based on MU	Industrial & Non Industrial, Agriculture, Residential and Commercial

Further, in terms of electrical connectivity, the AVVNL Discom is connected to Rajasthan Rajya Vidyut Prasaran Nigam Limited network at 33kV & 11kV levels. Also, there are few interconnection points with other Discoms.

1.4. Customers Profile

Discom currently serves about 5473245 regularconsumers with a total connected load of around 1,44,21,291 kW under the LT & HT categories of consumers. Hence, category wise break-up of total number of consumers with connected Load as on March 2022 is stated below:

Table 2: Customer Profile for LT&HT Consumers of AVVNL Discom

Category (LT)	Consumers (Nos)	Connected Load (kW)
Domestic	4393918	3943062
Non Domestic	392589	1527874
PSL	6851	138677
Agri (M)	579349	3973100
Agri (F)	453	5341
Agri (P)	1512	9385
SIP	50619	386441
MIP	10414	630158
LIP	5398	3413773
SIP(WW)	22314	164336
MIP(WW)	321	15829
LIP(WW)	197	80542
Mixed Load	9301	91520
EV	4	55
Railway Traction	5	41198
Total	54,73,245	1,44,21,291

2. PROJECT OBJECTIVE

AVVNL believes that there is a need for a consistent and long lasting solution in order to improve & strengthen the Power Distribution Network with minimum losses in the long run. Also, the distribution system has suffered various challenges such as **(a) Unbalanced Load Flow; (b) High Level of Technical Losses; (c) Less System Stability; (d)Poor Voltage Regulation; (e) Low Power Factor; (f) Low Consumer Satisfaction Level etc.** which need to be gradually resolved. In this regard, AVVNL is taking up Integrated Planning for Distribution System covering the Renovation & Modernization of the overall network. This will enable relieving congestion and improving the voltage profile at the load end.

"Government of India has finalized the scheme/ guidelines for operationalization of PSDF dated 10.01.2014. The provision consists of 'Installation of Shunt Capacitors, Series Compensators and other Reactive Energy Generators including Reactive Energy Absorption, Dynamic Reactive' support etc. for improvement of voltage profile in the Grid".

Hence, this report aims to provide detailed information relating to the project for which PowerSystem Development Fund for current year sought by the AVVNL. The keyactivity identified is to improve power distribution system with the installation

of**1980kVAr&3168kVArDynamic/ Automatic Capacitor Bank**at the selected 11kV Side of33/11 kV Sub-stations within the respective Circle/ Division/ Sub-division which could be possible with the **Power System Development Fund (PSDF).**

Table 3: Project Estimation for Installation of Capacitor Bank under AVVNL Discom

Installation of Dynamic/ Automatic Capacitor Bank under 12 Circles of AVVNL Discom							
Power Factor	**Circle**	**Division**	**Sub Division**	**Total 33/11 kV Substation**	**Feeder Count**	**Proposed Transformer Capacity (MVA)**	**Power Transformer Count (Nos.)**
Less than 0.85	12	39	127	732	1888	3.15/ 5	719
						8	13
						Total (In Nos.)	**732**

3. METHODOLOGY ADOPTED

The methodology as followed by AVVNL, for identification of low power factor *(i.e. below 0.85)* is as stated below.

a) AVVNLDiscom has developed a **Feeder Monitoring System (FMS)**in order to have a **'Real Time'**power supply status of 11 kV feeders including installation status, power quality, system reliability, issue tracker, block hours supply, power factors, loan analysis, energy audit, tamper details etc.

b) With the support of RFMS, the review reports consisting of 'Power Factors Less than 0.90' has been downloaded for the last 01 year *(i.e. from May 2021 till April 2022)*.

c) Analysis were carried-out on thePower Factor, Maximum Current (In Amp.) & Peak Load (In kW) at the various zone, circle, division, sub-division, 33/11 kV sub-stations, 11 kV feeders including its transformational capacity (In MVA).

d) The average power factor for the 12 months were calculatedand finalized for 12 circleswhich is enclosed under **Annexure 'I'.**

e) Further, the automatically generated data are reliable enough for consideration however, AVVNL has taken initiative andfinalized data were cross-checked on a sample basis at the various division/ sub-divisions levels.

4. BENEFICIARIES

Adequate reactive power compensation offered salient benefits to the power systemwhichincludes voltage regulation *(i.e. voltage control within acceptable limits)*, system powerlosses reduction brought about by power factor improvement and it increases the utilizationof connected equipments at the consumer end, improves reliability of transmission systemand more importantly efficiency of real power made available at the consumer end. Hence, the major beneficiaries are as stated below.

a) Rajasthan Rajya Vidyut Prasaran Nigam Limited

b) AjmerVidyutVitran Nigam Limited*(Approx. 20 Lakhs Consumers under 732 Nos. 33/11 kV Sub-stations of 12 Circles)*

5. ON-GOING INITIATIVES

AVVNL is taking active participation for the supply of quality power without compromising the technical and commercial losses in the urban and rural areas. Some of the initiatives include village electrification, augmentation of transformational capacity, infrastructure development, privatizations through distribution franchisee, meterization, theft control, adopting schemes like Revamped Distribution Sector Scheme (RDSS), PM-KUSUM Scheme etc. Further, for the improvement of power factors at load end, AVVNL has installed approx. 195242 Nos. . of LT Shunt Capacitors (3 kVAr / 6 kVAr / 9 kVAr) till date. However due to smaller impact of power factor improvement, burning/ failure issue and theft of LT Shunt Capacitors have forced Discom to rethink and initiate the implementation of dynamic/ automatic capacitor bank at the various 11 kV side of the 33/11 kV sub-stations.

Apart from above, majority of the 11kV feeders in AVVNL are having high agriculture load which are being catered using 3.15/ 5 MVA power transformers at substations.Over the decade, Discom has witnessed a growth of around ~9% in connected load thus leading to increase in power demand. Also, Government of Rajasthan has mandated supply of day-time power (two blocks supply) to agricultural farmers. To meet this increase in demand and ensure day time supply to agriculture consumers,AVVNL need to augment its existing transformation capacities at Substation level (specifically from 3.15MVA to 5 MVA) within next 2 years. Hence, under this detailed project report, AVVNL has considered the upcoming requirement and proposed a capacitor bank with common rated capacity for 3.15/ 5 MVA.

6. TECHNOLOGY

a) For 11kV, 1980kVAr& 3168 kVArDynamic/ Automatic Capacitor Bank shall include 11kV Vacuum Circuit Breaker (VCB) Switchgear with complete arrangement with Adopter Panel for connection with existing 11 kV Bus Bar, Capacitor Switch, Reactor, APFC,Indoor Type Automatic Control Unit, Lightning Arrestor, Surge Arrestor, Pin & Post Insulators, PT's-CT's, Power &Control Cables, Junction Box, Supports of various types channels, Nut Bolts, Bus Bar Structure, Laying of Cables, Installation of Energy Meters, Interconnection ofVCB and C&R Panel, Battery with Batter Charger etc.

b) The capacitor bank shall consist of variable steps of different kVAr*(details shared under BoQ)*. All the capacitor unit shall be controlled through separate capacitorswitch and complete capacitor bank shall be protected through a VCB suitable forcapacitor duty.

c) The rated voltage of the system will be not less than 12 kV and shall be carried-out under 3-Phase Power Supply; 50 Hz frequency level.

d) The automatic power factor control unit shall continuously monitor power factor at11kV side of power transformer and automatically switched ON/OFF capacitorsunits in steps according tothe requirement of KVAr to maintain the Target Power Factor*(atleast 0.98)*.

e) The automatic power factor control unit shall be programmable and have datadownloading facility. Data Storage capacity of the control unit shall be at least for45 days with every 15 minutes data. The bidder shall have to provide two datadownloading instrument for data download from control unit with necessary BCS ineach Circles.

f) The all display meters provided in the control panel shall be digital meters andshall be compatible for Automatic Meter Reading (AMR).

g) There are no low voltage limit for tripping of capacitor bank main VCB or capacitorswitch. Also, the power factor control unit and relays provided for the protection of control unitshall be capable to store at least last 05 faults.

h) All equipment and material shall be designed, manufactured and tested in accordancewith the latest applicable IS/IEC standards.

i) The electrical installation shall meet the requirement of Indian Electricity Rules-1956/CEA safety Regulation 2010 as amended up to date; relevant IS code of

practiceand Indian Electricity Act-2003 in addition other rules and regulations as applicable to the work shall be followed.

Note: *The above proposed technology is indicative only, detailed version will be a part of tender documents.*

7. MANAGEMENT ARRANGEMENTS

The implementation plan for the project will be **15 months**from the date of approval from funding agency and shall be executed as per proposedplan. Further, the works under different activities shall be carried out on **turnkey basis** throughinternational or national competitive bidding as per the guidelinesof funding agency.

The project shall cover the overall procurement,installation, commissioning, testing and 05 years maintenance of dynamic/ automatic capacitor bank and will be divided into two phases (I& II)depending upon the total number of sub-station considered, area covered, time frame andavailable fund. Here,providing the estimate for **'Phase – I'**.

8. COST ESTIMATES

The cost estimation of installation of **732 Nos. of Dynamic/ Automatic 11 kV Capacitor Bank** under Power System Development Fund is stated below.

Sr. No.	Name of Work	Unit	Qty.	Unit Rate (Rs. Lakhs)	*Amount (In Rs. Cr.)
1	Installation of 1980 kVAr Automatic 11 kV Capacitor Bank including procurement, installation, commissioning, testing and 05 years maintenance. (For 3.15/5 MVA)	Nos.	719	30.29	217.78
2	Installation of 3168 kVAr Automatic 11 kV Capacitor Bank including procurement, installation, commissioning, testing and 05 years maintenance. (For 8 MVA)	Nos.	13	35.29	4.59

***Note:** The above estimated cost is inclusive of applicable GST.

9. BILL OF QUANTITY (BOQ)

Cost break-up of 11 kV Switched Capacitor Bank at 3.15 / 5 MVA Power Transformer

Sl. No.	Name of Items	Unit	Qty.	Unit FOR Destination Supply Prices including GST (Rs.)	Unit Erection & Maintenance Charges Incl. GST(Rs.)
1	2	3	4	5	6
1	12.65 kV, **1980 kVAr**, 3-Phase, 50 C/s housed in Outdoor Type CRCA Panel, Capacitor Bank having two variable step of 792 kVAr & one variable steps of 396 kVAr. Bank shall be complete with capacitor units of 264/132 kVAr, aluminium busbars, pin & post insulators, HRC fuses, surge arrestor etc. with details as under.	Nos.	1	17,50,000	5,50,000
	11 kV, Aluminum Wound, Dry type Series Reactors				
a)	0.26 kVAr for 396 kVAr step	Nos.	3		
b)	0.52 kVAr for 792 kVAr step	Nos.	6		
c)	11 kV, 3-Phase dry type RVT	No.	1		
d)	12 kV 3 Phase Indoor type metal enclosed Vacuum Capacitor Switches.	Nos.	3		
e)	Indoor Type Automatic Control Unit	No.	1		
f)	IP 55 , Outdoor CRCA cubicle panel for accommodating capacitors, series reactor, vacuum contactor, surge arrestor fuses along with canaopy	Set	1		
2	11 kV, 400 Amp, Off Load Isolator with earth switch and mounting structure.	No.	1	40,000	5,000
3	9 kV, 10 kA, Station Class, Lightning Arrestors	Nos.	3	15,000	2,000
4	Control cables, lugs/thimble, Junction Box etc.	Set	1	35,000	-
5	11 kV XLPE insulated 3x185 mm^2 Armoured	Mtr.	50	18,770	5,000
6	**Heat Shrinkable Jointing kit for 11 kV 3x185 Sq. mm. XLPE Cable**				
a)	Indoor termination kit	No.	2	12,000	5,000
b)	Outdoor termination kit	No.	2	12,000	5,000

7	11 kV VCB (Kiosks) Switchgear with complete arrangement with adopter panel for connection with existing 11 kV bus bar.	No.	1	3,80,355	40,000
8	Casting of Civil foundation	Set	1	-	75,000
9	Cable trench for laying of power/control cables.	Rmt	25	-	4,000
10	Earthing for Panel and LAs by pipe in pipe earthing	Nos.	2	-	25,000
11	24 Volt Battery with Battery Charger	No	1	50,000	-
			TOTAL	23,13,125	7,16,000
	Grand Total (In Words: Thirty Lakhs Twenty Nine Thousand One Hundred Twenty Five Rupees Only)				30,29,125

Cost break-up of 11 kV Switched Capacitor Bank at 8 MVA Power Transformers

Sl. No.	Name of Items	Unit	Qty.	Unit FOR Destination Supply Prices with all taxes Supply (Rs.)	Unit Erection& Maintenance Charges Incl. Service Tax (Rs.)
1	2	3	4	5	6
1	12.65 kV, **3168 kVAr**, 3-Phase, 50 C/s housed in Outdoor Type CRCA Panel, Capacitor bank having three variable step of 792 kVAr & two variable steps of 396 kVAr. Bank shall be complete with Capacitor units of 264/132 kVAr, Aluminum busbars, Pin & Post insulators, HRC fuses, Surge arrestor etc. with details as under.	Nos.	1	22,15,000	5,70,000
	11 kV, Aluminum Wound, Dry type Series reactors				
a)	0.52 kVAr for 792 kVAr step	Nos.	9		
b)	0.26 kVAr for 396 kVAr step	Nos.	6		
c)	11 kV, 3-Phase dry type RVT	No.	1		
d)	12 kV 3 Phase Indoor type metal enclosed Vacuum Capacitor switches.	Nos.	4		
e)	Indoor Type Automatic Control Unit	No.	1		
f)	IP 55 , Outdoor CRCA cubicle Panel for accommodating capacitors, Series Reactor, Vacuum contactor, Surge arrestor, Fuses along with Canaopy	Set	1		

2	11 kV, 400 Amp, Off Load Isolator with earth switch and mounting structure.	No.	1	40,000	5,000
3	9 kV, 10 kA Station Class, Lightning Arrestors	Nos.	3	15,000	2,000
4	Control cables, lugs/thimble, Junction Box etc.	Set	1	35,000	-
5	11 KV XLPE insulated 3x185 mm^2 Armoured	Mtr.	50	18,770	5,000
6	**Heat Shrinkable Jointing kit for 11 kV 3x185 Sq. mm. XLPE Cable**				
a)	Indoor termination kit	No.	2	12,000	5,000
b)	Outdoor termination kit	No.	2	12,000	5,000
7	11 kV VCB (Kiosks) Switchgear with complete arrangement with adopter panel for connection with existing 11 kV bus bar.	No.	1	3,80,355	40,000
8	Casting of Civil foundation	Set	1	-	90,000
9	Cable trench for laying of power/control cables.	Rmt.	25	-	4,000
10	Earthing for Panel and LA by pipe in pipe earthing	Nos.	2	-	25,000
11	24 V Battery with Battery Charger	No	1	50,000	-
			TOTAL	**27,78,125**	**7,51,000**
Grand Total (In Words: Thirty-Five Lakhs Twenty Nine Thousand One Hundred Twenty FiveRupees Only)					**35,29,125**

10. TIME FRAME PERT CHART

The total duration of the project is considered as 15 months. The tentative start date shall be considered as the date of receipt of approval from PSDF funding while the completion time is likely to by end of October 2023. The detailed time frame is presented below.

Sr. No.	Description	Detailed Timeline of the Project/ Scheme/ Activity														
		FY 2022-23								FY 2023-24						
		Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23
Finalization of Tender Documents & Issuance of Work Order																
1	Project Approval															
2	Conduct of Committee Meeting															
3	Preparation & Release of Tender Document															
4	Evaluation, Contract Award and Mobilization															
Procurement, Installation, Commissioning & Testing of Equipments																
5	1st Disbursement (30% of Grant)				D1											
6	Procurement, Installation, Commissioning & Testing of Equipments				Progressive Basis											
7	Bi-monthly Review Meeting															
8	Monthly Report Submission															
9	2nd Disbursement (60% of Grant) i.e. After Utalization of 30% Grant + 10% Self-contribution (JVVNL)						D2									
Cost Benefit Analysis & Report Submission on Improved Power Factor																
10	Final Report Submission															
11	3rd Disbursement (10% of Grant) i.e. On Completion of Scheme															D3

11. SUCCESS CRITERIA&SUSTAINABILITY

To identify the success of any project, it is always necessary to evaluate the standards by which to examine whether the proposed objective, target or outcomes will be achieve or not. Hence, the **Cost-Benefit Analysis** for the 1980 kVAr &3168 kVAr ratings automatic capacitor bank on the 3.15, 5 & 8 MVA power transformer has been presented below.

Payback Calculation for Installation of 11 kV Automatic Capacitor Bank at 33/11 kV Sub-station

Assumptions - Load Factor - 80% | Avg. Loading - 54% | Average PF - 0.85 | Desired PF - 0.98 | Initial Line Losses as 20%

Sr. No.	Transformer Rating (In MVA)	Qty	Total MVA	Load Factor	Average Loading	Average Demand (In MW) with 0.85 Power Factor	Reduction in MVA after Capacitors Bank	% Line Loss Reduction	Actual Line Loss Reduction of Initial Loss as	Total MWh Drawn in a Year	Saving in MWh	Cost of energy saved per annum @ 4.85/- (2022-21) per unit	Proposed 11 KV Automatic Capacitor Bank (In kVAr)	Supply, Installation & Maintenance for 05 Years Cost (In Lakhs)	Total Cost (In Cr.)
				80%	54%		0.98		20						
1	3.15	431	1358	1086	587	498.5291	508.70	24.77	4.95	4367115	216355	1,049,321,636	1980	30.29	130.56
2	5	288	1440	1152	622	528.768	539.56	24.77	4.95	4632008	229478	1,112,969,584	1980	30.29	87.24
3	8	13	104	83	45	38.1888	38.97	24.77	4.95	334534	16573	80,381,137	3168	35.29	4.59
Grand Total										**9333656**	**462407**	**2,242,672,356**	-	-	**222.38**

Total Cost of the Project	:	Rs. 222.37 Cr.
Total Savings with Power Factor Improvement	:	Rs. 224.26 Cr
Payback Period	-	**Approx. 12 Months**

"Further, regional entities are liable for weekly settlement of 'Reactive Energy Charges' in accordance with theCERC (Indian Electricity Grid Code)Regulations, 2010 and amendments thereof, which are sometimes payable or receivable.Due to poor power factor, sometimes Rajasthan accounts for a penalty at the rate of 10 paise/kVArh *(from 03.05.2010 onwards)*reactive charges with escalation factor of 0.5 paise/ kVArh. Also, recent provision of CERC's Draft Indian Electricity Grid Code 2022 recommends the reactive charge at the rate of 5 paise/kVArh w.e.f. the date of effect of final regulations with escalation at 0.5paise/kVArh per year thereafter".

Hence, the draft provision to rate reduction along with saving achieved through installation of capacitor bank will definitely lower down the overall penalty impact. These shall be the contributing factor for the Improvement of Financial Health of Discoms and will leading to a sustainable implementation structure.*(Note: The NRLDC charges is not taken into consideration in above payback calculation).*

Moreover, the capacitor units are used in these capacitor banks shall be manufactured with the latestdesign and tested to meet or exceed the requirement of applicable IEC & IS Standards, it israted in continuous kVAr, voltage and frequency for operating within the -200°C to +500°Cambient temperature range &shall be designed to produce not less than rated kVA at rated voltageand frequency.

Capacitors will operate safely at 135% of kVAr rating under followingcondition as:

- kVAr caused by excess at rated frequency.
- kVAr added by the harmonic voltage superimposed on the powerfrequency voltage.
- kVAr attributable to manufacturing tolerances.

The maximum recommended working voltage of capacitor is 110% of rated voltage. The capacitors include a safely factor that permits them to tolerate without damagemomentary over voltage caused due to switching/load fluctuation.

Thus, it is quite successful and sustainable in the high voltage system.

ANNEXURE 'I'

List of Various 33/11 kV Sub-stations considered for Power Factor Improvement

List of 33/11 KV Sub-stations for installation of Capacitor Bank					
S.No.	NAME OF SUBSTATION	Installed Capacity (In MVA)	CIRCLE	DIVISION	SUBDIVISION
1	33/11 KV CHALLA	8.15	Sikar	NEEM KA THANA	KANWAT
2	33/11 KV GANESHWAR	3.15	Sikar	NEEM KA THANA	AEN RURAL NMKT
3	33/11 KV GANWADI MOD	7.5	Sikar	NEEM KA THANA	AEN RURAL NMKT
4	33/11 KV GOVINDPURA	3.15	Sikar	NEEM KA THANA	KANWAT
5	33/11 KV IA	13.15	Sikar	NEEM KA THANA	AEN O&M NEEMKATHANA
6	33/11 KV SIROHI	3.15	Sikar	NEEM KA THANA	AEN O&M NEEMKATHANA
7	AAKLA	6.3 (3.15+3.15)	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
8	Aarni	3.15	Chittorgarh	Kapasan	Rashmi
9	Abhaypura	3.15	Sikar	REENGUS	palsana
10	ACHINA	5	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
11	ADARSH NAGAR	10	Sikar	REENGUS	AEN (O&M) REENGUS
12	Adkaliya	3.15x1	Udaipur	XEN SALUMBER	Salumber (O&M)
13	AEN (O&M, Aspur)	3.15	Dungarpur	Sagwara	ASPUR
14	AEN (O&M, Bichhiwara)	3.15	Dungarpur	Dungarpur	MADA
15	AEN (O&M, Chithri)	3.15	Dungarpur	Sagwara	GHATA KA GAON
16	ajmeri	21	Sikar	SRIMADHOPUR	AEN O&M AJEETGARH
17	Akola	8.15 (3.15+5)	Chittorgarh	Kapasan	Bhopal Sagar
18	Akwa	3.15	Sikar	SIKAR RURAL	Kudan
19	Akya	6.3	Chittorgarh	Nimbahera	Bhadesar
20	Ambavli	6.3	Pratapgarh	XE RURAL PGH	AE ONM CHOTISADRI
21	Amlawad	6.3	Pratapgarh	XE RURAL PGH	AE RURAL PRATPGARH
22	ANANDPURI	6.3(3.15+3.15)	BANSWARA	KUSHALGARH	AEN(O&M, Anandpuri)
23	ANDESHWAR	3.15	BANSWARA	KUSHALGARH	AEN(O&M,Sajjangarh)
24	ANJANA	3.15	BANSWARA	BAGIDORA	AEN (O&M, Garhi)
25	anooppura	3.15	Chittorgarh	Bengu	Bengu
26	Anwalheda	8.15 (3.15+5)	Chittorgarh	Bengu	Bengu
27	Ardawata	3.15+3.15=6.	Jhunjhunu	Chirawa	Sultana

		30			
28	Arniyajoshi	6.3	Chittorgarh	Nimbahera	Mangrol
29	Arnod	6.3	Pratapgarh	XE ONM PGH	AE ONM ARNOD
30	Arnoda	5	Chittorgarh	Nimbahera	Mangrol
31	ARTHUNA	3.15	BANSWARA	BAGIDORA	AEN (O&M, Garhi)
32	Aruka	3.15+3.15=6.30	Jhunjhunu	Chirawa	Chirawa
33	Asawari	5	NAGAUR	NAGAUR	AEN(O&M), MUNDWA
34	Asawata	6.3	Pratapgarh	XE ONM PGH	AE ONM PRATPGARH
35	Asliyo ki Madri	3.15x1	Udaipur	Xen Rural-I Udaipur	Mavli
36	Babai	5	JHUNJHUNU	Khetri Nagar	Babai
37	Babalwara	3.15x1	Udaipur	Xen O&M Kherwada	Kherwara O&M
38	Babarmal	3.15x1	Udaipur	XEN SALUMBER	Veerpura
39	babrana	3.15	Chittorgarh	Kapasan	Bhopal Sagar
40	Badabara	3.15	NAGAUR	DEEDWANA	AEN(O&M),CHOTI KHATU
41	Badgaon	3.15x1	Udaipur	XEN SALUMBER	Veerpura
42	BADGAUN/CHIDIYAWASA	3.15	BANSWARA	BANSWARA	AEN (O&M-II), Banswara
43	badhalo ki dhani	3.15	Sikar	REENGUS	palsana
44	Badiyar	5x1	Udaipur	Xen Rural-I Udaipur	Mavli
45	BADODIYA	3.15	BANSWARA	BAGIDORA	AEN (O&M, Bagidora)
46	Badoli ghata	3.15	Chittorgarh	Nimbahera	Nimbahera(O&M)
47	BADREL	3.15	BANSWARA	BANSWARA	AEN (Rural, Banswara)
48	Badsodha	8.15	Chittorgarh	Nimbahera	Bhadesar
49	Badsri ka Bass	3.17	Jhunjhunu	Chirawa	Surajgarh
50	Bagholi	3.15+2.5=5.65	Jhunjhunu	Nawalgarh (O&M)	Udaipurwati
51	BAGIDORA	6.3(3.15+3.15)	BANSWARA	BAGIDORA	AEN (O&M, Bagidora)
52	Bagriyawas	6.3	Sikar	SRIMADHOPUR	AEN O&M SRIMADHOPUR
53	Bagwas	6.3	Pratapgarh	XE ONM PGH	AE ONM PRATPGARH
54	Bakaliya	3.15	nagaur	Ladnun	AEN(Rural,ladnu)
55	Balaya	3.15	NAGAUR	NAGAUR	AEN(O&M), MUNDWA
56	Baloda	5+5=10	Jhunjhunu	Chirawa	Surajgarh
57	Baluwa	3.15x1	Udaipur	Xen O&M Kherwada	Sarada
58	Bambori	8.15	Pratapgarh	XE RURAL PGH	AE RURALCHOTISADRI

59	Bamniya	8.15 (3.15+5)	Chittorgarh	Kapasan	Kapasan
60	Bangeda Ghata	5	Chittorgarh	Nimbahera	Mangrol
61	Bangothri	5+3.15+3.15 =11.30	Jhunjhunu	Chirawa	Pilani
62	Bansen	8.15	Chittorgarh	Nimbahera	Bhadesar
63	Bansi	10	Chittorgarh	Nimbahera	Badisadri
64	Bara barda	6.3	Pratapgarh	XE RURAL PGH	AE RURAL PRATPGARH
65	BARANGANA	3.15	NAGAUR	DEEDWANA	AEN(O&M),DEEDWANA
66	Barapal	3.15x1	Udaipur	Xen Rural-I Udaipur	Girwa
67	BARBATTA	3.15	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
68	Bardiya	6.3	Pratapgarh	XE RURAL PGH	AE RURAL PRATPGARH
69	BARI	3.15	BANSWARA	BANSWARA	AEN(O&M), Chhoti Sarvan
70	Bari sakhathali	13.15	Pratapgarh	XE ONM PGH	AE ONM DALOT
71	Barkhedi	6.3	Pratapgarh	XE ONM PGH	AE ONM DALOT
72	BARNEL	3.15	NAGAUR	DEEDWANA	AEN(O&M), JAYAL
73	Barotha	6.3	Pratapgarh	XE ONM PGH	AE ONM PRATPGARH
74	Barsuna	5	NAGAUR	DEEDWANA	AEN(O&M), ROLL
75	Barwadanaka	9.45	Pratapgarh	XE RURAL PGH	AE RURALCHOTISADRI
76	Basad	6.3	Pratapgarh	XE ONM PGH	AE ONM PRATPGARH
77	Basawa	5+3.15+3.15 =11.30	Jhunjhunu	Nawalgarh (O&M)	Nawalgarh (Rural)
78	Basawta	3.15	JHUNJHUNU	Khetri Nagar	Khetri Nagar
79	Baseda	6.3	Pratapgarh	XE RURAL PGH	AE RURALCHOTISADRI
80	Basera	6.3	Pratapgarh	XE ONM PGH	AE ONM PRATPGARH
81	Bassi	6.30 (3.15+3.15)	Chittorgarh	Bengu	Bassi
82	Bathoth	8.15	Sikar	LAXMANGARH(O&M)	LAXMANGARH RURAL
83	Baydi	3.15x1	Udaipur	Xen O&M Kherwada	Kherwara O&M
84	Beedasar	6.3	Sikar	LAXMANGARH(O&M)	LAXMANGARH(O&M)
85	Bengu	8.15 (3.15+5)	Chittorgarh	Bengu	Bengu
86	BENIWALO KI DHANI	3.15	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
87	BERATHAL	6.3 (3.15+3.15)	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
88	Berla	3.15	Jhunjhunu	Chirawa	Surajgarh
89	Besroli	3.15	nagaur	Makrana	AEN(O&M,Gachhipur

					a)
90	Beswa	3.15	Sikar	LAXMANGARH(O&M)	FATEHPUR RURAL
91	BHAGORA	3.15	BANSWARA	BAGIDORA	AEN (O&M, Partapur)
92	BHAGWANPURA	3.15	Chittorgarh	Nimbahera	Nimbahera(RURAL)
93	Bhagyniajohara	5+5=10	Jhunjhunu	Chirawa	Chirawa
94	Bhairughat	3.15	Jhunjhunu	Nawalgarh (O&M)	Udaipurwati
95	Bhakharwasi	3.15	Sikar	LAXMANGARH(O&M)	FATEHPUR RURAL
96	Bhatiwad	3.15	JHUNJHUNU	JJN (R)	Badagaon
97	BHAWANIPURA	6.3	Sikar	REENGUS	REENGUS
98	Bhawtri	3.15+3.15=6.30	Jhunjhunu	Chirawa	Surajgarh
99	Bheema	8.15	Sikar	SIKAR RURAL	LOSAL
100	Bheemgarh	5	Chittorgarh	Kapasan	Rashmi
101	BHER	6.3 (3.15+3.15)	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
102	Bherupura	6.3	Sikar	SIKAR (O&M)	CSD-II
103	BHIL KUWA	3.15	BANSWARA	KUSHALGARH	AEN(O&M,Sajjangarh)
104	Bhindasari	3.15	nagaur	Ladnun	AEN(Rural,ladnu)
105	Bhojpur	3.15	Pratapgarh	XE RURAL PGH	AE ONM DHARIYAWAD
106	Bhopal Sagar	6.30 (3.15+3.15)	Chittorgarh	Kapasan	Bhopal Sagar
107	Bhorki	3.15+3.15=6.30	Jhunjhunu	Nawalgarh (O&M)	Gudha (O&M)
108	bhunda	3.15	BANSWARA	BANSWARA	AEN (O&M, Ghatol)
109	Bhundel	3.15	NAGAUR	NAGAUR	AEN(RURAl), NAGAUR
110	bhurwada	3.15	RAJASAMND	Kankroli	Railmagra
111	BHUWASA	3.15	BANSWARA	BANSWARA	AEN (O&M, Ghatol)
112	Bichawa	3.15	NAGAUR	DEEDWANA	AEN(O&M),CHOTI KHATU
113	Bichhdi	5x1+3.15x1	Udaipur	Xen Rural-I Udaipur	Girwa
114	Bichor	3.15	Chittorgarh	Bengu	Bassi
115	Bidoli	3.15	Sikar	SIKAR RURAL	LOSAL
116	Biinjusar	5	JHUNJHUNU	JJN (R)	Badagaon
117	Bijarniyo ki dhani	3.15+3.15=6.30	Jhunjhunu	Nawalgarh (O&M)	Gudha (O&M)
118	Bijoli	3.15+3.15+3.15=9.45	Jhunjhunu	Chirawa	Surajgarh
119	Biladiya	6.3	Pratapgarh	XE RURAL PGH	AE ONM DHARIYAWAD
120	Biloda	6.3	Chittorgarh	Nimbahera	Dungla

121	Binjyasi	3.15	Sikar	SIKAR RURAL	Dhod
122	BINOTA	8.15	Chittorgarh	Nimbahera	Nimbahera(RURAL)
123	BIRLOKA	10 (5+5)	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
124	Birmi	3.15	Jhunjhunu	Jhunjhunu (O&M)	Bissau
125	Birol	5+3.15=8.15	Jhunjhunu	Nawalgarh (O&M)	Nawalgarh (Rural)
126	Bissau	5+3.15=8.15	Jhunjhunu	Jhunjhunu (O&M)	Bissau
127	Boheda	8.15	Chittorgarh	Nimbahera	Badisadri
128	Boo Narawata	3.15	NAGAUR	NAGAUR	AEN(O&M), MUNDWA
129	Bood	3.15	Chittorgarh	Chittorgarh	Gangrar
130	Borav	8.15 (3.15+5)	Chittorgarh	Bengu	Rawatbhata
131	Borda	5	Chittorgarh	Chittorgarh	Gangrar
132	Bordiya	6.3	Pratapgarh	XE ONM PGH	AE ONM DALOT
133	BORI	3.15	BANSWARA	BAGIDORA	AEN (O&M, Garhi)
134	BORIGAMA	3.15	BANSWARA	BAGIDORA	AEN (O&M, Bagidora)
135	BORWAT	3.15	BANSWARA	BANSWARA	AEN (Rural, Banswara)
136	Bosana	3.15	Sikar	SIKAR RURAL	Dhod
137	Budhwara	3.15	ACC	XEN RURAL,AJMER	AEN(O&M, Pisangan)
138	Bugala	3.15+3.15=6.30	Jhunjhunu	Nawalgarh (O&M)	Mukandgarh
139	Buhana	5	JHUNJHUNU	Khetri Nagar	Buhana
140	CHAJJA	3.15	BANSWARA	KUSHALGARH	AEN(O&M, Anandpuri)
141	Chakunda	3.15	Pratapgarh	XE ONM PGH	AE ONM DALOT
142	Chanana	3.15+3.15=6.30	Jhunjhunu	Chirawa	Chanana
143	CHANDER WADA	3.15	BANSWARA	KUSHALGARH	AEN(O&M, Anandpuri)
144	Chandesra	3.15X1	Udaipur	Xen Rural-I Udaipur	Debari
145	CHANDU JI GADA	3.15	BANSWARA	BANSWARA	AEN (O&M, Ghatol)
146	Chandwa	3.15	Jhunjhunu	Jhunjhunu (O&M)	Bissau
147	Changedi	3.15x2	Udaipur	Xen Rural-I Udaipur	Mavli
148	Chanwra	3.15	Jhunjhunu	Nawalgarh (O&M)	Gudha Rural
149	Charana	3.15	RAJASAMND	Kankroli	Railmagra
150	Charansingh Nagar	3.15	Jhunjhunu	Chirawa	Chanana
151	Charawas	3.15+3.15=6.30	Jhunjhunu	Chirawa	Chanana
152	Chelasi	3.15+3.15=6.30	Jhunjhunu	Nawalgarh (O&M)	Nawalgarh (O&M)
153	Chenchi	8.15 (3.15+5)	Chittorgarh	Bengu	Bengu

154	Chhapoli	5+3.15=8.15	Jhunjhunu	Nawalgarh (O&M)	Udaipurwati
155	Chhapri	3.15	Chittorgarh	Nimbahera	Dungla
156	Chhawasri	3.15	JHUNJHUNU	JJN (R)	Badagaon
157	Chhorai	3.15X3	Udaipur	Xen O&M Kherwada	Rishabdev
158	Chhotisadri	3.15	Pratapgarh	XE RURAL PGH	AE ONM CHOTISADRI
159	Chikarda	8.15	Chittorgarh	Nimbahera	Dungla
160	CHIKLI PUNA	3.15	BANSWARA	KUSHALGARH	AEN(O&M, Anandpuri)
161	Chiksi	3.15	Chittorgarh	Chittorgarh	Sawa
162	CHIPLATA	3.15	Sikar	SRIMADHOPUR	THOI
163	CHORDI	3.15	BANSWARA	KUSHALGARH	AEN(O&M, Anandpuri)
164	CHOTI SERVA	6.3(3.15+3.15)	BANSWARA	BANSWARA	AEN (O&M, Kushalgarh)
165	CHOTI SERVAN	3.15	BANSWARA	BANSWARA	AEN(O&M), Chhoti Sarvan
166	CHUGNI	3.15	NAGAUR	DEEDWANA	AEN(O&M), MOLASAR
167	Chupna	9.45	Pratapgarh	XE ONM PGH	AE ONM ARNOD
168	Churella	3.15+3.15=6.30	Jhunjhunu	Jhunjhunu (O&M)	Bissau
169	Churi	3.15	Jhunjhunu	Nawalgarh (O&M)	Mukandgarh
170	Dabda	6.3	Pratapgarh	XE ONM PGH	AE ONM PRATPGARH
171	Dabla	6.3	Sikar	NEEM KA THANA	Patan
172	Dabri Baloda	3.15+3.15=6.30	Jhunjhunu	Nawalgarh (O&M)	Mukandgarh
173	Dadhariya Khurd	3.15	NAGAUR	NAGAUR	AEN(O&M), MUNDWA
174	Dadiya	8.15	Sikar	SIKAR (O&M)	Piprali
175	DADUKA	3.15	BANSWARA	BAGIDORA	AEN (O&M, Garhi)
176	Dalot	13.15	Pratapgarh	XE ONM PGH	AE ONM DALOT
177	Dalpatpura	8.15	Sikar	NEEM KA THANA	Patan
178	Dasa ki dhani	3.15	Sikar	SIKAR (O&M)	Piprali
179	Dashera Maidan	5	Chittorgarh	Nimbahera	Nimbahera(O&M)
180	DATINA	3.15	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
181	Datunjla	3.15	Sikar	LAXMANGARH(O&M)	LAXMANGARH RURAL
182	Dehri	6.3 (3.15+3.15)	NAGAUR	DEEDWANA	AEN(O&M), JAYAL
183	Delwash	5	Chittorgarh	Nimbahera	Dungla
184	Deogarh	9.45	Pratapgarh	XE RURAL PGH	AE RURAL PRATPGARH

185	Deri	3.15x1	Udaipur	Xen O&M Kherwada	Kherwara O&M
186	DEU	6.3 (3.15+3.15)	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
187	DEVDA	3.15	BANSWARA	BANSWARA	AEN (O&M, Ghatol)
188	Devgav	3.15+3.15=6.30	Jhunjhunu	Nawalgarh (O&M)	Nawalgarh (Rural)
189	Devla	3.15	Pratapgarh	XE RURAL PGH	AE ONM DHARIYAWAD
190	Devpura	3.15	Chittorgarh	Bengu	Rawatbhata
191	Devrod	3.15+3.15=6.30	Jhunjhunu	Chirawa	Chirawa
192	Dewla	3.15	nagaur	Makrana	AEN(REC, Makrana)
193	Dhamana	3.15	Chittorgarh	Kapasan	Kapasan
194	Dhamancha	5	Chittorgarh	Bengu	Bengu
195	Dhamniya road	11.3	Pratapgarh	XE RURAL PGH	AE ONM CHOTISADRI
196	Dhamotter	6.3	Pratapgarh	XE RURAL PGH	AE RURAL PRATPGARH
197	Dhanet	3.15	Chittorgarh	Chittorgarh	Chittorgarh (Rec)
198	Dhariyawad	9.45	Pratapgarh	XE RURAL PGH	AE ONM DHARIYAWAD
199	Dhawa	3.15	NAGAUR	NAGAUR	AEN(O&M), MUNDWA
200	Dhawro ki dhani	3.15+3.15=6.30	Jhunjhunu	Nawalgarh (O&M)	Gudha (O&M)
201	Dhigal	3.15	Jhunjhunu	Nawalgarh (O&M)	Mukandgarh
202	Dhikniya	6.3	Pratapgarh	XE RURAL PGH	AE RURAL PRATPGARH
203	Dhindwa	5+3.15=8.15	Jhunjhunu	Chirawa	Pilani
204	DHINGSARA	3.15	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
205	Dhmora	5+3.15=8.15	Jhunjhunu	Nawalgarh (O&M)	Gudha (O&M)
206	Dhod	10	Sikar	SIKAR RURAL	Dhod
207	Dholakhera	3.15+3.15=6.30	Jhunjhunu	Nawalgarh (O&M)	Udaipurwati
208	DHOLIYADER	3.15	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
209	Dhulwa	3.15	JHUNJHUNU	Khetri Nagar	Buhana
210	Dindoli	3.15	Chittorgarh	Kapasan	Rashmi
211	Dingri	3.15x1	Udaipur	Xen O&M Kherwada	Sarada
212	Doomra	3.15+3.15=6.30	Jhunjhunu	Nawalgarh (O&M)	Mukandgarh
213	Doongla	8.15	Chittorgarh	Nimbahera	Dungla
214	Dudwa	5	Jhunjhunu	Chirawa	Pilani
215	Dugar	3.15	Chittorgarh	Bengu	Bassi

216	Dujod	5	Sikar	SIKAR RURAL	Sikar (Rural)
217	Dukia	3.15	Sikar	REENGUS	PALSANA
218	Dulaniya	5+5+5=15	Jhunjhunu	Chirawa	Pilani
219	Dundlod	5+5=10	Jhunjhunu	Nawalgarh (O&M)	Mukandgarh
220	DUNGARA	3.15	BANSWARA	KUSHALGARH	AEN(O&M,Sajjangarh)
221	DUNGARIYA	3.15	BANSWARA	BANSWARA	AEN (O&M, Ghatol)
222	Eklingpura	5	Chittorgarh	Bengu	Rawatbhata
223	Faglwa	6.3	Sikar	SIKAR RURAL	Sikar (Rural)
224	Falichda	3.15x1	Udaipur	Xen Rural-I Udaipur	Mavli
225	Fatehnagar	3.15X1+5X1	Udaipur	Xen Rural-I Udaipur	Mavli
226	Fatehnagar Railway Crossing	5x1	Udaipur	Xen Rural-I Udaipur	Mavli
227	Fatehpura	6.3	Sikar	SIKAR RURAL	Dhod
228	Fathegarh	6.3	Pratapgarh	XE ONM PGH	AE ONM ARNOD
229	Gadawat	3.15x1	Udaipur	Xen O&M Kherwada	Rishabdev
230	Gadhla	5+3.15=8.15	Jhunjhunu	Nawalgarh (O&M)	Gudha Rural
231	Gadola	9.45	Chittorgarh	Nimbahera	Nimbahera(O&M)
232	Gagrol	6.3	Pratapgarh	XE RURAL PGH	AE ONM CHOTISADRI
233	Gaju	10 (5+5)	NAGAUR	NAGAUR	AEN(O&M), MUNDWA
234	Galoli	3.15	NAGAUR	DEEDWANA	AEN(O&M), ROLL
235	Gandraf	3.15	Chittorgarh	Kapasan	Rashmi
236	GANESHPURA	3.15	Pratapgarh	XE RURAL PGH	AE RURALCHOTISADRI
237	GANGADTALAI	3.15	BANSWARA	BAGIDORA	AEN (O&M, Bagidora)
238	Gangiyasar	3.15	Jhunjhunu	Jhunjhunu (O&M)	Bissau
239	Gangrar	8.15 (3.15+5)	Chittorgarh	Chittorgarh	Gangrar
240	GANODA	3.15	BANSWARA	BANSWARA	AEN (O&M, Ghatol)
241	Ganthlasar	3.15	NAGAUR	NAGAUR	AEN(RURAl), NAGAUR
242	Gawaloo	6.3 (3.15+3.15)	NAGAUR	NAGAUR	AEN(O&M), MUNDWA
243	Geda Khurd	3.15	nagaur	Makrana	AEN(O&M,Gachhipura)
244	Ghanoli	3.15x1+1.6X1	Udaipur	Xen Rural-I Udaipur	Debari
245	Ghantali	6.3	Pratapgarh	XE ONM PGH	AE ONM PEEPALKHUNT
246	Ghasa	3.15x1	Udaipur	Xen Rural-I Udaipur	Debari
247	Ghaseda	3.15	JHUNJHUNU	Khetri Nagar	Buhana

248	Ghatiyawali	6.3	Chittorgarh	Chittorgarh	Sawa
249	GHATOL	6.3(3.15+3.15)	BANSWARA	BANSWARA	AEN (O&M, Ghatol)
250	GHIRNIYA	3.15	Sikar	LAXMANGARH(O&M)	NECHHWA
251	Ghoriwara	3.15	Jhunjhunu	Nawalgarh (O&M)	Mukandgarh
252	Gidania	3.15	Jhunjhunu	Chirawa	Sultana
253	Gilund	3.15	Chittorgarh	Chittorgarh	Sawa
254	Gogor	3.15	nagaur	Kuchaman	AEN(O&M,NawaCity)
255	Gokalpura	8.15	Sikar	SIKAR (O&M)	Piprali
256	Golyana	8+5=13	Jhunjhunu	Nawalgarh (O&M)	Udaipurwati
257	Gopalpura	3.15	nagaur	Kuchaman	AEN(Rural,Kuchaman City)
258	GOPI NATH KA GADA	3.15	BANSWARA	BAGIDORA	AEN (O&M, Garhi)
259	Gosunda	5	Chittorgarh	Chittorgarh	Chittorgarh (Rec)
260	Goth	3.15	NAGAUR	DEEDWANA	AEN(O&M), ROLL
261	Gothara	3.15	JHUNJHUNU	Khetri Nagar	Khetri Town
262	Goutemeshwar	6.3	Pratapgarh	XE ONM PGH	AE ONM ARNOD
263	Govaliya (Khakhla)	3.15	BHILWARA	XEN(O&M)	Gangapur
264	Govindpura	3.15	Chittorgarh	Bengu	Bengu
265	Guda Bhagwan Das	3.15	NAGAUR	NAGAUR	AEN(RURAl), NAGAUR
266	Gugli	8.15	RAJASAMND	AMET	AMET
267	Gumanpura	3.15	Chittorgarh	Nimbahera	Dungla
268	Gunawati	5	nagaur	Makrana	AEN(O&M,Makarana)
269	Gungara	8.15	Sikar	SIKAR (O&M)	Piprali
270	Gunta	8.15 (3.15+5)	Chittorgarh	Bengu	Bengu
271	Hadmatiya Kundal	3.15	Pratapgarh	XE RURAL PGH	AE RURALCHOTISADRI
272	Haminpur	3.15+3.15=6.30	Jhunjhunu	Chirawa	Pilani
273	HAMIRANA	3.15	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
274	HARIPURA	6.3	Sikar	SRIMADHOPUR	AJEETGARH
275	Harsore	3.15	NAGAUR	XEN(O&M,DEGANA)	BHERUNDA(O&M)
276	Hathiyana	6.30 (3.15+3.15)	Chittorgarh	Kapasan	Kapasan
277	Heerwa	3.15	Jhunjhunu	Chirawa	Chirawa
278	HEJA MAL	3.15	BANSWARA	KUSHALGARH	AEN(O&M,Sajjangarh)
279	HEMPURA	5	NAGAUR	NAGAUR	AEN(O&M),

					KHINVSAR
280	Hetamsar	3.15	Jhunjhunu	Jhunjhunu (O&M)	Mandawa
281	Hirani	3.15	nagaur	Kuchaman	AEN(Rural,Kuchaman City)
282	Idana	3.15x1	Udaipur	XEN SALUMBER	Salumber (O&M)
283	Inana	6.3 (3.15+3.15)	NAGAUR	NAGAUR	AEN(O&M), MUNDWA
284	Indali	3.15	JHUNJHUNU	JJN (R)	JJN (R)
285	Inderpura	3.15	Jhunjhunu	Nawalgarh (O&M)	Udaipurwati
286	Indokali	10 (5+5)	NAGAUR	NAGAUR	AEN(O&M), MUNDWA
287	Indokha	3.15	nagaur	Makrana	AEN(O&M,Gachhipura)
288	Indora	6.30 (3.15+3.15)	Chittorgarh	Chittorgarh	Gangrar
289	Intali	5x1+3.15x1	Udaipur	Xen Rural-I Udaipur	Mavli
290	ISARNVDA	6.3 (3.15+3.15)	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
291	Islampur	3.15	JHUNJHUNU	JJN (R)	Bagar
292	Ismailpur	3.15+3.15=6.30	Jhunjhunu	Chirawa	Chirawa
293	Jahaj	3.15	Jhunjhunu	Nawalgarh (O&M)	Udaipurwati
294	JAHANPURA	6.3(3.15+3.15)	BANSWARA	BANSWARA	AEN(O&M), Chhoti Sarvan
295	Jaitpura	3.15+3.15=6.30	Jhunjhunu	Nawalgarh (O&M)	Udaipurwati
296	Jajli	6.3	Pratapgarh	XE ONM PGH	AE ONM ARNOD
297	Jakhal	3.15+3.15=6.30	Jhunjhunu	Nawalgarh (O&M)	Gudha (O&M)
298	Jakhod	5+3.15=8.15	Jhunjhunu	Chirawa	Surajgarh
299	Jakhoda	3.15	JHUNJHUNU	JJN (R)	Bagar
300	Jalampura	5	Chittorgarh	Chittorgarh	Sawa
301	Jaliya	8.15	Chittorgarh	Nimbahera	Nimbahera(O&M)
302	Jaloda jager	9.45	Pratapgarh	XE RURAL PGH	AE RURALCHOTISADRI
303	JAMNADI	10	Sikar	SRIMADHOPUR	AEN O&M AJEETGARH
304	Janana	8.15(3.15+5)	NAGAUR	NAGAUR	AEN(O&M), MUNDWA
305	Jasrasar	5	Sikar	LAXMANGARH(O&M)	LAXMANGARH RURAL
306	Jawad	3.15x1	Udaipur	XEN SALUMBER	Veerpura
307	JAWADA	10	Chittorgarh	Nimbahera	Nimbahera(RURAL)
308	Jawada Nimdi	6.30	Chittorgarh	Bengu	Rawatbhata

		(3.15+3.15)			
309	Jawhar nagar	6.3	Pratapgarh	XE RURAL PGH	AE ONM DHARIYAWAD
310	Jayal	6.3 (3.15+3.15)	NAGAUR	DEEDWANA	AEN(O&M), JAYAL
311	Jeeni	3.15+3.15=6.30	Jhunjhunu	Chirawa	Surajgarh
312	Jerthi	3.15	Sikar	SIKAR RURAL	Kudan
313	Jetpura	8.15	RAJASAMND	AMET	AMET
314	Jewana	3.15x1	Udaipur	Xen Rural-I Udaipur	Mavli
315	JEWELIYAWAS	3.15	NAGAUR	DEEDWANA	AEN(O&M),DEEDWANA
316	Jhadol	3.15x1	Udaipur	XEN SALUMBER	Veerpura
317	Jhajar	3.15	Jhunjhunu	Nawalgarh (O&M)	Nawalgarh (Rural)
318	JHALKHEDA	3.15	Chittorgarh	Bengu	Rawatbhata
319	Jhallara	3.15x1	Udaipur	XEN SALUMBER	Salumber rural
320	Jharkhana	10	Chittorgarh	Nimbahera	Badisadri
321	Jharno ki sarai	3.15x1+3.15x1	Udaipur	Xen Rural-I Udaipur	Girwa
322	Jhasma	6.30 (3.15+3.15)	Chittorgarh	Kapasan	Bhopal Sagar
323	Jhatawa	3.15	JHUNJHUNU	JJN (R)	Malsisar
324	Jherli	5+3.15=8.15	Jhunjhunu	Chirawa	Pilani
325	Jhunjhunda	3.15	NAGAUR	NAGAUR	AEN(O&M), MUNDWA
326	Jodhiyasi	3.15	NAGAUR	NAGAUR	AEN(O&M), DEH
327	JOLANA	5	BANSWARA	BAGIDORA	AEN (O&M, Garhi)
328	Jurathara	6.6	Sikar	REENGUS	palsana
329	Kachotiya	6.3	Pratapgarh	XE ONM PGH	AE ONM PEEPALKHUNT
330	Kachumra	3.15	Chittorgarh	Nimbahera	Badisadri
331	Kagdar Bhatia	3.15x1	Udaipur	Xen O&M Kherwada	Rishabdev
332	Kairpura Kalan	3.15	Jhunjhunu	Chirawa	Sultana
333	Kairu	5+3.15=8.15	Jhunjhunu	Nawalgarh (O&M)	Mukandgarh
334	Kajra	3.15+3.15=6.30	Jhunjhunu	Chirawa	Surajgarh
335	Kakoda	5+5=10	Jhunjhunu	Chirawa	Surajgarh
336	Kakrana	3.15	Jhunjhunu	Nawalgarh (O&M)	Gudha Rural
337	Kali pahari		JHUNJHUNU	JJN (R)	Bagar
338	Kamediya	3.15	NAGAUR	NAGAUR	AEN(O&M), DEH

339	Kanbai	3.15x1	Udaipur	Xen O&M Kherwada	Kherwara O&M
340	Kanera	8.15	Chittorgarh	Nimbahera	Mangrol
341	Kankarwa	5	Chittorgarh	Kapasan	Bhopal Sagar
342	Kannoj	6.3	Chittorgarh	Nimbahera	Bhadesar
343	KANTIYA	8.15 (5+3.15)	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
344	KANWAT	8.15	Sikar	NEEM KA THANA	KANWAT
345	KARAD	3.15	Sikar	DANTARAMGARH	KHACHARIYAWAS
346	Kari	5+3.15=8.15	Jhunjhunu	Nawalgarh (O&M)	Nawalgarh (Rural)
347	Karjali	3.15	Chittorgarh	Kapasan	Kapasan
348	KARJI	3.15	BANSWARA	BAGIDORA	AEN (O&M, Bagidora)
349	Karloo	6.3 (3.15+3.15)	NAGAUR	NAGAUR	AEN(O&M), MUNDWA
350	KARNU	6.3 (3.15+3.15)	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
351	Karunda	6.3	Chittorgarh	Nimbahera	Mangrol
352	KASARWADI	3.15	BANSWARA	KUSHALGARH	AEN(O&M,Sajjangarh)
353	Kashara Khedi/ROLAHEDA	3.15	Chittorgarh	Chittorgarh	Chittorgarh (Rec)
354	Kashmor	5	Chittorgarh	Chittorgarh	Chittorgarh (Rec)
355	Kasli	6.3	Sikar	SIKAR RURAL	Dhod
356	Katoti	3.15	NAGAUR	DEEDWANA	AEN(O&M), JAYAL
357	Katunda Mode	8.15 (3.15+5)	Chittorgarh	Bengu	Bengu
358	Keerpura	3.15+3.15=6.30	Jhunjhunu	Nawalgarh (O&M)	Gudha Rural
359	Kela mela	6.3	Pratapgarh	XE ONM PGH	AE ONM PEEPALKHUNT
360	Keli	3.15	Chittorgarh	Nimbahera	Nimbahera(O&M)
361	Kelu kheda	8.15	Pratapgarh	XE RURAL PGH	AE ONM CHOTISADRI
362	Kesharpura	3.15	Pratapgarh	XE ONM PGH	AE ONM PEEPALKHUNT
363	Kewalpura	3.15	Chittorgarh	Nimbahera	Badisadri
364	Khabdiyana	3.15	NAGAUR	NAGAUR	AEN(O&M), DEH
365	KHACHARIYAWAS	6.3	Sikar	DANTARAMGARH	KHACHARIYAWAS
366	Khajpur	3.15	JHUNJHUNU	JJN (R)	JJN (R)
367	KHAJURI	3.15	BANSWARA	BANSWARA	AEN(O&M), Chhoti Sarvan
368	Khajwana	15(5+5+5)	NAGAUR	NAGAUR	AEN(O&M), MUNDWA
369	KHAMERA	3.15	BANSWARA	BANSWARA	AEN (O&M, Ghatol)

370	Khandwa	3.15	JHUNJHUNU	Khetri Nagar	Buhana
371	khardewala	5	Chittorgarh	Nimbahera	Badisadri
372	KHARSANA	3.15	BANSWARA	BAGIDORA	AEN (O&M, Bagidora)
373	Khati Khera	3.15	Chittorgarh	Bengu	Rawatbhata
374	KHATORA	5	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
375	KHATUSHYAM JI	16.15	Sikar	DANTARAMGARH	KHATUSHYAM JI
376	Khemli	3.15+3.15	Udaipur	Xen Rural-I Udaipur	Debari
377	KHERA	3.15	BANSWARA	BAGIDORA	AEN (O&M, Partapur)
378	Kherad	3.15x1	Udaipur	XEN SALUMBER	Salumber (O&M)
379	Khermaliya	3.15	Chittorgarh	Nimbahera	Badisadri
380	Kherot	6.3	Pratapgarh	XE ONM PGH	AE ONM PRATPGARH
381	KHERWALIPADA	3.15	BANSWARA	BANSWARA	AEN (Rural, Banswara)
382	Kherwara	5X1	Udaipur	Xen O&M Kherwada	Kherwara O&M
383	Khinswar	3.15	Sikar	LAXMANGARH(O&M)	LAXMANGARH(O&M)
384	KHINVSAR OLD	10 (5+5)	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
385	Khirod	3.15	Jhunjhunu	Nawalgarh (O&M)	Nawalgarh (Rural)
386	KHODAN	3.15	BANSWARA	BAGIDORA	AEN (O&M, Partapur)
387	Khodip	3.15	Chittorgarh	Nimbahera	Bhadesar
388	Khoor	11.3	Sikar	SIKAR RURAL	LOSAL
389	Khorandi	6.30(3.15+3.15))	nagaur	Kuchaman	AEN(O&M,Chitawa)
390	KHORIYA	3.15	Pratapgarh	XE RURAL PGH	AE RURAL PRATPGARH
391	Khudaniya	3.15+3.15=6.30	Jhunjhunu	Chirawa	Pilani
392	KHUNDALA	8.15 (5+3.15)	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
393	Khunkhuna	6.3 (3.15+3.15)	NAGAUR	DEEDWANA	AEN(O&M),CHOTI KHATU
394	Kirdoli	3.15	Sikar	SIKAR RURAL	Sikar (Rural)
395	Kisan kareri	3.15	Chittorgarh	Nimbahera	Dungla
396	Kithana	5+3.15=8.15	Jhunjhunu	Chirawa	Sultana
397	Kolida	8.15	Sikar	SIKAR (O&M)	Piprali
398	Kolsiya	3.15+3.15=6.30	Jhunjhunu	Nawalgarh (O&M)	Nawalgarh (Rural)
399	KOTDA	3.15	BANSWARA	BAGIDORA	AEN (O&M, Garhi)

400	Kotdi	3.15	Pratapgarh	XE ONM PGH	AE ONM DALOT
401	Kuchera 132 KV	10(5+5)	NAGAUR	NAGAUR	AEN(O&M), MUNDWA
402	Kudan	11.3	Sikar	SIKAR RURAL	Kudan
403	Kuharwas	5	JHUNJHUNU	Khetri Nagar	Buhana
404	Kuloth Kala	3.15	Jhunjhunu	Chirawa	Surajgarh
405	Kuloth Khurad	5+5=10	Jhunjhunu	Chirawa	Surajgarh
406	Kulthana	6.3	Pratapgarh	XE ONM PGH	AE ONM PRATPGARH
407	Kumari	6.3 (3.15+3.15)	NAGAUR	NAGAUR	AEN(RURAl), NAGAUR
408	Kumawas	5+5+3.15=13 .15	Jhunjhunu	Nawalgarh (O&M)	Mukandgarh
409	Kuni	6.3	Pratapgarh	XE ONM PGH	AE ONM PRATPGARH
410	KUNJI KA PARDA	3.15	BANSWARA	BAGIDORA	AEN (O&M, Partapur)
411	Kunwaliya	8.15 (3.15+5)	Chittorgarh	Chittorgarh	Gangrar
412	KUPDA	3.15	BANSWARA	BANSWARA	AEN (O&M-II), Banswara
413	kuraj	5.65	RAJASAMND	Kankroli	Railmagra
414	KURCHI	10 (5+5)	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
415	KUSHALGARH	6.3(3.15+3.1 5)	BANSWARA	BANSWARA	AEN (O&M, Kushalgarh)
416	Kuthana	3.15	Chittorgarh	Nimbahera	Bhadesar
417	Kyamsar	5+3.15=8.15	Jhunjhunu	Chirawa	Sultana
418	Kyar ki Dhani	3.15	NAGAUR	NAGAUR	AEN(O&M), MUNDWA
419	LADPUR	3.15	Sikar	REENGUS	AEN (O&M) REENGUS
420	LADWA	3.15	Sikar	SIKAR RURAL	Dhod
421	LALAP	5	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
422	LALAWAS	3.15	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
423	Lamba	6.30(3.15+3. 15)	nagaur	Kuchaman	AEN(O&M,Chitawa)
424	Lambadabra	3.15	Pratapgarh	XE ONM PGH	AE ONM PEEPALKHUNT
425	LAMIYA	8.15	Sikar	DANTARAMGARH	KHATUSHYAM JI
426	LASDAWAN	8.15	Chittorgarh	Nimbahera	Nimbahera(RURAL)
427	Laungach	5	Chittorgarh	Kapasan	Kapasan
428	Laxman ka bas	6.3	Sikar	SIKAR (O&M)	Piprali
429	Ledi	3.15	nagaur	Ladnun	AEN(Rural,ladnu)
430	Leswa	6.3	Chittorgarh	Nimbahera	Bhadesar

431	Linkoda	6.3	Chittorgarh	Nimbahera	Badisadri
432	LOHARIYA	3.15	BANSWARA	BAGIDORA	AEN (O&M, Partapur)
433	Lopda	3.15x1	Udaipur	Xen Rural-I Udaipur	Mavli
434	Losal	15	Sikar	SIKAR RURAL	LOSAL
435	Lothiyana	3.15	Chittorgarh	Nimbahera	Dungla
436	LOTIYANA	3.15	Chittorgarh	Bengu	Rawatbhata
437	Loyal	3.15+3.15=6.30	Jhunjhunu	Chirawa	Chanana
438	LUNAWAS	3.15	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
439	Luttoo	3.15	JHUNJHUNU	JJN (R)	Malsisar
440	MACCHAWALI	6.3	Sikar	REENGUS	AEN (O&M) REENGUS
441	MADHANIO KI DHANI	3.15	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
442	Madhopur ITI	5	Chittorgarh	Bengu	Bengu
443	Madhura Talab	3.15	Pratapgarh	XE RURAL PGH	AE RURAL PRATPGARH
444	MADKOLA	3.15	BANSWARA	KUSHALGARH	AEN(O&M, Anandpuri)
445	MADPURA	6.3 (3.15+3.15)	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
446	Magra bas	3.15	nagaur	Ladnun	AEN(O&M,Ladnu)
447	MAGRAWAS	5	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
448	MAHESHPURA	6.3 (3.15+3.15)	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
449	MAHIDEM	3.15	BANSWARA	BANSWARA	AEN (O&M-II), Banswara
450	Mahpalwas	3.15	Jhunjhunu	Chirawa	Surajgarh
451	Mainana	3.15	JHUNJHUNU	Khetri Nagar	Khetri Nagar
452	Mainns	6.3(3.15+3.15)	BANSWARA	BAGIDORA	AEN (O&M, Partapur)
453	Maligaonv	3.15	JHUNJHUNU	JJN (R)	Bagar
454	Malsisar	3.15	JHUNJHUNU	JJN (R)	Malsisar
455	Malupura Bhamarwasi	3.15	Jhunjhunu	Chirawa	Sultana
456	Managao	6.3	Pratapgarh	XE RURAL PGH	AE ONM DHARIYAWAD
457	Managaon	6.3	Pratapgarh	XE RURAL PGH	AE ONM DHARIYAWAD
458	MANAKPUR	6.3 (3.15+3.15)	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
459	Mandavi	6.3	Pratapgarh	XE RURAL PGH	AE ONM

					DHARIYAWAD
460	Mandawa	5+3.15=8.15	Jhunjhunu	Jhunjhunu (O&M)	Mandawa
461	Mandawari	3.15	Chittorgarh	Bengu	Bengu
462	Mandeta	8.15	Sikar	SIKAR RURAL	LOSAL
463	Mandfiya	6.3	Chittorgarh	Nimbahera	Bhadesar
464	Mandri	3.15	JHUNJHUNU	Khetri Nagar	Khetri Town
465	Mangalward	6.3	Chittorgarh	Nimbahera	Dungla
466	Mangrol	8.15	Chittorgarh	Nimbahera	Mangrol
467	Mani Vihar	8+5=13	Jhunjhunu	Jhunjhunu (O&M)	Jhunjhunu (O&M)
468	Manohargarh	9.45	Pratapgarh	XE ONM PGH	AE ONM PRATPGARH
469	Manota Jatan	3.15	Jhunjhunu	Chirawa	Chanana
470	Manpur	3.15x1	Udaipur	XEN SALUMBER	Salumber rural
471	Manpura	8.15 (3.15+5)	Chittorgarh	Chittorgarh	Chittorgarh (Rec)
472	Marmi	3.15	Chittorgarh	Kapasan	Rashmi
473	Masaro ki obri	5x1+5x1	Udaipur	Xen O&M Kherwada	Rishabdev
474	Mavli	3.15X2	Udaipur	Xen Rural-I Udaipur	Mavli
475	Medi ka amrana	3.15	Chittorgarh	Chittorgarh	Sawa
476	Meghpura	3.15	Chittorgarh	Bengu	Bengu
477	Mehara	5	JHUNJHUNU	Khetri Nagar	Khetri Town
478	MEHROLLI	10	Sikar	REENGUS	AEN (O&M) REENGUS
479	Merta Road	10(5+5)	NAGAUR	XEN(O&M,MERTA)	Merta(Rural)
480	Minda	4.75(3.15+1.6)	nagaur	Kuchaman	AEN(O&M,NawaCity)
481	Mindana	3.15	Chittorgarh	Nimbahera	Nimbahera(RURAL)
482	Mohan pura	6.3	Pratapgarh	XE RURAL PGH	AE RURALCHOTISADRI
483	MOHKAMPURA	3.15	BANSWARA	BANSWARA	AEN (O&M, Kushalgarh)
484	Mokhampura	9.45	Pratapgarh	XE ONM PGH	AE QNM PRATPGARH
485	Molasi	3.15	Sikar	SIKAR RURAL	Dhod
486	MONADUNGRI	3.15	BANSWARA	BAGIDORA	AEN (O&M, Bagidora)
487	Morwan	5	Chittorgarh	Nimbahera	Dungla
488	MOTA GAUN	3.15	BANSWARA	BANSWARA	AEN (O&M, Ghatol)
489	Mugana	6.3	Pratapgarh	XE RURAL PGH	AE ONM DHARIYAWAD
490	Mujwa	3.15	Chittorgarh	Nimbahera	Badisadri
491	Mukandgarh	2.5+5=7.5	Jhunjhunu	Nawalgarh (O&M)	Mukandgarh
492	Mundi	3.15	NAGAUR	DEEDWANA	AEN(O&M), ROLL
493	Mundwa	10(5+5)	NAGAUR	NAGAUR	AEN(O&M), MUNDWA

494	Mundwa (IPDS)	5	NAGAUR	NAGAUR	AEN(O&M), MUNDWA
495	Mundwara	13.15	Sikar	SIKAR RURAL	Sikar (Rural)
496	MUNGTHALI	3.15	BANSWARA	BANSWARA	AEN (Rural, Banswara)
497	Murla	3.15	Chittorgarh	Kapasan	Bhopal Sagar
498	NAGAWADA	3.15	BANSWARA	BAGIDORA	AEN (O&M, Bagidora)
499	NAGRI	8.15 (5+3.15)	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
500	Nagwa	3.15	Sikar	SIKAR RURAL	Dhod
501	Nakor	6.3	Pratapgarh	XE RURAL PGH	AE RURAL PRATPGARH
502	Nanagli	5+3.15=8.15	Jhunjhunu	Chirawa	Chanana
503	Nandvwi	5	Chittorgarh	Bengu	Bengu
504	Nani	5	Sikar	SIKAR RURAL	Sikar (Rural)
505	Napaniya	3.15	Chittorgarh	Nimbahera	Bhadesar
506	Napavli	6.3	Chittorgarh	Nimbahera	Bhadesar
507	NAPLA	3.15	BANSWARA	BANSWARA	AEN(O&M), Chhoti Sarvan
508	Narela	3.15	Chittorgarh	Chittorgarh	Chittorgarh (Rec)
509	Narhar	3.15+3.15+1.5=7.8	Jhunjhunu	Chirawa	Chirawa
510	NARWA	10 (5+5)	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
511	NATHPURA	3.15	BANSWARA	BANSWARA	AEN (O&M, Kushalgarh)
512	Nawalgarh	5+5+5=15	Jhunjhunu	Nawalgarh (O&M)	Nawalgarh (O&M)
513	Naya boriya	3.15	Pratapgarh	XE RURAL PGH	AE ONM DHARIYAWAD
514	Nayakheda	3.15	Chittorgarh	Nimbahera	Nimbahera(RURAL)
515	Neem ki dhani	3.15+3.15=6.30	Jhunjhunu	Nawalgarh (O&M)	Gudha Rural
516	Netarwas	6.3	Sikar	SIKAR RURAL	Dhod
517	Netaval Garh Pachli	5	Chittorgarh	Chittorgarh	Chittorgarh (Rec)
518	New Housing Board	5	Jhunjhunu	Jhunjhunu (O&M)	Jhunjhunu (O&M)
519	NICHALA GHANTALA	3.15	BANSWARA	BANSWARA	AEN (O&M-II), Banswara
520	Nikumbh	6.3	Chittorgarh	Nimbahera	Badisadri
521	Nimbahera	8.15 (3.15+5)	Chittorgarh	Chittorgarh	Gangrar
522	Nirdhnu	3.15	Jhunjhunu	Jhunjhunu (O&M)	Bissau
523	Nogama	3.15	BANSWARA	BAGIDORA	AEN (O&M, Bagidora)
524	Noorda	3.15x1	Udaipur	Xen Rural-I Udaipur	Debari

525	Nua	3.15+3.15=6.30	Jhunjhunu	Jhunjhunu (O&M)	Mandawa
526	Nunia Gothra	3.15	JHUNJHUNU	JJN (R)	Bagar
527	Nya Gaun	3.15	BANSWARA	BANSWARA	AEN (Rural, Banswara)
528	Ojtoo	3.15+3.15=6.30	Jhunjhunu	Chirawa	Chirawa
529	Pacheri	3.15	JHUNJHUNU	Khetri Nagar	Buhana
530	PADAAL	3.15	BANSWARA	BANSWARA	AEN (O&M, Ghatol)
531	PADLA	3.15	BANSWARA	BANSWARA	AEN (Rural, Banswara)
532	Pahuna	5	Chittorgarh	Kapasan	Rashmi
533	PAKHAND	3.15	RAJASAMND	Nathdwara	Nathdwara
534	Palanakala	5x1	Udaipur	Xen Rural-I Udaipur	Mavli
535	PALDI	6.3	Sikar	LAXMANGARH(O&M)	LAXMANGARH(O&M)
536	Palka	3.15	Chittorgarh	Bengu	Bassi
537	PALODA	3.15	BANSWARA	BAGIDORA	AEN (O&M, Partapur)
538	Palodra	3.15x1+3.15x1	Udaipur	XEN SALUMBER	Veerpura
539	Palsana I/A	6.3	Sikar	REENGUS	palsana
540	PANCHLA SIDDHA	10 (5+5)	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
541	PANCHORI	10 (5+5)	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
542	Panchwa	11.30(5+3.15+3.15)	nagaur	Kuchaman	AEN(Rural,Kuchaman City)
543	Pandiyawara	3.15x1	Udaipur	Xen O&M Kherwada	Rishabdev
544	Pandoli	10 (5+5)	Chittorgarh	Chittorgarh	Chittorgarh (Rec)
545	Pandoli Station	3.15	Chittorgarh	Kapasan	Kapasan
546	Panmodi	6.3	Pratapgarh	XE RURAL PGH	AE RURAL PRATPGARH
547	Panndeda	3.15	Chittorgarh	Nimbahera	Badisadri
548	Parewari	3.15	nagaur	Kuchaman	AEN(O&M,Chitawa)
549	Parsad	3.15x1	Udaipur	Xen O&M Kherwada	Sarada
550	Parsoli	3.15	Chittorgarh	Nimbahera	Badisadri
551	Parsrampura	3.15+3.15=6.30	Jhunjhunu	Nawalgarh (O&M)	Nawalgarh (Rural)
552	PARTAPUR	6.3(3.15+3.15)	BANSWARA	BAGIDORA	AEN (O&M, Partapur)
553	PATAN	3.15	BANSWARA	BANSWARA	AEN (O&M, Kushalgarh)
554	Patiya	3.15x2	Udaipur	Xen O&M Kherwada	Kherwara O&M

555	Patniya	3.15	Chittorgarh	Chittorgarh	Sawa
556	Patoliya	3.15	Chittorgarh	Kapasan	Bhopal Sagar
557	Patusari	5	JHUNJHUNU	JJN (R)	JJN (R)
558	Peeh	8.15(5+3.15)	nagaur	Makrana	AEN(O&M,Bagot)
559	Peelikhera	6.3	Pratapgarh	XE RURAL PGH	AE RURALCHOTISADRI
560	Peepalkhut	6.3	Pratapgarh	XE ONM PGH	AE ONM PEEPALKHUNT
561	Peepli	5+5=10	Jhunjhunu	Chirawa	Pilani
562	Pewa	3.15	Sikar	SIKAR RURAL	Dhod
563	PH 2 Lakadwas	3.15x2	Udaipur	Xen Rural-I Udaipur	Girwa
564	Pichanwa	1.6+3.15+3.15=7.9	Jhunjhunu	Chirawa	Chirawa
565	Pilani	8+8=16	Jhunjhunu	Chirawa	Pilani
566	Pind bhanuja	10	Chittorgarh	Nimbahera	Badisadri
567	Pindiya	3.15	NAGAUR	DEEDWANA	AEN(O&M), JAYAL
568	PIPALIYA	6.3 (3.15+3.15)	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
569	Pipli	5+5=10	Jhunjhunu	Chirawa	Pilani
570	Piprali	10	Sikar	SIKAR (O&M)	Piprali
571	Pirana	6.3	Chittorgarh	Nimbahera	Dungla
572	PITAMPURI	8.15	Sikar	NEEM KA THANA	KANWAT
573	Ponkh	3.15+3.15=6.30	Jhunjhunu	Nawalgarh (O&M)	Gudha Rural
574	PRITAMPURI	8.15	Sikar	NEEM KA THANA	KANWAT
575	Putholi	3.15	Chittorgarh	Chittorgarh	Gangrar
576	Rabdiyad	3.15	nagaur	Makrana	AEN(O&M,Bagot)
577	Raghunathpura	3.15+3.15=6.30	Jhunjhunu	Nawalgarh (O&M)	Gudha (O&M)
578	Rahanwa	3.15	Sikar	LAXMANGARH(O&M)	LAXMANGARH(O&M)
579	Railmagra	6.3	RAJASAMND	Kankroli	Railmagra
580	Raipur	3.15	Pratapgarh	XE ONM PGH	AE ONM DALOT
581	Raipur Hiran	3.15	JHUNJHUNU	Khetri Nagar	Buhana
582	RAIPURA	3.15	Sikar	REENGUS	palsana
583	RAIYANA	3.15	BANSWARA	BAGIDORA	AEN (O&M, Garhi)
584	Rajas	11.30(3.15+3.15+5)	nagaur	Kuchaman	AEN(O&M,NawaCity)
585	Rajgarh	3.15	Chittorgarh	Bengu	Bassi
586	Rajiliya	3.15	nagaur	Kuchaman	AEN(O&M,NawaCity)

587	Ram devji	11.3	Pratapgarh	XE RURAL PGH	AE ONM CHOTISADRI
588	RAMGARH	3.15	BANSWARA	BANSWARA	AEN (O&M, Kushalgarh)
589	Rampura talai	5	Sikar	SIKAR RURAL	LOSAL
590	RANI KHEDA	5	Chittorgarh	Nimbahera	Nimbahera(RURAL)
591	ranoli	8.15	Sikar	REENGUS	palsana
592	Rashmi	8.15 (3.15+5)	Chittorgarh	Kapasan	Rashmi
593	Rasidpura	6.3	Sikar	SIKAR RURAL	Kudan
594	Rasoolpur	5	JHUNJHUNU	Khetri Nagar	Babai
595	Rathajana	9.45	Pratapgarh	XE RURAL PGH	AE RURAL PRATPGARH
596	Rathliya	4.15(3.15+1)	nagaur	Makrana	AEN(REC, Makrana)
597	Rayti	3.15	Chittorgarh	Bengu	Bengu
598	REST HOUSE	10(5+5)	NAGAUR	NAGAUR	AEN(O&M), NAGAUR
599	RIICO	8.15 (3.15+5)	Chittorgarh	Kapasan	Kapasan
600	RIICO Gudli	8X2+5*1	Udaipur	Xen Rural-I Udaipur	Debari
601	RiicO Parbatsar	5	nagaur	Makrana	AEN(O&M,Parabatsar)
602	RIICO REENSUS	10	Sikar	REENGUS	AEN (O&M) REENGUS
603	Rishabdev	3.15x2+5x1	Udaipur	Xen O&M Kherwada	Rishabdev
604	ROHIDA	3.15	BANSWARA	BAGIDORA	AEN (O&M, Partapur)
605	Rohindi	3.15	nagaur	Makrana	AEN(O&M,Parabatsar)
606	Rohi-Raipura	6.3	Sikar	REENGUS	palsana
607	Rol	8.15(3.15+5)	NAGAUR	DEEDWANA	AEN(O&M), ROLL
608	Roliya	6.30 (3.15+3.15)	Chittorgarh	Kapasan	Kapasan
609	Rood	3.15	Chittorgarh	Kapasan	Rashmi
610	Roon -I	10(5+5)	NAGAUR	NAGAUR	AEN(O&M), MUNDWA
611	Roon -II	6.3 (3.15+3.15)	NAGAUR	NAGAUR	AEN(O&M), MUNDWA
612	Rotu	3.15	NAGAUR	NAGAUR	AEN(O&M), DEH
613	Rukansar	3.15	Sikar	LAXMANGARH(O&M)	Ramgarh skh.
614	Rupakhadi	3.15	Chittorgarh	Kapasan	Kapasan
615	Sadas	8.15 (3.15+5)	Chittorgarh	Chittorgarh	Gangrar
616	SADEENSAR	3.15	Sikar	LAXMANGARH(O&M)	FATEHPUR RURAL

617	Sadi	3.15	Chittorgarh	Bengu	Bassi
618	Sagdod	3.15	BANSWARA	BANSWARA	AEN (Rural, Banswara)
619	Sahanwa	3.15	Chittorgarh	Chittorgarh	Sawa
620	sajjanpura	3.15	Chittorgarh	Chittorgarh	Chittorgarh (Rec)
621	sakhtali khurd	3.15	Pratapgarh	XE ONM PGH	AE ONM ARNOD
622	Sakroda	3.15x1	Udaipur	Xen Rural-I Udaipur	Girwa
623	Salamgrah	10	Pratapgarh	XE ONM PGH	AE ONM DALOT
624	SALEDIPURA	6.3	Sikar	REENGUS	KHANDELA
625	Salera kala	3.15x1	Udaipur	Xen Rural-I Udaipur	Debari
626	Salumber	3.15x2	Udaipur	XEN SALUMBER	Salumber (O&M)
627	Salumber Hosuing Board	3.15x1	Udaipur	XEN SALUMBER	Salumber (O&M)
628	Sami	3.15	Sikar	SIKAR RURAL	LOSAL
629	Samriya Kala	3.15	Chittorgarh	Bengu	Bengu
630	Sangliya	8.15	Sikar	SIKAR RURAL	LOSAL
631	SANIK NAGAR	5	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
632	Sankhwas	8.15(3.15+5)	NAGAUR	NAGAUR	AEN(O&M), MUNDWA
633	Sanwad	5x1+3.15x1	Udaipur	Xen Rural-I Udaipur	Mavli
634	Sarada	3.15x1	Udaipur	Xen O&M Kherwada	Sarada
635	Saran	3.15	Chittorgarh	Chittorgarh	Gangrar
636	Sarasani	3.15	NAGAUR	NAGAUR	AEN(O&M), DEH
637	Sardarpur+B1503	3.15+3.15=6.30	Jhunjhunu	Chirawa	Pilani
638	Sardarpura	3.15	nagaur	Kuchaman	AEN(O&M,Chitawa)
639	SAREDI BADI	3.15	BANSWARA	BAGIDORA	AEN (O&M, Partapur)
640	Sarera	5x1	Udaipur	Xen O&M Kherwada	Kherwara O&M
641	SARGOTH	10	Sikar	REENGUS	AEN (O&M) REENGUS
642	Sarwadi	6.3	Sikar	SIKAR RURAL	Dhod
643	SATIKA	8.15(5+3.15)	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
644	Satkhanda	6.3	Chittorgarh	Nimbahera	Mangrol
645	Satola	9.45	Pratapgarh	XE RURAL PGH	AE RURALCHOTISADRI
646	Satpuda	3.15	Chittorgarh	Chittorgarh	Chittorgarh (Rec)
647	Savloda purohitan	6.3	Sikar	SIKAR RURAL	Kudan
648	sawa	9.45	Chittorgarh	Chittorgarh	Sawa

649	Sawatgath	3.15	nagaur	Kuchaman	AEN(O&M,NawaCity)
650	Sehi Kalan	3.15	Jhunjhunu	Chirawa	Chirawa
651	Sekhsar	3.15	Jhunjhunu	Jhunjhunu (O&M)	Mandawa
652	Semari	5x1	Udaipur	Xen O&M Kherwada	Sarada
653	Semarthali	3.15	Pratapgarh	XE RURAL PGH	AE RURALCHOTISADRI
654	SENAWASA	3.15	BANSWARA	BANSWARA	AEN (O&M, Ghatol)
655	Senthi	8	Chittorgarh	Chittorgarh	CHI O&M (I)
656	Sersi Melana	5	Chittorgarh	Nimbahera	Mangrol
657	Sewad Chhoti	6.3	Sikar	SIKAR RURAL	Dhod
658	Shambupura	6.3	Chittorgarh	Chittorgarh	Sawa
659	Sherpura	6.3	Sikar	REENGUS	palsana
660	Sheshpur	3.15x1	Udaipur	XEN SALUMBER	Salumber rural
661	Shiavsinghpura/ KUDLI	6.3	Sikar	SIKAR (O&M)	CSD-III
662	Shilanwad	3.15	nagaur	Ladnun	AEN(O&M,Nimbi Jodha)
663	Shiv	3.15	nagaur	Kuchaman	AEN(Rural,Kuchaman City)
664	Shiv Mandir	10(5+5)	nagaur	Kuchaman	AEN(O&M,Kuchaman City)
665	Shiv Nagar	3.15	NAGAUR	DEEDWANA	AEN(O&M), JAYAL
666	Shree Bala JI	3.15	NAGAUR	NAGAUR	AEN(RURAl), NAGAUR
667	Shyampura	5	Sikar	SIKAR (O&M)	Piprali
668	Shyamsar	3.15	NAGAUR	NAGAUR	AEN(O&M), DEH
669	Siddhapura	8.15	Pratapgarh	XE RURAL PGH	AE RURAL PRATPGARH
670	Sidheriya	6.3	Pratapgarh	XE ONM PGH	AE ONM PRATPGARH
671	Sigra	3.15	Jhunjhunu	Jhunjhunu (Q&M)	Mandawa
672	SIHODI	3.15	Sikar	SRIMADHOPUR	THOI
673	Sihot Badi	6.3	Sikar	SIKAR RURAL	Dhod
674	Sihot Chhoti	10	Sikar	SIKAR RURAL	Sikar (Rural)
675	SIMARALA	6.3	Sikar	REENGUS	AEN (O&M) REENGUS
676	Singhpur	8.15 (3.15+5)	Chittorgarh	Kapasan	Kapasan
677	Singnore	3.15+3.15=6.30	Jhunjhunu	Nawalgarh (O&M)	Gudha (O&M)
678	Siyakhedi	6.3	Pratapgarh	XE RURAL PGH	AE ONM CHOTISADRI
679	SOBAWALI	6.3	Chittorgarh	Nimbahera	Nimbahera(RURAL)
680	Solana	3.15	Jhunjhunu	Chirawa	Chanana
681	Somi	3.15	Chittorgarh	Kapasan	Rashmi
682	SON NAGAR	10 (5+5)	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR

683	Sonagar	3.15	Chittorgarh	Bengu	Bassi
684	Soniyana	8.15 (3.15+5)	Chittorgarh	Chittorgarh	Gangrar
685	SONTHALIYA	6.3	Sikar	REENGUS	AEN (O&M) REENGUS
686	Soobi	3.15	Pratapgarh	XE RURAL PGH	AE ONM CHOTISADRI
687	Sotwara	3.15	Jhunjhunu	Nawalgarh (O&M)	Mukandgarh
688	Sudri	3.15	Chittorgarh	Chittorgarh	Gangrar
689	Suhagpura	6.3	Pratapgarh	XE ONM PGH	AE ONM PEEPALKHUNT
690	Sukhwada	3.15	Chittorgarh	Nimbahera	Bhadesar
691	Sulai	3.15x1	Udaipur	Xen O&M Kherwada	Kherwara O&M
692	Sultana	5+5=10	Jhunjhunu	Chirawa	Sultana
693	Sunari	3.15	nagaur	Ladnun	AEN(Rural,ladnu)
694	Surajgarh	5+5+5=15	Jhunjhunu	Chirawa	Surajgarh
695	Surpur	3.15	Chittorgarh	Kapasan	Kapasan
696	SURVANIYA	3.15	BANSWARA	BANSWARA	AEN (Rural, Banswara)
697	Suwala	3.15	BANSWARA	BAGIDORA	AEN (O&M, Bagidora)
698	Swami Sehi	3.15+3.15=6.30	Jhunjhunu	Chirawa	Surajgarh
699	Tain	3.15	Jhunjhunu	Jhunjhunu (O&M)	Bissau
700	TALWARA	6.3(3.15+3.15)	BANSWARA	BANSWARA	AEN (Rural, Banswara)
701	TAMBESRA/OSARA	3.15	BANSWARA	KUSHALGARH	AEN(O&M,Sajjangarh)
702	Tana	3.15	Chittorgarh	Kapasan	Bhopal Sagar
703	TANKLA	5	NAGAUR	NAGAUR	AEN(O&M), KHINVSAR
704	Tarnau	3.15	NAGAUR	DEEDWANA	AEN(O&M), JAYAL
705	Thamala	3.15x1	Udaipur	Xen Rural-I Udaipur	Mavli
706	THICKRIYA	8.15	Sikar	REENGUS	AEN (O&M) REENGUS
707	Thikriya	3.15	Chittorgarh	Chittorgarh	Sawa
708	THOI	6.3	Sikar	SRIMADHOPUR	THOI
709	Tidi	3.15x1	Udaipur	Xen Rural-I Udaipur	Girwa
710	TIMEDA	3.15	BANSWARA	BANSWARA	AEN (O&M, Kushalgarh)
711	Titanwar	3.15+3.15=6.30	Jhunjhunu	Nawalgarh (O&M)	Gudha (O&M)
712	Tiwadi Ki Dhani	3.15	Sikar	SRIMADHOPUR	AEN O&M SRIMADHOPUR
713	Todi	3.15+3.15=6.30	Jhunjhunu	Nawalgarh (O&M)	Gudha (O&M)
714	todi madhopura	8.15	Sikar	REENGUS	palsana
715	Tonk Chhelri	5	Jhunjhunu	Nawalgarh (O&M)	Udaipurwati

716	Topakheda	6.3	Pratapgarh	XE RURAL PGH	AE RURAL PRATPGARH
717	Toshina	4.75 (3.15+1.6)	NAGAUR	DEEDWANA	AEN(O&M),CHOTI KHATU
718	Udaipurwati	5+5=10	Jhunjhunu	Nawalgarh (O&M)	Udaipurwati
719	Ugarpura	3.15	nagaur	Kuchaman	AEN(Rural,Kuchaman City)
720	Umand	6.30 (3.15+3.15)	Chittorgarh	Kapasan	Kapasan
721	UMARAI	6.3(3.15+3.15)	BANSWARA	BANSWARA	AEN (Rural, Banswara)
722	Uncha	6.30 (3.15+3.15)	Chittorgarh	Kapasan	Rashmi
723	Unchaida	6.3 (3.15+3.15)	NAGAUR	DEEDWANA	AEN(O&M), JAYAL
724	UNKALA	3.15	BANSWARA	BANSWARA	AEN (O&M, Kushalgarh)
725	Utharda	3.15x1	Udaipur	XEN SALUMBER	Salumber (O&M)
726	Vani	8.15	Chittorgarh	Nimbahera	Bhadesar
727	Vasaliya	3.15x1	Udaipur	Xen Rural-I Udaipur	Mavli
728	VEERPUR	6.3(3.15+3.15)	BANSWARA	BANSWARA	AEN (Rural, Banswara)
729	Vijaypur	6.30 (3.15+3.15)	Chittorgarh	Bengu	Bassi
730	Vijaypura	8.15	Sikar	LAXMANGARH(O&M)	NECHHWA
731	W/W	10	Sikar	SIKAR RURAL	Sikar (Rural)
732	Welcome Choraya	5	Chittorgarh	Nimbahera	Nimbahera(O&M)

Rajasthan Electricity Regulatory Commission Jaipur

Petition No.RERC/tariff/8/2000

filed by

Rajasthan Rajya Vidyut Prasaran Nigam Limited,

****

Mr. Arun Kumar, Chairman,

Mr. Shanti Prasad, Member,

Mr. Prabhakar K. Das, Member

Date of order: 24th March 2001

ORDER

1 The Secretary (Administration), Rajasthan Rajya Vidyut Prasaran Nigam Limited had submitted a petition before the Commission on 1st December 2000 on behalf of Rajasthan Rajya Vidyut Prasaran Nigam Limited (hereinafter referred to as 'RVPN') under section 26 of the Rajasthan Power Sector Reforms Act 1999, (Act 23 of 1999)(hereinafter referred to as the Reforms Act) for fixation of tariff for bulk supply and transmission of electricity for the years 2000-01 and 2001-02. This application was submitted in pursuance of resolution of Board of Directors dated 25.11.2000.

2 Rajasthan Electricity Regulatory Commission was established under the provisions of the Electricity Regulatory Commissions Act 1998 (Act 14 of 1998), on 10th December 1999 vide Government of Rajasthan Gazette notification of the same date. The Commission became operational with effect from 2nd January 2000,on appointment of Chairman and a Member. The Commission had notified interalia Rajasthan Electricity Regulatory Commission (Conduct of Business) Regulations 2000, Rajasthan Electricity Regulatory Commission (Tariff) Regulations 2000 (hereinafter referred to as Tariff Regulations) and had issued order No.2 dated 22.4.2000 laying down the methodology, procedure and formats for furnishing information under sub clause (1) of clause 3 and clause 4 of the Tariff Regulations. The Government of Rajasthan promulgated the Rajasthan Power Sector Reforms Act 1999 (Act 23 of 1999) on 10th January 2000 and made it effective on 1st June 2000. The Commission set up under the Electricity Regulatory Commissions Act 1998, became the first Commission under

87 The bulk supply tariff determined by the Commission is based on the projected cost of power purchase by the petitioner after allowing reasonable escalation. There shall be no separate power purchase and fuel cost adjustment charge.

88 In case there is a large variation in the power purchase and fuel cost, the petitioner may take that into account at the time of next tariff filing or propose a power purchase cost adjustment formula for the approval of the Commission.

Rebate for timely payment

89 The Commission has analysed the provisions of tariff for central sector generating/transmission companies, agreements for bulk power supply with NPC, tariff orders for NTPC, NHPC and PGCIL. Considering these & working capital requirements, the Commission directs that 1.5% rebate shall be admissible to Discoms for payment of bill by them upto 3rd day of billing, 1% rebate thereafter for payment upto 25th day of billing. After 55 days of billing a late payment surcharge of 1.5% per month shall be chargeable from Discoms.

Power factor levy/incentive

90 Power factor levy/incentive shall be effective after three months. In the meantime duly calibrated electronic meters capable of recording such readings on hourly basis shall be installed at all substations.

Directions to RVPN

The directions given by the Commission in this order are summarised below:

91 RVPN to be vigilant and ensure that tapping of exclusive supply lines of RVPN is not effected in future by other state/organization. (Para 23)

92 RVPN shall strive for rationalisation of determination of EHV loss in BBMB & Northern Region (NR) so that its impact on purchase from each power station is determinable in advance. (Para 32)

93 RVPN shall strive for EHV loss within the State to be reduced to the level of 5% in next five years. For the year 2001-02 a reduction of 0.08% be achieved. Steps taken by RVPN for this purpose and reduction in losses achieved should be reported to the Commission on quarterly basis. (Para 35)

94 The RVPN shall control EHV loss within the State as per directions in para 37. (Para 37)

95 Vitran Nigam shall maintain minimum power factor of 85%. Requirement of Shunt capacitors for the year be assessed as per NREB studies. 50% of the required capacity shall be installed by RVPN and balance 50% by three Vitran Nigam @ 16.6% capacity. (Para 40)

96 Lagging kVArh draw in excess of 62% of KWh draw, measured at each substation and integrated for Vitran Nigam as a whole, shall attract a penalty of 4 paisa per kVArh with 5% annual escalation with effect from 1.4.2001. Lagging kVArh draw below 32% of KWh drawn shall earn an incentive at the same rate. (Para 40)

97 SLDC shall monitor, on computer, the MVAr draw/injection at power grid/BBMB interconnections at system voltage below 97% and above 103% at respective point. (Para 40)

98 SLDC shall formulate scheme of switching off of excess capacity of shunt capacitors in phases at system voltage from 100% to 103% and switching on of shunt capacitors in phases at system voltage from 100% to 97%. (Para 40)

99 RVPN and Vitran Nigams shall prepare a comprehensive power cut and load shedding scheme so that no sector suffers at the cost of other and all categories of consumers share the shortage. (Para 52)

100 RVPN shall segregate account of generation, transmission & load despatch. (Para 54)

101 RVPN should report status and review of order after three months of introduction of ABT regime. (Para 56)

102 RVPN shall finalise provisional rate for billing conveyed by Director finance and company affairs, RVPN vide letter dated 29.8.2000. (Para 60)

103 RVPN shall enter into power station wise PPA based on GOI guidelines with RVUN within 3 months of this order. (Para 62)

Appendix - I

Complete list of Objectors (RVPNL)

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remain in force until any amendment to the tariff is approved by the Commission. This tariff shall become effective from 1st April 2001.

121. This order is made on March 24, 2001.

-sd- -sd- -sd-

(Prabhakar K. Das) (Shanti Prasad) (Arun Kumar)

Member Member Chairman

Certified copy

(Prabhat Dayal)

Secretary

Rajasthan Electricity Regulatory Commission

Jaipur

RAJASTHAN ELECTRICITY REGULATORY COMMISSION, JAIPUR
NOTIFICATION
JAIPUR 24.05. 2008

No. RERC / Secy / Reg - 74 In exercise of the powers conferred under Section 181 read with section 86(1)(h) of the Electricity Act, 2003 (Act 36 of 2003) the Rajasthan Electricity Regulatory Commission after previous publication makes the following regulations namely:

1.0 Short title and applicability

(i) These regulations shall be called as the "Rajasthan Electricity Regulatory Commission (Rajasthan Electricity Grid Code) Regulations 2008". In short **REGC**.

(ii) These regulations shall apply to the **Users** of 33kV and above, which includes Transmission licensee, Generating Station located in the State including Independent Power Producers, Renewable Energy Power Plants, Generating or/and Transmission Companies connected to State Transmission System, Distribution Companies having HV/EHV consumers directly connected to State Transmission System, Open access customers interconnected to State Transmission System, and Traders.

(iii) These Regulations supersede Part-1 of the Grid Code; earlier approved by Rajasthan Electricity Regulatory Commission **(RERC)** and published by Rajasthan Rajya Vidyut Prasaran Nigam Ltd **(RVPN).** The REGC shall be effective from the date of its publication in the official gazette.

(iv) These Regulations shall also be applicable to the new **Connections** and equipments procured/provided for new works/replacements from the date the **REGC** is made effective. The existing Connections and equipments shall continue to operate till such time it is considered necessary. The operational aspects of the **REGC** shall have no such relaxation and shall be applicable with immediate effect.

(v) The Regulations relating to Grid connectivity, Grid standards & safety standard as specified by the CEA under section 73 of the Act shall generally be complied with in addition to **REGC**.

(vi) These Regulations are covered in 16 Chapters:

Chapter I	SHORT TITLE AND APPLICABILITY
Chapter II	GENERAL REQUIREMENT & BACKGROUND.
Chapter III	DEFINITIONS.
Chapter IV	MANAGEMENT OF THE GRID CODE.
Chapter V	SYSTEM PLANNING.
Chapter VI	CONNECTION CONDITIONS.
Chapter VII	SYSTEM SECURITY ASPECTS.
Chapter VIII	OUTAGE PLANNING.
Chapter IX	OPERATIONAL PLANNING.
Chapter X	SCHEDULEING, DESPATCH AND ACCOUNTING.
Chapter XI	FREQUENCY, VOLTAGE AND NETWORK LOADING MANAGEMENT.
Chapter XII	CONTINGENCY PLANNING.
Chapter XIII	INTER USER BOUNDARY SAFETY.
Chapter XIV	OPERATIONAL EVENT/INCIDENT AND ACCIDENT REPORTING
Chapter XV	PROTECTION.
Chapter XVI	DATA REGISTRATION.

2.0 Chapter-II General Requirement & Background

The Central Electricity Regulatory Commission (**CERC**) under the Electricity Act 2003, Section 79(1)(h) has specified the Indian Electricity Grid Code (**IEGC**). The Electricity Act 2003, Section 86(1)(h) also mandates that the State Electricity Regulatory Commissions shall specify State Grid Code consistent with **IEGC**. Accordingly **REGC** is introduced.

REGC lays down the rules, guidelines and the standards to be followed by the **Users** to operate and maintain an efficient and coordinated State Transmission

Close co-ordination amongst the **Users, SLDC** and the **Transmission Licensee** shall exist at all times for the purposes of effective frequency and voltage management.

The **SLDC** shall monitor the actual **Drawal** against the scheduled **Drawal** and shall regulate the internal generation/demand and maintain the schedule. **SLDC** shall also monitor the reactive power drawal and availability of capacitor bank(s).

The **SGS** shall follow the **despatch instructions** issued by **SLDC.**

The **Discoms** shall primilarly be responsible for managing its load and reactive power **drawal** as per instructions of **SLDC.**

11.3 **Frequency Management:** The nominal system frequency is 50Hz. All possible efforts shall be made to ensure that system frequency shall remain in the band of 49.0Hz to 50.5Hz.

11.4 **Voltage Management: STU** and/or **SLDC** shall carry out the load flow studies based on operational data from time to time to predict where the voltage problems may be encountered and to identify appropriate measures to ensure that the voltage remain within the prescribed limits. Based an such studies the **SLDC** shall instruct the **SGS** to maintain the specified voltage level at interconnecting points. **SLDC** and **STU** shall co-ordinate with the **Discoms** to determine voltage level at the interconnection points.

SLDC shall continuously monitor 400kV, 220kV, 132kV voltage levels at strategic sub-stations and take appropriate measures to control **STS** voltages which may include but not be limited to transformer tap changing, capacitor / reactor switching including capacitor switching by **Discoms** at 33 kV substations, operation of Hydro unit as synchronous condenser and use of MVAr reserves with **SGS** within technical limits as agreed to between **STU** and **SGS.**

RVUN and **IPPs** shall make available the up-to-date capability curves for all **Generating Units** to **SLDC**, as detailed in Chapter-VI, indicating restrictions if any, to allow more accurate system studies and effective operation of the **STS.** The **CPPs** shall furnish the net reactive capability available for Export to/Import from **STS.**

The **Discoms** shall participate in voltage management by providing Local VAR compensation as far as possible, in low voltage system close to load points not depending on **EHV Grid** for reactive support.

11.5 **Network Loading Management:** The **SLDC** shall carry out the periodic studies of the intra-state network loading at least once a year to assess the transfer capability of the state as a whole as well as **Discom** wise and post such information on its website. This shall form the basis for approving Short Term OA transaction at the inter state level.

12.0 Chapter -XII CONTINGENCY PLANNING

12.1 **General:** The recovery process is to be followed by all the **Users** in the event of contingency i.e. total or partial blackouts of **STS** or Regional Transmission System to achieve the fastest recovery taking into account the essential load, Generator capabilities and system constraints.

12.2 **Contingency Planning Procedure:** The contingency planning and blackstart procedure for the **State Transmission System** shall be as per Load Despatch & System Operation Manual.

12.3 **Restoration Procedure:** The restoration procedure for **STS** shall be prepared by **SLDC** for the following contingency:

(i) Total system black out
(ii) Partial System Blackout
(iii) Synchronisation of System Islands and System Split (separation)

The procedure shall be in conformity to the Recovery Procedure of the **Northern Region** prescribed under **IEGC** to be updated with new network parameters.

The restoration process shall take into account the generator capabilities and the operational constraints of Region and **STS** in achieving normalcy in the shortest possible time. The Users should be aware of the steps to be taken during the **Grid Disturbance** and system restoration process.

12.4 During the restoration period as certified by **SLDC** the provision of ABT shall remain

RAJASTHAN RAJYA VIDYUT PRASARAN NIGAM LIMITED.
[Corporate Identity Number (CIN):U40109RJ2000SGC016485]
(Regd. Office: Vidyut Bhawan, Jan Path, Jyoti Nagar, Jaipur - 302 005)
OFFICE OF THE SUPERINTENDING ENGINEER (PROJECT & PLANNING)
✆ +91-141-2740623,Fax:+91-141-2740794;
e-mail: se.pp@rvpn.co.in; website:www.rvpn.co.in
RVPN
An ISO 9001:2015 Certified Company
75 YEARS OF CELEBRATING THE MAHATMA

No. RVPN/SE(P&P)/XEN -2/AE-III/ F. /D 17 | 3 Jaipur, Dt. 13 | 12 | 2022

Member Secretary
Northern Regional Power Committee,
18-A, Shaheed Jeet Singh Marg, Katwaria Sarai,
New Delhi-110016

Sub: Submission of agenda note for consideration and approval of Installation of Capacitor Banks on 11 KV Side 33/11 KV Substations of Jodhpur DISCOM (Rajasthan) for Reactive Power Compensation under Power system Development Fund (PSDF)-Phase 'I'.

Dear Sir,

On the above captioned subject, kindly find enclosed herewith the agenda note for Installation of Capacitor Banks on 11 KV Side 33/11 KV Substations of Jodhpur DISCOM (Rajasthan) for Reactive Power Compensation under Power system Development Fund. Summary of the scheme is mentioned below:-

S. No.	Scheme details	Estimated Amount (Rs. In Cr.)
1	Installation of Capacitor Banks on 11 KV Side 33/11 KV Substations of Jodhpur Vidyut Vitran Nigam Limited (JdVVNL)	296.85

Enclosure:

1. Agenda Note of JdVVNL
2. Annexure A- DPR provided by JdVVNL
3. Annexure B- RERC Order dated 24.03.2001
4. Annexure-C- Rajasthan Electricity Grid Code, 2008
5. Annexure-D- Format A5: Appraisal by STU

(S.C.Meena)
Chief Engineer (PP&D)

Brief Details of the Project Appraisal by CTU / STU / RPC

The applicant utility shall submit project appraisal by CTU / STU / RPC in the given format and a copy of the Appraisal Report should be attached at Annexure.

Item	Details to be filled by Applicant Utility	
Appraisal By:	STU [■] CTU [ ] RPC [ ]	
Date of Submission to CTU / STU / RPC for approval	Scheme was submitted to Rajasthan Rajya Vidyut Prasaran Nigam Ltd. (STU) by JdVVNL on dated 28.10.2022.	
Name of the Scheme	Implementation of Automatic Reactive Power Solutions at 33/11 kV substations in Jodhpur DISCOM	
Copy of the Appraisal Report by CTU / STU / RPC is Attached at Annexure	Yes [■] No [ ] [DPR enclosed at Enclosure-1)]	
Summary of observations from CTU/ STU/RPC Appraisal Report	Summary of Proposal Appraised	The DPR has been prepared so as to improve & strengthen the operational reliability, enhancement of system, real-time data capturing and better management of reactive power.
	Technical Observations	As per the order of Rajasthan Electricity Regulatory Commission (RERC) dated 24.03.2001, 50% of the total MVAR requirement (presently approx. 10000 MVAR) shall be compensated by RVPN, while remaining 50% shall be compensated by remaining DISCOMs (16.6% by each DISCOM). This project report proposes installation of 1830 MVAR which is above the target of 1660 MVAR, as such, 1660 MVAR may be considered for approval of the competent authority.
	Financial Observations	As per guideline/procedure for disbursement of funds from PSDF in category 5.1(b), this scheme may be posed for funding/ grant from PSDF fund on 90% basis.
	Compliance of Grid Standards / Codes by the Applicant	All the grid standards, IS, IEC required, shall be followed for implementation of the scheme
	Limitations / Shortcomings pointed out by CTU/STU/RPC if any	NIL
	Recommendations of CTU/STU/RPC	The scheme may be posed for funding/ grant from PSDF fund.

Date:-

Chief Engineer (PP&D)
RVPN, Jaipur

Item No. _____
Agenda note for decision.

Agenda note for consideration and approval of Installation of Capacitor Banks on 11 KV Side 33/11 KV Substations of Jodhpur DISCOM (Rajasthan) for Reactive Power Compensation under Power system Development Fund (PSDF)-Phase 'I'.

I

The proposal herein is to accord approval of Installation of Capacitor Banks on 11 KV Side 33/11 KV Substations of Jodhpur DISCOM (Rajasthan) for Reactive Power Compensation under Power system Development Fund (PSDF)-Phase 'I'.

II

Power System Development Fund (PSDF) provides grant for improvement of Transmission System. PSDF provides fund for the following categories-

a) Creating necessary transmission system of strategic importance based on operational feedback by load dispatch centers for relieving congestion in interstate transmission system and intrastate system which are incidental to ISTS.
b) Installation of shunt capacitor, series compensators and other reactive energy generators including reactive energy absorption, dynamic reactive support etc. for improvement of voltage profile in the Grid.
c) Installation of standard and special protection schemes, pilot and demonstrative projects, projects for setting right the discrepancies identified in the protection audit on regional basis, any communication/ measurement / monitoring schemes including installation of Phasor Measurement Units (PMUs) etc.
d) Renovation & Modernization of transmission and distribution system for relieving congestion.
e) Any other scheme/project in furtherance of the above objectives, such as conducting technical studies and capacity building etc.
f) Other schemes benefitting large number of utilities collectively and having a significant impact towards the power system development and Grid operation, on case to case basis.

Presently, scheme detailed as under are posed for approval of funding from PSDF.

S. No.	Scheme details	Approval from BoD	Estimated Amount (Rs. In Cr.)	A&FS issued on dated	Proposed Grant (%age)
1	Installation of Capacitor Banks on 11 KV Side 33/11 KV Substations of Jodhpur Vidyut Vitran Nigam Limited (JdVVNL)	22.08.2022	296.85	22.08.2022	90%

PSDF-NLDC in its 66th meeting of TESG held on dated 29.09.2022 has desired the appraisal from regional power committee (NRPC) for the scheme to be funded from PSDF.

Brief note on the scheme-

1. Due to the spread of population in the remote areas of Rajasthan in recent years, meeting power demand, distribution of electricity and maintaining quality power for every category of consumers has always remained a challenge. The state is primarily agricultural base; and power is supplied to the domestic, non-domestic and industrial sector too. It has been identified that these loads are highly inductive in nature which need rectification.

2. In this regard, JdVVNL has proposed to install dynamic/ automatic capacitor banks under which the capacitive load helps to adjust power factor as close to 'Unity Power Factor'. The implementation of the project/ scheme will limit the heavy drawl of reactive power from grid and mitigate the risk such as (a) Overloading of transmission lines; (b) Overloading of transformers at different voltage levels; and (c) Increase in system losses.

3. It has been noticed that the power factor is ranging from 0.80 to 0.90 at urban feeder and 0.75 to 0.80 (or even less) at the rural feeders within the respective circles. In view of this, installation of capacitor banks on 11 kV side of 33/11 kV substations has been proposed at various circles having 'power factor less than 0.85.

4. JdVVNL proposes installation of ***capacitor banks at 911 Nos. of 33/11 kV substations*** out of total 2337 Nos. of substations spread across 12 circles and 10 districts of Rajasthan. ***Total MVAR installation will be 1829.52 MVAR.*** Detailed list of these substations have been enclosed with DPR.

5. Methodology adopted by JDVVNL consists of extracting previous year data from dedicated Feeder Monitoring System (FdrMS) to have greater insights about ***'real time'*** power supply of 11 kV feeders. The data was further analyzed and cross checked with the field on sample basis to arrive at the conclusion.

6. Approximately 30 lakh consumers at these 911 Nos. of substations along with the concerned STU (Rajasthan Rajya Vidyut Prasaran Nigam Ltd.) shall be benefitted with these measures.

7. Total cost of the scheme comes around 296.85 cr. for which detailed cost estimated have been enclosed with the DPR.

   Detailed Project Project (DPR) is placed as Annexure-A.

Appraisal by the STU (Rajasthan Rajya Vidyut Prasaran Nigam Ltd. (RVPNL))-

RVPNL understands that proposal by JDVVNL to install 911 Nos. of capacitor banks at 11 kV side on their 33/11 kV substations in technically and financially justified up to the maximum installation of 1660 MVA.

As per the order of Rajasthan Electricity Regulatory Commission (RERC) dated 24.03.2001, 50% of the total MVAR requirement (presently approx. 10000 MVAR) shall be compensated by RVPN, while remaining 50% shall be compensated by remaining DISCOMs (16.6% by each DISCOM). (Copy of the order enclosed as Annexure-B).

Further**,** The clause no. 11.4 of Rajasthan Electricity Grid Code, 2008 states that *"The DISCOMs shall participate in voltage management by providing Local VAR compensation as far as possible, in low voltage system close to load points not depending on EHV Grid for reactive support."* (Copy of the clause enclosed as Annexure-C).

This project report proposes installation of approx. 1830 MVAR which above the target of 1660 MVAR. Thus, upper limit of 1660 MVAR may be considered as per appraisal of RVPN (STU). (Appraisal by STU in Format-A5 has been enclosed as Annexure-D).

III

The agenda is hereby placed before NRPC for approval, after appraisal of RVPN (STU) in Annexure A5 of following scheme for further submission to NLDC-PSDF for availing 90% grant:

S. No.	Scheme details	Estimated Amount (Rs. In Cr.)
1	Installation of Capacitor Banks on 11 KV Side 33/11 KV Substations of Jodhpur Vidyut Vitran Nigam Limited (JdVVNL)	296.85

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JODHPUR VIDYUT VITRAN NIGAM LIMITED

DETAILED PROJECTREPORTFORIMPLEMENTATION OF AUTOMATIC REACTIVE POWER SOLUTION ON 33/11 KV SUB STATIONSOFJODHPUR DISCOM

TOTAL ESTIMATED COST:
Two Hundred Ninety Seven crores
(SayRs.296.85crores) only

JODHPUR VIDYUT VITRAN NIGAM LIMITED
Corporate Identity Number (CIN) – U40109Rj2000SG016483
Regd. Office : New Power House, Jodhpur – 342 003
web site: www.energy.rajasthan.gov.in/jdvvnl

Format A1
Page 1 of 1

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SUMMARY OF PROPOSAL

For Official Use- To be filled by the Nodal Agency of PSDF	
Project ProposalNo: ----------	Date of Receipt: ----------

To be filled by the Requesting Organization / Project Entity	
1. Name of the requesting Organization / Utility	Jodhpur VidyutVitran Nigam Limited., Jodhpur
2. Summary of Project/ Scheme / Activity	
a. Name and location of the Project/Scheme/Activity:	**Implementation of Automatic Reactive Power Solution on 33/11 KV substations in Jodhpur DISCOM**
b. Objective of the Project/Scheme/Activity:	The objective is to automate the reactive power and optimize the performance of the distribution grid of Sub Stations of JdVVNL, Jodhpur
c. Authorized person for this Project/Scheme/Activity:	Name: Sh. PramodTak, Managing Director, JDVVNL E-mail ID: md.jdvvnl@rajasthan.gov.in Land Line: +91 291 2742229 Mobile No: +91 9413359001 Fax No : +91 291 2741870
d. Nature of the Project/Scheme/Activity: Interstate/Intra-State	Intra-State
e. Identified Beneficiaries	The State Grid of Rajashtan and Regional Grid of Northern Region of India. The Project will strengthen the Medium Voltage Network of the State which will in turn benefit the Distribution Licensees, the JdVVNL, Jodhpur.
f. Merits of the scheme	Better Management of Volt-VAR
g. Limitations, if any	Installation process may take considerable time.
h. Time frame of Implementation	24months
i. Estimated Cost of Project/Scheme/Activity:	**Rs. 296.85Crores**
j. Category under which the project is classified (Please refer Para 5.1 of the Guidelines/Procedure)	**5.1 (b) as per Guidelines/Procedure for Disbursement of Fund from Power System Development Fund**

03/08/2022

(M.L. BENDA)
Superintending Engineer (PPM)
Ju. V.V.N.L., JODHPUR

(8)

DETAILED PROPOSAL (DP)

1. DETAILS OF THE REQUESTING ORGANIZATION / PROJECT ENTITY

1.1 Details of Organization / Entity

Name of Organization / Entity	Jodhpur VidyutVitran Nigam Limited. Jodhpur
Acronym or Abbreviation (if applicable)	JdVVNL

1.2 Details of Head of the Organization

Name (Mr/Ms/Mrs)	Mr. PramodTak
Designation	Managing Director
E-mail Address	md.jdvvnl@rajasthan.gov.in
Land line No	+91 291 2742229
Fax No.	+91 291 2741870
Address	New Power House,Basni,Jodhpur
City	Jodhpur
Postal Code	342003

1.3Details of Project Incharge/ Project Manager (Authorized Person) for this project / scheme / activity (Not below the rank of Dy. General Manager / Superintending Engineer)

Name (Mr/Ms/Mrs)	Mr. M.L.Benda
Designation	Superintending Engineer (PP&M)
E-mail Address	seppmju@gmail.com
Land Line No.	
Mobile No	9413359040
Fax No.	NA
Address	New Power House, Basni, Jodhpur
City	Jodhpur
Postal Code	342003

Any change in above mentioned details may be notified to the Nodal agency of PSDF immediately.

03/08/2022
(M.L. BENDA)
Superintending Engineer (PP&M)
Ju. V.V.N.L., JODHPUR

2. Justification of the Proposal

2.1 Analysis of the Objective

GENERAL PROFILE OF JODHPUR DISCOM			
S.No.	**Particular**	**UNIT**	**March, 2022**
1	Area	Sq. Km	182509
2	Population 2011 (as per 2011 Census)	Crore	2.00 (2,00,10,828)
3	Nos. of O & M Circles	Nos.	12
4	Nos. of O & M Divisions	Nos.	48
5	Nos. of O & M Sub-Divisions	Nos.	193
6	Nos. of 33KV Sub Stations	Nos.	2337
7	Nos. of Consumers (Regular)	Lacs	45.61
8	No. of Ag. Consumers (PDC)	Lacs	4.26
9	Average Monthly Energy Draw (LU)	LU	24478.40
10	Average Monthly Energy Sold (LU)	LU	19312.16
11	Average Monthly Rev Assessed (Rs. Crores)	CR.	1472.71
12	Average Monthly Rev. Realisation (Rs. Crores)	CR.	1480.90
13	Percentage Realisation	%	100.56
14	T&D losses As on MAR, 2022.	%	21.11
15	No. of 11kv Feeders	Nos.	11690
16	No. of Urban 11kv Feeders	Nos.	1253
17	No. of Rural 11kv Feeders	Nos.	10437

03/08/2022
(M.L. BENDA)
Superintending Engineer (EPM)
Ju. V.V.N.L., JODHPUR

The problem / constraint to be addressed:

(82)

The reasons for high AT&C Losses in the state are primarily the following:

- Non – availability of reliable Reactive Power compensation solution, resulting in high technical losses.
- Deficiency in the organizational setup (O & M)&Financial Support from Government Power Department.
- Electricity consumption in the state consists mainly of domestic (17.84%), Agriculture (60.52%), industrial/commercial category (10.10%) and water works and other category (11.54%).
- The Department is also plagued by shortage of manpower. All these factors lead to inefficiency of the power sector. Therefore reduction of AT&C Losses requires a very committed road map/policy of the Government by considering electricity as a business commodity for essential contribution towards the growth of the economy (resources) while notwithstanding the social obligation in providing energy as a basic need.
- The state is forced to maintain a high HT line length ratio owing to the extremely extended area 182509 KM where electricity is transmitted to long distances due to which frequency and voltage could not be maintained to specified limits..Hence voltage at receiving end drastically drops and leads to drawl to excess current.Same can be understand by formula of Power, $P(KW) = \sqrt{3}xVxIxCos\phi$, according to this formula $V \propto I$.
- This distributed population not only increased the capital investment requirements of the state but also makes the maintenance and monitoring of the network very difficult.
- Defective meters, tampering and power theft are the main causes for high AT&C losses. With prepaid metering the AT&C losses in the State may improve drastically and also alleviate shortage of manpower.
- Formulation of Consumer Call Centre and receiving identification of theft from public domain , escalating the same for detection on online auto shifting mode.

05/08/2022

(M.L. BENDA)
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Ju. V.V.N.L., JODHPUR

(83)

JdVVNL have envisaged following measures for bringing down AT&C losses;

- Installation of Automatic Power Factor Control (APFC) Capacitor banks at all 33/11 kV transformers.
- Identification of loss prone area by tagging of consumers with DTs and feeders for energy accounting.
- Load verification of agriculture category during peak session and ensuring billing accordingly.
- Improvement in HT/LT ratio.
- Formation of Special Task Force for raid against theft.
- Implementation of IT enabled services for power consumers. This has great potential in reducing losses and providing consumer friendly services.
- Smart Metering under RDSS Scheme.
- Feeder and DT metering for accurate energy accounting.
- Introduction of modern technologies to monitor reliable and quality power supply.

03/08/2022
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Superintending Engineer (RPM)
Ju. V.V.N.L., JODHPUR

Introduction Of APFC Panel

In present condition, the 11 KV capacitor bank is controlled by manually switched devices like Isolators/Load Break Switch or circuit breakers. This old practice has disadvantage as compared to modern automatically switched Capacitor Bank.

- The ON/OFF operation of capacitor bank is depending on one operator and it is difficult to control on switching ON/OFF the capacitor bank as per varying load condition.
- There are only two possible conditions in manually switched banks, complete bank is either fully in their circuit or out of circuit and reactive power compensation cannot be closely matched with the varying load condition.
- This results in over compensation or under compensation of reactive power at varying load condition.
- If one of the capacitor units from the capacitor bank is failed, whole capacitor bank will become idle.

Following are the some advantages to propose the Automatic power factor correction systems up to 11 KV.

The APFC scheme is to provide an effective control of capacitor bank installations in Substations to maintain power factor under varying load conditions, for any sub- station load on Transformer changes during a 24 Hour daily load cycle. This variation of load depends upon type of load i.e. Urban Load, Rural load, Agricultural Load, Industrial load etc. The load pattern will be different for different loads. Thus load variation will follow certain pattern and which could be divided into four or six periods in a 24 Hour daily load cycle. Power factor would also vary and at the same time actual requirement of Capacitors in circuit will also vary. If steps are provided with capacitor banks to switch them as required it will help the Electricity Supply Authority to maintain the power factor at desired level throughout the day.

This load variation has been observed to change from 8 % to 68 %. When conventional fixed type capacitor banks are used the capacitor bank will provide compensation of certain level and in an event the bank is not removed from the circuit at low load, it will provide overcompensation to the system. In conventional fixed type capacitor bank removing required capacitor cells from circuit is very cumbersome process as the lineman/operator has to switch on Breaker, Isolator, disconnect the fuse to isolate the capacitor cells and switch ON all the equipments once again. This will again depend upon availability of trained man power for such purpose.

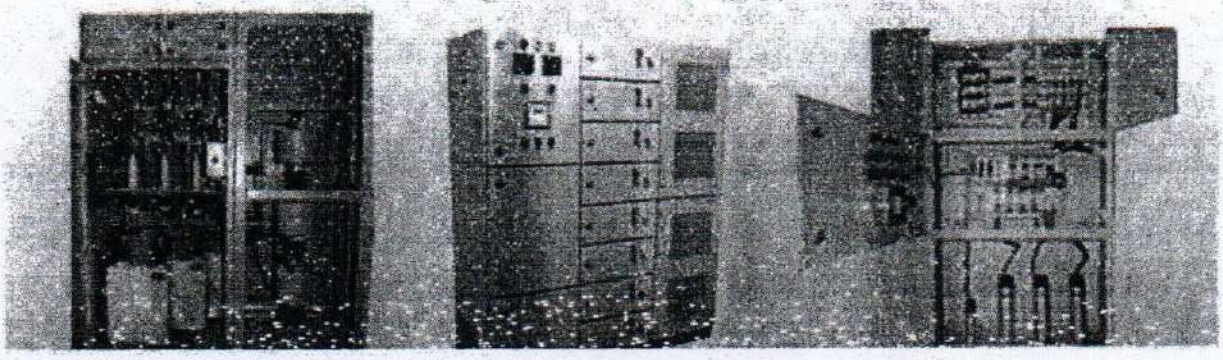
Overcompensation has harm full effects on Capacitors, switching devices. Outdoor type H.T. Capacitor bank with facility of automatic switching of required number of steps with the help of capacitor switch. The bank comprising of externally single star connected Capacitor bank, 0.2% to 0.4% Series Reactors for switching inrush current suppression at neutral end, RVT for unbalance protection.

CEA Regulation

(2) Capacitors and the residual voltage transformer shall be as per relevant IS.

(3) The capacitors shall be of automatic switched type for sub-stations of 5 MVA and higher capacity.

(4) Where un-switched (fixed) capacitors are provided, the rating shall be chosen so as to prevent over compensation during off peak periods.



03/08/2022
(M.L. BENDA)
Superintending Engineer (PPM)
Jd. V.V.N.L., JODHPUR

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BENEFITS OF POWER QUALITY IMPROVEMENT

Difficult to Quantify	Improved voltage stability margins Reduction in equipment failure rates Reduction in equipment mal-function	Compliance to standards Compliance to regulations CDM benefits
Easy to Quantify	Reduction in equipment losses Release of blocked capacity Reduction in T & D loss	Depreciation benefits Incentives Penalties Statutory levies Tariff benefits
	Technical	Non-Technical

03/08/2022
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Ju. V.V.N.L., JODHPUR

DETERMINATION OF THE CAPACITOR BANK RATING

The size of capacitor unit (or Bank) required may be determined from the following formula:

$$Q = P (\tan \theta - \tan \theta c)$$

Where:

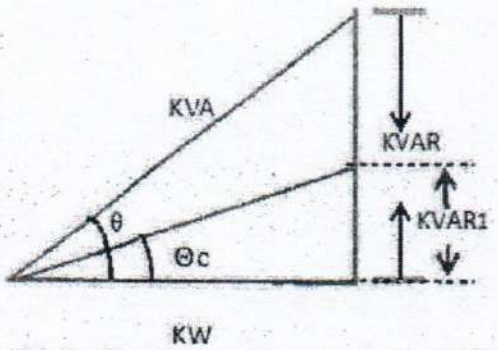
Q = KVAR required

P = Active power in KW

Cos θ = Power factor before compensation

Cos θc = Power factor after compensation

Tan θ = Perpendicular/Base



Tan θ = KVAR/KW

Tan θc = KVAR1 /KW

KVAR = KW (Tan θ)

KVAR1 = KW (Tan θc)

(KVAR-KVAR1) = KW (Tanθ-Tanθc)

Q = P (tan θ - tan θc)

Table Indicating capacitor size in KVAR for each KW Load for correction from different P.F to higher P.F

θ											
									TARGET		Q
								Q			
		0.80	0.82	0.85	0.88	0.90	0.92	0.94	0.96	0.98	1.00
						Factor F					
3.18	0.30	2.43	2.48	2.56	2.64	2.70	2.76	2.82	2.89	2.98	3.18
2.96	0.32	2.21	2.26	2.34	2.42	2.48	2.53	2.60	2.67	2.76	2.96
2.77	0.34	2.02	2.07	2.15	2.23	2.28	2.34	2.41	2.48	2.56	2.77
2.59	0.36	1.84	1.89	1.97	2.05	2.10	2.17	2.23	2.30	2.39	2.59
2.43	0.38	1.68	1.73	1.81	1.89	1.95	2.01	2.07	2.14	2.23	2.43
2.29	0.40	1.54	1.59	1.67	1.75	1.81	1.87	1.93	2.00	2.09	2.29
2.16	0.42	1.41	1.46	1.54	1.62	1.68	1.73	1.80	1.87	1.96	2.16
2.04	0.44	1.29	1.34	1.42	1.50	1.56	1.61	1.68	1.75	1.84	2.04
1.93	0.46	1.18	1.23	1.31	1.39	1.45	1.50	1.57	1.64	1.73	1.93
1.83	0.48	1.08	1.13	1.21	1.29	1.34	1.40	1.47	1.54	1.62	1.83
1.73	0.50	0.98	1.03	1.11	1.19	1.25	1.31	1.37	1.45	1.63	1.73
1.64	0.52	0.89	0.94	1.02	1.10	1.16	1.22	1.28	1.35	1.44	1.64
1.56	0.54	0.81	0.86	0.94	1.02	1.07	1.13	1.20	1.27	1.36	1.56
1.48	0.56	0.73	0.78	0.86	0.94	1.00	1.05	1.12	1.19	1.28	1.48
1.40	0.58	0.65	0.70	0.78	0.86	0.92	0.98	1.04	1.11	1.20	1.40
1.33	0.60	0.58	0.63	0.71	0.79	0.85	0.91	0.97	1.04	1.13	1.33
1.30	0.61	0.55	0.60	0.68	0.76	0.81	0.87	0.94	1.01	1.10	1.30
1.27	0.62	0.52	0.57	0.65	0.73	0.78	0.84	0.91	0.98	1.08	1.27
1.23	0.63	0.48	0.53	0.61	0.69	0.75	0.81	0.87	0.94	1.03	1.23
1.20	0.64	0.45	0.50	0.58	0.66	0.72	0.77	0.84	0.91	1.00	1.20
1.17	0.65	0.42	0.47	0.55	0.63	0.68	0.74	0.81	0.88	0.97	1.17
1.14	0.66	0.39	0.44	0.52	0.60	0.65	0.71	0.78	0.85	0.94	1.14

03/06/2022
(M.L. BENDA)
Superintending Engr.
O.: V.V.N.L., JODI

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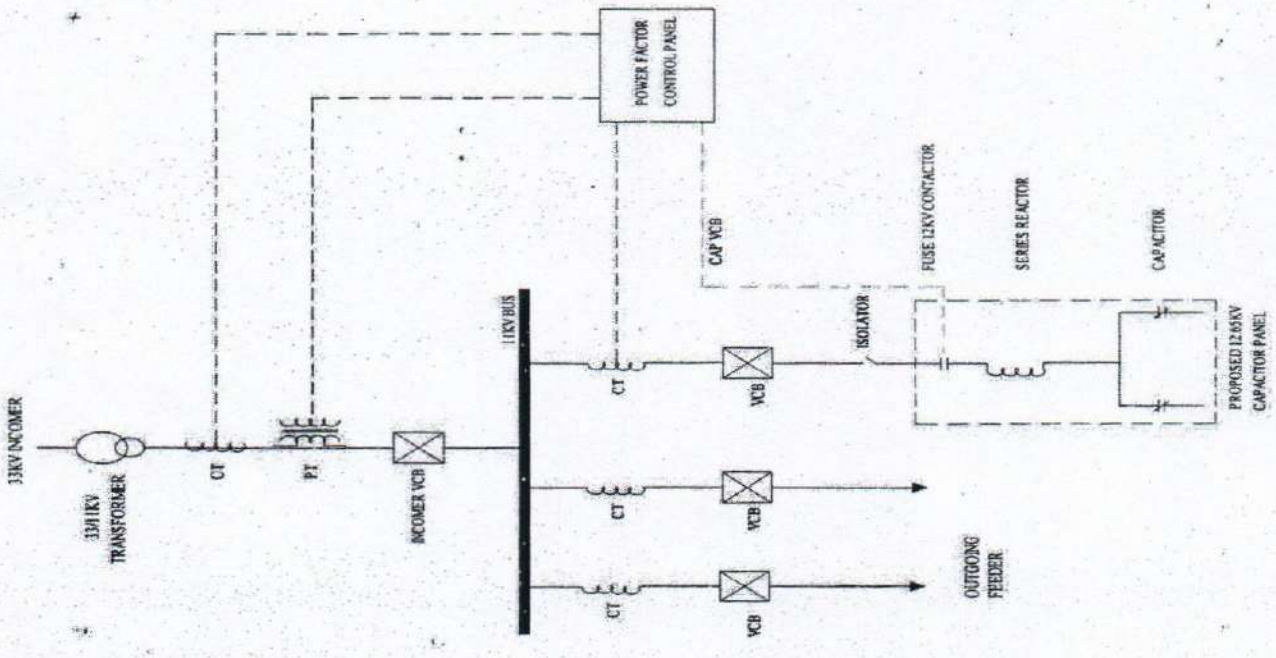
SINGLE LINE DIAGRAM FOR PLACEMENT OF APFC PANELAT 33/11 KV SUBSTATIONS



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Superintending Engineer (PPM)
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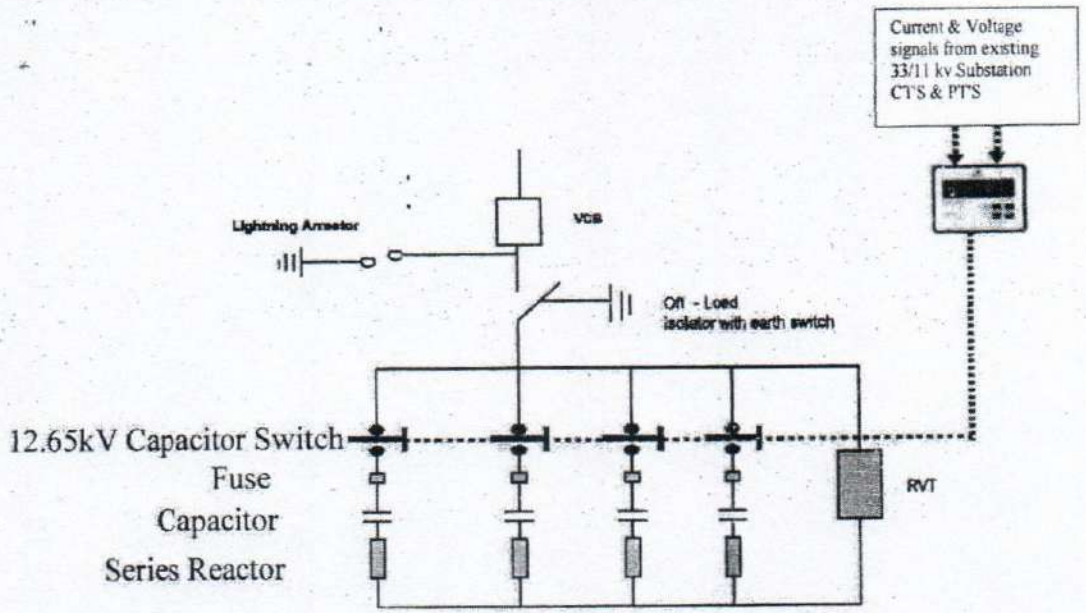
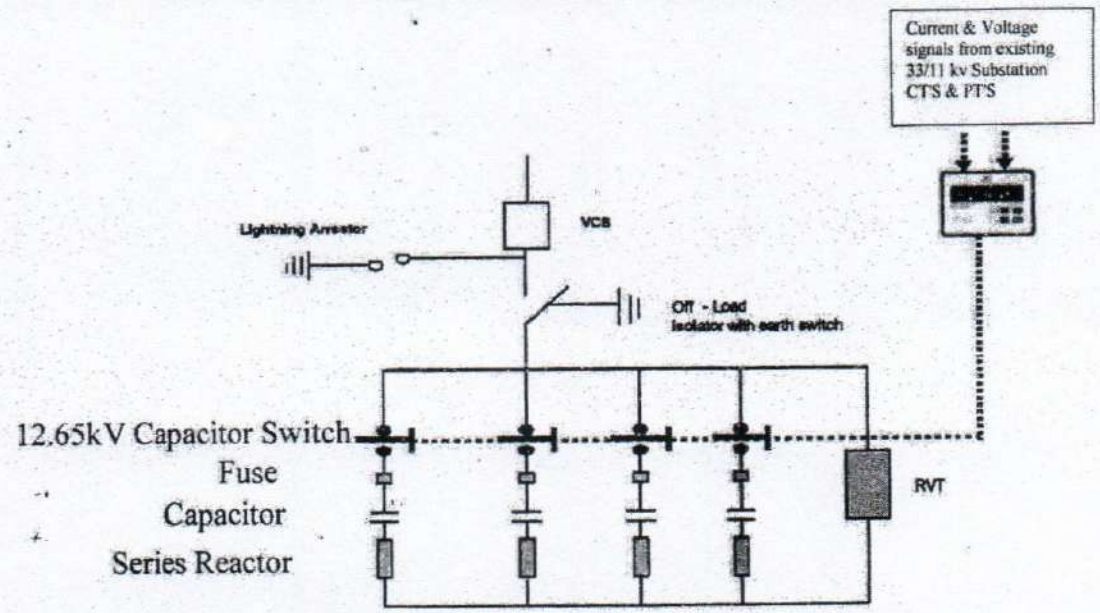
SINGLE LINE DIAGRAM PROPOSED for APFC PANEL ON 3.15, 5.8 and 10 MVA TRANSFORMER AT 33/11 KV SUBSTATIONS



1980 KVAR APFC Bank with 3 Steps of 396+792+792kVAr for , 33/11 KV, 3.15& 5 MVA Transformer



3960 KVAR APFC Bank with 4 Steps of 792+792+1188+1188kVAr for , 33/11 KV, 8

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Objective of the project / scheme/ activity:

Maintaining voltage by reactive power management

Voltage Control in an electrical power system is important for proper operation for electrical power equipment to reduce technical losses, prevent damage to equipment's, overhead lines etc. In general terms, decreasing reactive power causes voltage to fall while increasing it causes voltage to rise. When reactive power supply lowers voltage, current must increase to maintain power supplied, causing system to consume more reactive power and the voltage drops further. If the current increases too much, transmission lines go off line, overloading other lines and potentially causing cascading failures.

This can be controlled by managing the reactive power in the system. To introduce Reactive Power, capacitors are the cheapest and the simplest means. By introducing Switched Capacitor Banks, precise and real time compensation of Reactive Power can be achieved. By achieving precise Reactive Power Compensation, overall healthy voltage profile can be achieved.

Advantages to JDVVNL:

a. Improvement in Voltage level.

b. Reduction of losses in lines and transformers.

c. Reduction of over loading means less heating cables, conductors, transformers etc.

d. A better utilization of the capacity of the generators, transformers, switchgear, cables lines, etc., means increase in efficiency of the system.

e. Reduced depreciation charges on capital outlay and less capital investment.

f. Reduced reactive power drawn charges to NRLDC

g.Reduction in T & D loss (through reduction in current)
- i. Additional units available for sale
- ii. Lower Impact on environment

h.Release of Blocked Capacity (through reduction in apparent power)
- i. Defer Capital Investment
- ii. Better utilization of fixed asset/capital investment

i.Better asset management (operation at lower temperatures)
- i. Lower life cycle cost
- ii. Longer life of equipment & lower replacement cost Better voltage profile

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Required physical additions/equipment in power system

As per BOQ and the DPR.

- **Financing and other commercial details**
  90% grant under PSDF.

- **Merits and limitations (if any) in the implementation of the project / scheme / activity**
  Thedeficienciesintheoldsystemareexpectedtoberemoveprovidedtheprojectisfundedwithfullgrant.However,trainingoftheengineerstofamiliarizewiththenewstateofartequipment'swillhavetobelookedinto.

2.2 Identified Beneficiaries of the Project

The beneficiary of the schemes isJodhpur VidyutVitran Nigam Limited. Jodhpur, State Power utilities suffer from frequent load shedding, tripping due to over loading of transformer resulting in loss of revenue. This system will provide much needed relief to the already overloaded and stressed grid sub stations of JdVVNL.

2.3 Identified Source of funding

90% funding is being proposed through PSDF for installation of 911 Nos. Automatic Reactive Power Solution on 33/11 KV substation in Jodhpur DISCOM in the general interest of providing better power supply to the consumers as JdVVNL is not financially sound.

Contribution from Internal Sources:

10% through internal funding.

Contribution from External Sources:

No external borrowing is envisaged as the project is planned for 90% funding through PSDF and 10% through internal funding.

2.4 Details of Activities for project / Scheme / Activity

Process of implementation

The project will be implemented in following phases:

- Installation of automatic reactive power solution system equipment; S/I/T/C and FMS of Capacitor Cubical Panels, Outdoor Kiosk VCB, Isolator and allied equipment's.

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Present the voltage profile for SS worsened due to load growth in last 5 years and need to installCapacitor Banks in s/s where the voltage profile needs improvement.

To achieve Volt/ volt ampere reactive optimization and Energy conservation through voltage reduction JdVVNL is proposing 911 sub stations for Automatic Reactive Power Solution system as per below list:

Sr. No.	Name of Substations	Transformer Capacity (MVA)	Sub Station/ Transformer Peak Loading (MW)	Voltage
1	MATHANIA	5	4.56	10.3
2		5	4.47	10.3
3	UMMED NAGAR (JOOD)	5	4.52	10.2
4	RAMPURA+RIICO	5	4.98	10.2
5		5	5.00	10.2
6	RAJASANI	3.15	2.78	10.2
7		3.15	2.83	10.2
8	NEWRA ROAD	3.15	3.12	10.5
9		3.15	3.09	10.5
10		3.15	3.05	10.5
11	KIRMARSAIYA	5	4.78	10.5
12		5	4.87	10.5
13	BHENSER KOOTRI	3.15	2.94	10.3
14		3.15	2.98	10.3
15	JOOD	3.15	2.94	10.3
16		3.15	2.80	10.3
17	KHARDA	3.15	2.95	10.2
18		3.15	3.02	10.2
19	NEWRA GAON	3.15	3.05	10.3
20		5	3.00	10.3
21	GAGADI	3.15	2.82	10.5
22		3.15	2.80	10.5
23	MANDIYAI KALLA	5	4.78	10.5
24		5	4.82	10.5
25	BALARWA	3.15	2.75	10.5
26		3.15	2.69	10.5
27		3.15	2.83	10.5

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28	MINIYARD TINWARI	5	4.69	10.5
29		5	4.78	10.5
30	GHEWARA	3.15	2.74	10.2
31		5	4.34	10.2
32	PANCHALA	3.15	2.62	10.2
33		3.15	2.65	10.2
34	BADA KOTECHA-II	3.15	2.81	10.2
35		3.15	2.76	10.2
36	BADLA BASNI	3.15	2.81	10.3
37		3.15	2.77	10.3
38		3.15	2.72	10.3
39	MANDIYAI KHURD	3.15	2.94	10.2
40		3.15	3.01	10.2
41	MALUNGA	3.15	3.10	10.2
42	GOPASARIYA	3.15	3.00	10.3
43		3.15	3.05	10.3
44	BHALASARIYA	3.15	3.09	10.2
45	BANA KA BAS	3.15	3.00	10.5
46		3.15	3.07	10.5
47	THOB	3.15	2.82	10.2
48		3.15	2.73	10.2
49	HARLAYA	3.15	3.01	10.5
50	OSIAN	3.15	2.99	10.5
51		5	4.70	10.5
52	CHERAI	3.15	2.77	10.5
53		3.15	2.69	10.5
54	SINWARO KI DHANI (SIRMANDI)	3.15	2.85	10.3
55		3.15	2.88	10.3
56	AKAL KHORI	3.15	3.05	10.1
57		5	4.78	10.1
58	SAMRAU	3.15	3.07	10.2
59		3.15	2.94	10.2
60	SOMERI BHAKARI	3.15	2.88	10.3
61	BHIMSAGAR	3.15	2.92	10.4
62		3.15	3.01	10.4
63	BERDO KA BAS	3.15	2.98	10.3
64		3.15	2.89	10.3
65	RAWAT BERA	3.15	2.77	10.4
66	NARINADI BHED	3.15	3.02	10.2
67		3.15	3.05	10.2
68	JAKHRO KI DHANI	3.15	2.78	10.4
69		3.15	2.71	10.4

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70	BARAKALLA	3.15	2.54	10.5
71		3.15	2.59	10.5
72	HATUNDI	3.15	2.43	10.2
73		3.15	2.62	10.2
74	SILLI	3.15	2.62	10.2
75	GINGALA	3.15	2.59	10.2
76		3.15	2.51	10.2
77	RATRANADA	3.15	3.10	10.2
78	CHANDRAKH	3.15	2.78	10.2
79		3.15	2.82	10.2
80		3.15	2.92	10.2
81	DHANARI KALLA	3.15	2.75	10.5
82		5	4.31	10.5
83	CHINDARI	3.15	2.71	10.2
84		3.15	2.75	10.2
85	NANDIYA KHURD	3.15	2.89	10.3
86		3.15	3.01	10.3
87	JELAV NADI	3.15	2.91	10.2
88		3.15	2.66	10.2
89	JETIYAWAS	3.15	2.91	10.3
90		3.15	3.03	10.3
91	SELVI NADI(RAIKORIYA)	3.15	2.98	10.3
92	TAPU	3.15	3.08	10.4
93		3.15	3.15	10.4
94	NOSER	3.15	3.09	10.2
95		5	4.75	10.2
96	KANKRALA	3.15	2.80	10.5
97		3.15	2.95	10.5
98		3.15	2.77	10.5
99	PADASALA	3.15	2.62	10.2
100		3.15	2.78	10.2
101		3.15	2.68	10.2
102	NIMBO KA TALAB	3.15	2.82	10.2
103		3.15	3.02	10.2
104	PALLI	3.15	2.91	10.3
105		5	4.61	10.3
106	KHEDAPA	3.15	2.63	10.5
107		5.00	4.24	10.5
108	ANWANA OLD	3.15	2.88	10.4
109		3.15	2.83	10.4
110	BIRAI	3.15	2.90	10.2
111		3.15	2.86	10.2

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112	DANWARA	3.15	2.73	10.2
113		3.15	2.82	10.2
114	BAORI	5	4.74	10.5
115		5	4.83	10.5
116	POONIYO KI BASNI	3.15	2.91	10.3
117	KAJNAU KHURD	3.15	2.68	10.5
118		3.15	2.80	10.5
119	KAJNAU KALLA	3.15	3.02	10.3
120		3.15	2.72	10.3
121	ANWANA NEW	3.15	2.94	10.4
122	MANAI	3.15	2.86	10.5
123		3.15	2.72	10.5
124	INDROKA	5	4.94	10.5
125	SALAWAS	3.15	3.14	10.2
126		5	5.04	10.2
127		5	5.13	10.2
128	DHANDHORA	5	4.08	10.5
129	HEERADESHAR	3.15	2.86	10.2
130		3.15	2.78	10.2
131	DHORU	3.15	2.69	10.2
132	RAJLANI	3.15	2.77	10.2
133		3.15	2.60	10.2
134	DEVARI	3.15	2.83	10.2
135	HINGOLI	5	4.47	10.2
136	GAJSINGHPURA	3.15	2.98	10.2
137		3.15	2.72	10.2
138	RAMPURA	5	4.56	10.2
139	ASOP	3.15	2.89	10.2
140		5	4.56	10.2
141	ARTIYA KALLAN	3.15	2.74	10.2
142	BARNI KHURD	3.15	2.91	10.2
143		5	4.51	10.2
144	MANGERIYA	3.15	2.68	10.3
145	BILARA	5	4.43	10.5
146		5	4.34	10.5
147	SOJATI GATE	5	4.58	10.5
148		5	4.66	10.5
149	DIWAN JI KI PIAO	3.15	2.67	10.5
150		3.15	2.51	10.5
151	KHARIYA MITHAPUR	3.15	2.78	10.5
152		5	4.50	10.5

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153	JHAK	3.15	2.94	10.5
154	UDALIYAWAS	3.15	2.69	10.5
155		3.15	2.63	10.5
156	RANSI GAON	3.15	2.71	10.5
157		5	4.27	10.5
158	PIPAR CITY	5	4.75	10.5
159		5	4.66	10.5
160	SATHIN	1.6	1.46	10.5
161		3.15	2.94	10.5
162	KHARIYA KHANGAR	3.15	2.71	10.2
163	PABUNAGAR	3.15	2.74	10.5
164		3.15	2.67	10.5
165	AMRIT NAGAR	3.15	3.14	10.5
166	RATORI GAL (BASTWA)	3.15	3.06	10.5
167		3.15	3.08	10.5
168	CHIDWAI	3.15	2.72	10.2
169	NATHARAU	3.15	2.69	10.2
170		3.15	2.74	10.2
171	DERIYA	3.15	2.77	10.4
172		3.15	2.67	10.4
173	KERLI	3.15	2.85	10.5
174		5	4.48	10.5
175	DEVANIYA	5	4.63	10.5
176	GILAKAUR	3.15	2.75	10.3
177		3.15	2.78	10.3
178	GODELAI	3.15	2.82	10.3
179		3.15	2.88	10.3
180		3.15	2.68	10.3
181	RAMSAR	3.15	2.75	10.2
182		3.15	2.72	10.2
183		3.15	2.82	10.2
184	BHOMSAGAR	3.15	2.88	10.5
185		3.15	2.83	10.5
186	SETRAWA	3.15	2.72	10.6
187	LALPURA	3.15	3.11	10.5
188		3.15	3.15	10.5
189	ASARLAI	3.15	2.67	10.5
190		3.15	2.74	10.5
191	GUMANPURA	3.15	2.93	10.5
192	CHEELA	3.15	2.70	10.2
193		3.15	2.67	10.2
194	RELA	3.15	2.77	10.2

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195		3.15	2.81	10.2
196	KANODIYA MAHASINGH	3.15	2.80	10.4
197		3.15	2.75	10.4
198	BUDKIYA	3.15	2.67	10.3
199		3.15	2.72	10.3
200	UNTHWALIYA	5	4.15	10.2
201		5	4.22	10.2
202	KHIYASARIYA	3.15	2.66	10.2
203		3.15	2.69	10.2
204	PABUSAGAR UNTHAWALIYA	3.15	2.80	10.3
205	BABA KI NIMBARI(DHEERPURA)	3.15	3.03	10.6
206		3.15	3.10	10.6
207	SEKHALA	3.15	2.93	10.5
208		3.15	3.00	10.5
209	KANODIYA PUROHITAN	3.15	2.82	10.2
210	BHALU KALLA	3.15	2.88	10.5
211	KHIRJAKHAS	3.15	3.01	10.5
212	SOMESAR	3.15	2.95	10.5
213	CHABA	3.15	2.91	10.5
214	SOINTRA	3.15	2.90	10.3
215	KHIRJA TIBNA	3.15	2.95	10.1
216	DEVRAJGARH	3.15	2.98	10.2
217	NOKHDADA BHATIYA	3.15	2.81	10.3
218		3.15	2.88	10.3
219	RAD KA BERA	5	4.54	10.4
220	CHHITERBERA	3.15	2.85	10.3
221		3.15	2.76	10.3
222	CHADI	3.15	2.83	10.4
223		3.15	2.93	10.4
224	KRISHAN NAGAR	3.15	3.02	10.2
225		3.15	3.05	10.2
226	RIDMALSAR	3.15	2.78	10.4
227		3.15	2.71	10.4
228	MANASAR	3.15	2.70	10.5
229		3.15	2.59	10.5
230	BOONGADI	3.15	2.59	10.2
231	INDO KA BAS	3.15	2.62	10.2
232		3.15	2.62	10.2
233	IGNP PHALODI	3.15	2.27	10.8
234	(BAP) R.D.1120	3.15	3.01	10.2
235	DURGANI	3.15	2.78	10.2

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236		3.15	2.82	10.2
237	SHEKHASAR	3.15	2.75	10.5
238		3.15	2.80	10.5
239	ANOP NAAGAR	3.15	2.88	10.2
240		3.15	2.85	10.2
241	RIN SALT	3.15	2.89	10.3
242	JHARASAR KALLA	3.15	2.70	10.2
243		3.15	2.62	10.2
244	Rampura(Raneri)	5	4.65	10.3
245	JETERI	3.15	2.85	10.3
246		3.15	2.85	10.3
247	Poonasar	3.15	2.94	10.4
248		3.15	2.98	10.4
249		5	4.64	10.4
250	JAKHAN	3.15	3.08	10.4
251		3.15	2.96	10.4
252		3.15	3.15	10.4
253	BAPINI	3.15	2.92	10.2
254		3.15	2.90	10.2
255		3.15	2.81	10.2
256	BEDU	3.15	2.80	10.5
257		3.15	2.95	10.5
258	DHOLASAR	3.15	2.62	10.2
259		3.15	2.78	10.2
260	PALINA	3.15	2.82	10.2
261		3.15	3.02	10.2
262	SINGARSAR	3.15	2.75	10.3
263		3.15	2.67	10.3
264	BHAJAN NAGAR	3.15	2.80	10.5
265		3.15	2.71	10.5
266	ROOPANA JETANA	5.00	4.39	10.4
267		5.00	4.34	10.4
268	CHEELA	3.15	2.74	10.2
269		5.00	4.42	10.2
270	KUSHLAYNADA	3.15	2.73	10.2
271		3.15	2.82	10.2
272	NAYABERA	3.15	2.95	10.5
273		3.15	3.04	10.5
274	KUSHLAWA	5.00	4.61	10.3
275		3.15	2.91	10.3
276	BHOJAKOR	3.15	2.88	10.5
277		3.15	2.80	10.5

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278	MORIYA	3.15	3.02	10.3
279		5	4.39	10.3
280	AMLA	5	4.70	10.4
281	DELANA	3.15	2.94	10.4
282	P.DHNI	5	4.83	10.5
283	J.NAGAR	5	4.90	10.5
284	DAYAKOR	5	4.70	10.2
285	Chainpura	3.15	2.80	10.5
286		3.15	2.69	10.5
287	SHIVSAR	5	4.08	10.5
288		3.15	2.48	10.5
289	BAORI KALLA	5	4.46	10.2
290	RAYADA	3.15	2.98	10.2
291		3.15	3.01	10.2
292	MARJAT	3.15	2.77	10.2
293	JALODA	3.15	2.83	10.2
294		3.15	2.88	10.2
295	MANDLA KHURD	3.15	2.89	10.2
296		3.15	2.98	10.2
297	KHARA	3.15	2.98	10.2
298		3.15	2.89	10.2
299	KOLU PABUJI	3.15	2.96	10.2
300	BENGTI KHURD	3.15	2.89	10.2
301		5	4.56	10.2
302	SIHRA	3.15	2.91	10.2
303		5	4.61	10.2
304	MANDLA KALLAN	3.15	2.95	10.2
305		5	4.71	10.2
306	EKA BHATIYA	3.15	2.91	10.2
307	JEMALA	5	4.54	10.3
308		3.15	2.85	10.3
309	GAJJA	3.15	2.94	10.5
310		3.15	3.01	10.5
311	BARSANADA	3.15	2.94	10.5
312		3.15	3.00	10.5
313	KAPADISAR	3.15	2.67	10.5
314		3.15	2.70	10.5
315	SADAWATA	3.15	2.78	10.5
316	Goyali Road	5	4.12	10.58
317		3.15	3.00	10.58
318	Sirohi City	5	4.74	10.62

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319	Sindrath	3.15	2.74	10.41
320	Jawal	5	4.00	10
321		3.15	2.78	10
322	Padiv	3.15	2.50	10
323	Varada	3.15	2.70	10
324	SheoganjRiico	5	4.34	10
325		3.15	2.78	10
326	Posaliya	3.15	2.56	10
327		3.15	2.45	10
328		3.15	2.54	10
329	Jogapura	3.15	2.45	10
330		3.15	2.58	10
331	Badgaon	3.15	2.45	10
332	Palari	3.15	2.70	10
333		3.15	2.78	10
334		3.15	2.60	10
335	Andor	3.15	2.80	10
336		3.15	2.45	10
337	Kailash Nagar	3.15	2.50	10
338		3.15	2.80	10
339	Sawali	3.15	2.50	10
340	Jhadoli Veer	3.15	2.60	10
341	Kalandari	3.15	2.80	10
342		3.15	2.23	10
343	Krishnaganj	3.15	2.56	10
344		3.15	2.70	10
345	MerMandwara	3.15	2.50	10
346		3.15	2.40	10
347	Tanwari	3.15	2.23	10
348	Swaroopganj	3.15	2.39	10
349		3.15	2.45	10
350	Nitora	3.15	2.48	10
351		3.15	2.78	10
352	Rohida	3.15	2.60	10
353		3.15	2.30	10
354	Bhujela	3.15	2.20	10
355		3.15	2.70	10
356	Sirohi Road	3.15	2.50	10
357		3.15	2.60	10
358		5	4.65	10
359	Pindwara City	5	4.34	10

Date: 03/08/2022

Signature:_____
Name:_____ (Authorized Representative)

(M.L. BENDA)
Superintending Engineer (PPM)
Ju. V.V.N.L., JODHPUR

360	Banas	5	4.60	10
361	Veerwada	3.15	2.38	10
362	Nadiya	3.15	2.80	10
363	Gandhi Nagar	10	6.20	9.78
364	IOCL	5	3.20	9.7
365	AmbajiIndAr	10	7.80	9.7
366	Khara	10	7.38	9.7
367	Manpur	10	3.87	9.7
368	Deldar	3.15	2.25	9.7
369	Karoli	3.15	2.34	9.7
370	Moogthala	3.15	2.40	9.7
371		3.15	5.40	9.7
372	Girwar	3.15	2.43	9.7
373	Mawal	3.15	1.98	9.7
374	Mt. Abu	5	3.50	9.7
375		5	3.40	9.7
376	Reodar	3.15	2.70	10
377		3.15	2.40	10
378	Jolpur	3.15	2.50	10
379	Selwada	3.15	2.15	10
380	Dabani	3.15	2.78	10
381		3.15	2.56	10
382	Makawal	3.15	2.60	10
383	Sirodi	3.15	2.30	10
384	Anadara	3.15	2.40	10
385		3.15	2.30	10
386	Dantarai	3.15	2.60	10
387	Varman	3.15	2.40	10
388		3.15	2.42	10.2
389	Mandar	3.15	2.90	10.2
390		3.15	2.88	10.2
391	Bant	3.15	2.35	10.2
392	Jethawada	3.15	2.50	9.8
393		5	4.50	9.8
394	Morwada	3.15	2.45	9.8
395		3.15	2.70	9.8
396	Rahua	3.15	2.60	9.8
397		3.15	2.70	9.8
398	Nimbaj	3.15	2.76	9.8
399		5	4.88	9.8
400	Raipur	3.15	2.70	9.8

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Signature:_____
Name:_____ (Authorized Representative)

(M.L. BENDA)
Superintending Engineer (PPM)
Ju. V.V.N.L., JODHPUR

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401	Magriwada	3.15	2.55	9.8
402		3.15	2.86	9.8
403	GusaisarBada	3.15	2.67	9.8
404		3.15	2.78	9.8
405	Mankrasar	3.15	2.97	9.8
406		3.15	3.00	9.8
407	Binjasar 1st	3.15	2.37	9.8
408	Binjasar 2nd	3.15	2.27	9.8
409		3.15	2.47	9.8
410	Benisar	3.15	2.40	10
411		3.15	2.78	10
412	Dusarna-1	3.15	2.86	10
413		3.15	2.80	10
414	Jetasar	5	4.00	10
415		3.15	2.70	10
416	THUKRIYASAR-1	3.15	2.61	9.9
417	THUKRIYASAR-II	3.15	2.80	10
418	Jai salSar	3.15	2.33	10
419	Gopalsar - I	3.15	2.71	9.9
420		3.15	2.66	9.9
421	SATTSAR	3.15	2.62	10
422		3.15	2.38	10
423	DHEERDESAR PURIHITAN	3.15	2.58	10.1
424	LIKHMADESAR-1	5	3.57	10.1
425		3.15	2.69	10.1
426	LIKHMADESAR-III	3.15	2.78	10
427		3.15	2.42	10
428	AADSAR	3.15	2.52	10
429		3.15	2.60	10
430		3.15	2.40	10
431	UDRASAR	3.15	2.85	10
432	LALASAR	3.15	2.71	10
433	SARNA JOHAD	3.15	2.87	10
434	Ramdevra	3.15	2.47	10
435		3.15	2.60	10
436	Seruna 1	5	2.70	10
437		5	4.20	10
438	Seruna 2	5	4.10	10
439		3.15	2.40	10
440	Derajsar - I	5	4.23	10
441		3.15	2.55	10
442	Gopalsar-II	3.15	2.54	10

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Signature:
Name:
(Authorized Representative)

(M.L. BENDA)
Superintending Engineer (PPM)
Ju. V.V.N.L., JODHPUR

443	Gogana	3.15	2.19	10
444		3.15	2.47	10
445	Sarunda	3.15	2.40	10
446	Siniyala - I	5	4.36	10
447		3.15	2.50	10
448	Hanuman Nagar	3.15	2.40	10
449	Bhadla	3.15	2.13	10
450	Nathusar	3.15	2.35	10
451	Saisar	3.15	2.39	10
452		3.15	2.49	10
453	Ratriyaphanta	3.15	2.40	10
454		3.15	2.80	10
455	LalasarSathri	5	4.23	10
456	Bhedkitalai	3.15	2.32	10
457	Mainsar	5	4.24	10
458	Jhareli -I	5	4.45	10
459		3.15	2.40	10
460	Gundusar	3.15	2.30	10
461		5	4.30	10
462	Udsar	3.15	2.60	10
463		5	2.40	10
464	Jhareli-II	3.15	2.85	10
465	Shiv Mandir	3.15	2.19	10
466	Bhagwatikund	3.15	2.70	10
467	AMBASAR	5	4.00	10
468	SUJASAR	3.15	2.50	10
469		3.15	2.67	10
470	GIGASAR	3.15	2.60	10
471	1. SURDHNA -I	5	2.56	10
472	2. SURDHNA -II	3.15	2.58	10
473		3.15	2.85	10
474	1. K.D JATAN -II	3.15	2.80	10
475		3.15	2.66	10
476	1. NAPASAR	3.15	2.70	10
477		3.15	2.47	10
478	Gunsaisar-I	5	4.27	10
479		3.15	2.19	10
480	Naurangdesar	5	4.36	10
481		3.15	2.76	10
482	NAPASAR - II	3.15	2.44	10
483	2. RAMSAR -I	5	4.35	10
484		5	4.48	10

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(M.L. BENDA)
Superintending Engineer (PPM)
Ju. V.V.N.L., JODHPUR

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485	3. RAMSAR-II	3.15	2.67	10
486		3.15	2.50	10
487	1.K.D.Boran-I	3.15	2.43	10
488	2.K.D. Jatan -I	5	4.54	10
489	1. K.D.Jatan-IV	3.15	2.51	10
490	2. KILCHU	5	3.80	10
491	1. TEJRASAR - I	5	3.89	10
492		3.15	2.44	10
493	2. TEJRASAR - III	5	4.57	10
494	4. BELASAR	5	3.42	10
495	2. TEJRASAR - II	5	4.57	10
496	Ranisar	5	4.50	10
497		3.15	2.52	10
498	Serera	5	4.56	10
499		5	4.45	10
500	Rajera	3.15	2.19	10
501		3.15	2.57	10
502	RuniyaBada Bass	5	4.50	10
503		5	3.94	10
504	katriyasar	5	4.40	10
505		5	4.49	10
506	2. SINTHAL	3.15	2.57	10
507	L D MAGARA	5	4.38	10
508		3.15	2.57	10
509	JD MEGRA	5	3.80	10
510	MEGHASAR	5	3.90	10
511		5	4.23	10
512	BARSINGHSAR	5	4.49	10
513		5	4.34	10
514	SWAROOPDESAR	3.15	2.23	10
515	BHANEKA	3.15	2.49	10
516		3.15	2.45	10
517	RANERI	5	4.44	10
518		5	4.28	10
519	HADDA	3.15	2.28	10
520	LOHIYA	5	3.81	10
521	KHINDASAR	5	4.00	10
522	BHELU	5	4.57	10
523	SERPURA	3.15	3.71	10
524	KISHANASAR	3.15	2.73	10
525		3.15	2.46	10
526	DANTOR	3.15	2.67	10

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Signature:
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(M.L. BENDA)
Superintending Engineer (PPM)
Ju. V.V.N.L., JODHPUR

104

527	28 KJD	3.15	2.48	10
528	3 PWM	3.15	2.29	10
529	1 ADM	3.15	2.67	10
530	RANJEETPURA	3.15	3.05	10
531	RD 25	3.15	2.86	10
532		5	4.28	10
533	GHADIYALA	5	4.40	10
534	Jamsar	3.15	2.36	10
535		3.15	2.30	10
536	1. GADHWALA - I	3.15	2.45	10
537		5	4.00	10
538	2 GADHWALA - II	5	3.81	10
539		3.15	2.50	10
540	Pugal	3.15	2.48	10
541	RD 710	3.15	2.48	10
542	RD 750	3.15	2.29	10
543	BADERAN	3.15	2.50	10
544	JETPUR	3.15	2.34	10
545		3.15	2.19	10
546	ARJUNSAR	3.15	2.45	10
547	Lalera	3.15	2.35	10
548	Mahajan	3.15	1.71	10
549	JAWAHARNAGAR	5	4.45	10
550		5	4.34	10
551		5	4.30	10
552		5	4.30	10.5
553	MAUSAM VIBHAG	8	6.30	10.5
554		5	4.20	10.5
555	MAHALAXMI ENCLAV	5	4.45	10.5
556	AGRAWAL COLONY	5	3.42	10.5
557	2 ML NATHAWALI	5	2.88	10.5
558		3.15	2.30	10.5
559	RIICO-I	3.15	2.40	10.5
560		8	5.89	10.5
561		5	4.17	10.5
562		5	4.30	10.5
563	RIICO-II	8	6.70	10.5
564		5	4.38	10.5
565	SHANI MANDIR	5	4.44	10.5
566		5	4.34	10.5
567	SABJI MANDI	10	8.78	10.5
568		5	3.80	10.5

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Signature:_____
Name:_____ (Authorized Representative)

(M.L. BENDA)
Superintending Engineer (PPM)
Ju. V.V.N.L., JODHPUR

105

569	KUNJ VIHAR	3.15	3.00	10.5
570	JCT	10	7.80	10.5
571		5	4.30	10.5
572	3 PULI	10	8.00	10.5
573	BHAGAT SINGH CHOCK	8	6.60	10.5
574		8	6.50	10.5
575	KUMS	5	4.13	10.5
576		5	3.89	10.5
577	HOSPITAL	5	3.90	10.5
578		5	4.67	10.5
579	SADBHAWANA NAGAR	5	4.56	10.5
580		5	4.35	10.5
581	V.K. CITY	5	4.48	10.5
582	PHG	5	4.45	10.5
583		5	4.00	10.5
584	kaliyan	3.15	2.80	10.5
585	khatlabana	3.15	2.90	10.8
586	dulapurkeri	3.15	2.03	10.6
587	hindumalkot	3.15	2.46	10.7
588	sadhuwali	3.15	2.60	10.9
589	7A	3.15	2.60	10.8
590	BURJAWALI	3.15	1.90	10.6
591	CHUNAWAD	3.15	1.40	10.7
592	15Z	3.15	2.20	10.9
593	HOMELAND	5	3.40	10.8
594	RISHI SIDHI	5	3.70	10.8
595	NETEWALA	3.15	2.40	10.7
596		3.15	2.80	10.7
597	7 ML	3.15	2.60	10.9
598		3.15	2.50	10.9
599	25 ML	3.15	2.80	10.6
600	DHINGAWALI	3.15	2.10	10.7
601	JODHEWALA	3.15	1.20	10.9
602	SADULSAHAR	2.5	1.60	10.5
603	RIICO	5	4.11	10.8
604	4 KRW	3.15	2.74	10.3
605	PARTAP PURA	3.15	2.22	10.5
606	BUDHRWALI	3.15	1.37	10.5
607	PATALI	3.15	2.05	10.3
608	MANNIWALI	3.15	1.37	10.3
609	IPDS KESRISINGHPUR	5	3.10	10.3
610	V HEAD	3.15	2.60	10.3

Date: 03/08/2022

Signature:_____
Name:_____
(Authorized Representative)

(M.L. BENDA)
Superintending Engineer (PPM)
Ju. V.V.N.L., JODHPUR

106

611	DHNOOR	3.15	1.90	10.3
612	DALPATSINGHPUR	3.15	1.40	10.3
613	KAMINPURA	3.15	2.20	10.3
614	ARAYAN	3.15	2.40	10.3
615	MALKANA	3.15	2.40	10.3
616	MIRJEWALA	5	3.85	10.3
617	18F	3.15	1.20	10.3
618	KONI	3.15	2.80	10.3
619	DAULATPURA	3.15	2.10	10.3
620	MANFOOLSINGHWALA	5	4.50	10.3
621	GANESHGARH	3.15	1.24	10.3
622	GANESHGARH	3.15	2.60	10.3
623	LALGARH	3.15	2.40	10.3
624	PANNIWALI	3.15	2.20	10.3
625	BANWALI	3.15	2.40	10.3
626	MAMMAR	3.15	2.49	10.3
627	KHARACHAK	3.15	2.02	10.3
628	5 LNP	3.15	2.30	10.3
629	SAMEJA	3.15	2.24	10.3
630	BAJUWALA	3.15	2.71	10.3
631	SATJANDA	3.15	2.52	10.3
632	DABLA	3.15	2.61	10.3
633	MUKLAWA	3.15	2.43	10.3
634	LOONEWALA	3.15	1.49	10.3
635	16PS	3.15	1.12	10.3
636	UDSAR	3.15	2.33	10.3
637	BHOMPURA	3.15	1.40	10.3
638	RAISINGHNAGAR	8	7.72	10.3
639		3.15	2.70	10.3
640	BADA MANDIR	5	4.24	10.3
641	RIICO	5	4.21	10.3
642	PADAMPUR	5	4.00	10.3
643	24 BB	5	3.00	10.3
644	4 JJ	3.15	2.50	10.3
645	4 DD	3.15	2.30	10.3
646	CHANNADHAM	3.15	2.70	10.3
647	CC HEAD	3.15	2.00	10.3
648	3 RB	3.15	2.20	10.3
649	P S HEAD	3.15	2.30	10.3
650		3.15	2.50	10.3
651	JIVANDESAR	3.15	2.10	10.3
652	69 LNP	3.15	2.30	10.3

Date: 03/05/2022

Signature:
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(M.L. BENDA)
Superintending Engineer (PPM)
Ju. V.V.N.L., JODHPUR

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653	BINJHBAYLA	3.15	2.90	10.3
654		3.15	2.50	10.3
655	GHAMURWALI	3.15	2.19	10.3
656	SAWANTSAR	3.15	2.10	10.3
657	MANJHUWASS	3.15	2.30	10.3
658	SKPR	5	4.10	10.3
659		3.15	2.90	10.3
660	39H	3.15	2.80	10.3
661	2FC	3.15	2.75	10.3
662	52GG	3.15	2.95	10.3
663	48GG	3.15	2.90	10.3
664	42F	3.15	2.70	10.3
665	5"O"	3.15	2.70	10.3
666	GAJSINGHPUR	5	3.50	10.3
667		5	4.60	10.3
668	SANGRANA	3.15	1.90	10.3
669	BALARAJPURA	3.15	2.28	10.3
670	JORAWAR	3.15	2.00	10.3
671	CCBF	3.15	2.70	10.3
672	PALIWALA	3.15	2.57	10.3
673		3.15	2.63	10.3
674	SARDARPURA BIKA	3.15	2.03	10.3
675	NIRWANA	3.15	2.46	10.3
676	DHABA	3.15	2.54	10.3
677	GURUSAR MODIA	3.15	2.46	10.3
678	BDOPAL ROAD GSS	5	4.49	10.3
679		5	4.34	10.3
680	RIICO GSS	5	4.67	10.3
681		5	4.52	10.3
682	PHED GSS	5	4.60	10.3
683	STADIUM GROUND GSS	5	3.33	10.3
684	SOMASAR	5	4.42	10.3
685		5	3.98	10.3
686	KALUSAR	3.15	2.50	10.3
687	THETHAR	3.15	2.44	10.3
688	RAIYAWALI	3.15	2.67	10.3
689	UDAIPUR	3.15	2.70	10.3
690	BIRMANA	3.15	2.60	10.3
691	2 GPN	3.15	2.62	10.3
692	19.600 RDR	3.15	2.50	10.3
693	RAJIASAR	3.15	2.38	10.3
694		3.15	2.58	10.3

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Signature:_____
Name:_____
(Authorized Representative)

(M.L. MENDA)
Superintending Engineer (PP-I)
O/o V.V.N.L, JODHPUR

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695	DEEDWANA	3.15	2.40	10.3
696	BACHHRAR	3.15	2.22	10.3
697	BHOJUSAR	3.15	2.40	10.3
698		3.15	2.30	10.3
699	GOVINDSAR	3.15	2.30	10.3
700		3.15	2.35	10.3
701	RAGHUNATHPURA	3.15	2.15	10.3
702	SILWANI	3.15	2.50	10.3
703	SRI VIJAYNAGAR	5	4.17	10.3
704		5	4.11	10.3
705	29 GB	5	3.80	10.3
706	44 GB	3.15	4.30	10.3
707	KUPLI	3.15	1.30	10.3
708	PURANA BIJLI BOARD	5	4.10	10.3
709	2 DAM	5	4.45	10.3
710		3.15	2.13	10.3
711	ANOOPGARH	5	4.43	10.3
712		3.15	2.50	10.5
713	RIICO	5	4.34	10.5
714		3.15	2.65	10.5
715	PREM NAGAR	5	4.45	10.5
716	76GB	3.15	2.50	10.7
717	BANDA COLONY	3.15	2.60	10.7
718	10A	3.15	2.65	10.7
719	27A	3.15	2.45	10.7
720		3.15	2.50	10.7
721	61GB	3.15	2.50	10.9
722	RAMSINGHPUR	3.15	2.50	10.9
723	NHARAWALI	3.15	2.58	10.9
724	RAWLA MANDI	3.15	2.50	10.5
725		3.15	2.45	10.5
726	3 KD	3.15	1.45	10.5
727	7 KND	3.15	2.03	10.5
728	365 HED	3.15	2.46	10.5
729	NEW MANDI GHARSANA	3.15	2.40	10.5
730		3.15	2.60	10.5
731	OLD MANDI GHARSANA	3.15	2.40	10.5
732	6 DD	3.15	2.15	10.5
733	PATRODA	3.15	2.45	10.5
734	281 HEAD	3.15	2.35	10.5
735	JALWALI	3.15	1.98	10.5
736	ROJARY	3.15	2.95	10.5

Date: 03/08/2022

Signature:_____

Name:_____

(M.L. BENDA)
Superintending Engineer (PPM)
Ju. V.V.N.L., JODHPUR

(Authorized Representative)

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737	4 STR	3.15	2.82	10.5
738	CHAWA	3.15	2.72	10.2
739	KAWAS	3.15	2.83	10.4
740	BACHHADAU	3.15	2.74	10.1
741	BOOTH	3.15	2.18	10.5
742	KAGAU	3.15	2.39	10.5
743	LEELSAR	3.15	2.40	10
744		3.15	2.60	10
745	MARUDI	3.15	2.94	10.3
746	NIMBARI	3.15	2.98	10.6
747	SANAWARA	3.15	2.45	10.3
748	HATHMA	3.15	2.12	10.2
749	RAMSAR	3.15	2.01	10.3
750	GIRAB	3.15	2.40	9.6
751		3.15	2.65	9.6
752	HARSANI	3.15	2.82	10.5
753	BATADOO	3.15	2.45	9.8
754		3.15	2.80	9.8
755	BHIMADA	3.15	2.50	9.8
756		3.15	2.45	9.5
757	KHANJI KA TALLA	3.15	2.75	10.5
758	JETANIYON KI DHANI	3.15	2.39	10.1
759		3.15	2.50	10.1
760	BHADAKHA	5	2.45	10.2
761		5	2.30	10.2
762	HADWA HADVECHA	3.15	2.50	10.5
763	SAJITARA	5	2.70	10.2
764		5	2.67	10.2
765	BHIYAND	3.15	2.34	9.8
766		3.15	2.45	9.8
767	CHOCHRA	3.15	2.89	10.2
768		3.15	2.45	10.2
769	DHEER JI KI DHANI	3.15	2.65	9.8
770	KANASAR	3.15	2.70	10.2
771		3.15	3.90	10.2
772	MOKHAB	5	4.45	10.1
773		5	4.60	10.1
774	PRAHLADPURA	3.15	2.81	10.3
775	SADRAM KI BERI	3.15	2.40	10.2
776		3.15	2.56	10.2
777	ALAMSAR	3.15	2.60	9.9
778		3.15	2.90	9.9

Date: 03/08/2022

Signature:_____

Name:_____ (Authorized Representative)

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Superintending Engineer (PPM)
Ju. V.V.N.L., JODHPUR

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779	BIJRAR	3.15	2.56	10.2
780	BURAN KI TALLA	5	4.05	10.3
781	ITADA	3.15	2.95	10.5
782		3.15	2.65	10.5
783	NETRAD	3.15	2.81	10.7
784	SARUPE KI TALLA	3.15	2.10	10.2
785		3.15	3.00	10.2
786	SRI RAM WALA	3.15	2.73	10
787	TALSAR	3.15	2.56	10.5
788		3.15	2.21	10.5
789	ASOTRA	3.15	2.85	10.3
790	BITHUJA	3.15	2.88	10.1
791	BRAHMAJI KA MANDIR	3.15	2.54	10.1
792	BUDIWARA	3.15	2.70	10.4
793		3.15	2.45	10.4
794	JAGSA	3.15	2.56	10.2
795		3.15	2.45	10.2
796	JASOL	3.15	2.68	10.7
797		3.15	2.70	10.7
798	KANANA	3.15	2.88	10.3
799	KITHNOD	3.15	2.92	10.4
800	PADROO-FANTA	3.15	3.00	10.4
801		3.15	2.00	10.4
802	SARANA	3.15	2.98	10.3
803	KALYANPUR	3.15	2.77	10.4
804	NAGANA	3.15	2.51	10.2
805	PACHPADRA	3.15	2.56	10.2
806		3.15	2.67	9.8
807	PATODI	3.15	2.78	10.4
808	THOMBLI	3.15	2.71	10.5
809	KANOD	3.15	2.59	10.3
810	RATEU	3.15	2.98	10.4
811		3.15	2.16	10.4
812	BHAGWA	3.15	3.00	10
813		3.15	2.01	10
814	DHEERA	3.15	2.41	10.2
815	GUDANAAL	3.15	2.74	10.2
816	GUNGROT	5	4.23	10.5
817	INDRANA	3.15	2.92	10.5
818	KATHADI	3.15	2.45	10.5
819		3.15	2.67	10.5
820	KERLI NADI	3.15	2.46	10.2

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821	MELI	3.15	2.71	10.2
822	MOKALSAR	5	4.52	10.1
823	MUTHALI	3.15	2.89	10.3
824	AJEET	3.15	2.91	10.2
825	KARMAWAS	3.15	2.66	10
826	RAKHI	3.15	2.91	10.3
827	SAMDARI	3.15	2.75	10.2
828		3.15	2.56	10.2
829	SILORE	3.15	2.74	10.3
830	DHARANA	3.15	2.69	10.4
831		3.15	2.29	10.4
832	ITAWAYA-FANTA	3.15	2.26	10.4
833		3.15	2.88	10.4
834	KHANKHI	3.15	2.87	10.2
835		3.15	2.56	10.2
836	KUNDAL	3.15	2.53	10.4
837		3.15	2.40	10.4
838	MITHORA	3.15	2.90	10.5
839		3.15	2.06	10.5
840	RELO KI DHANI	3.15	2.77	10
841	SAILA	3.15	2.62	10.2
842	SINER	3.15	2.67	9.78
843		3.15	2.61	9.78
844	VAV NAGAR	3.15	2.68	10
845	ADEL	3.15	2.82	10.2
846	BHATTA	3.15	2.43	10.1
847		3.15	2.79	10.1
848	CHADON KI DHANI	3.15	2.91	10.3
849	CHAUDHARIYON KI DHANI	3.15	2.61	10.5
850	DHANWA-FANTA	3.15	2.63	10.5
851	DHUDIA MOTI S	5	4.24	10
852	J.M.K.	3.15	2.23	10.4
853		3.15	2.25	10.4
854	SARNU-PANJI	3.15	2.83	10
855	BHATALA	3.15	2.86	10.3
856	BADON-KA-TALA	3.15	2.73	10.2
857	BAMNOR	5	4.23	10.1
858	BAMRLA	5	4.62	10.5
859	BHAG BHERE KI BERI	3.15	2.30	10.4
860	BISARNIYA	3.15	2.52	1.3
861		3.15	2.00	10.3
862	DHUDHU	3.15	3.00	9.9

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863		3.15	2.23	9.9
864	KEKAR	3.15	2.28	9.8
865		3.15	3.00	9.8
866	KITHNORIYA	3.15	2.94	10.4
867	KOJA	3.15	2.86	10.5
868	LUKHU	3.15	2.65	10.5
869	RELO KI BERI	3.15	2.80	9.6
870	ROHILA (EAST)	3.15	2.82	10.2
871	SACHI KI BERI	3.15	2.81	10.5
872	SAUAN KI BERI	3.15	2.65	10.2
873		3.15	2.35	10.2
874	BORCHARNAN	3.15	2.78	10
875	BHEDANA	3.15	2.78	9.4
876		3.15	2.45	9.4
877	GADEVI	3.15	2.83	10.2
878	LUNWA- CHARNAN	3.15	2.98	10.2
879	NAGAR	3.15	2.72	10.1
880	PANEL KI BERI	3.15	2.98	10.2
881	RAM JI GOAL	3.15	2.89	10.2
882	SALLU KI BERI	3.15	2.95	9.7
883	SINDHASWA-CH.	3.15	2.13	10.2
884		3.15	2.88	10.2
885	ANDANIYO KI BERI	3.15	2.05	10.2
886		3.15	3.00	10.2
887	JALI KHERA	3.15	2.96	10
888	MALPURA	3.15	2.68	10.3
889	NOKHARA	3.15	2.23	10.5
890		3.15	2.20	10.5
891	AKAL	3.15	2.91	9.5
892	GANGASARA	3.15	2.90	10.5
893	GORA	3.15	2.81	9.8
894	GULE KI BERI	3.15	2.67	10.5
895	SOBHALA-DARSHAN	3.15	2.78	10.5
896	SONARI	5	4.50	10.3
897	BHANWAR	3.15	2.00	10.5
898		3.15	3.00	10.5
899	BISASAR	3.15	2.69	10.5
900	DHURAWA	3.15	2.50	10.1
901		3.15	2.52	10.1
902	FAGALIYA	3.15	2.78	10.5
903		3.15	2.28	10.5
904	HARPALIYA	3.15	2.56	10

Date:_____

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905	JANPALIYA	3.15	2.63	10.5
906		3.15	2.60	9.9
907	MAN JI KA TALLA	3.15	2.06	9.9
908	SALARIYA	5	3.89	10.5
909	SARLA	3.15	2.94	10.1
910		3.15	2.57	10.5
911	SEDWA	5	4.10	10.5

As a constituent of NER grid, it is required to operate the power system as per IEGC Code and all equipment as specified by CEA Technical Standards Regulation (2010).

In order to increase the power factor (near to unity) and hence resulting in low losses, efficient system and better voltage profile, introduction of reactive (capacitors) component (kVAR) are the cheapest and simplest means of power compensation. Hence, the objective of the project is to give better power supply with better voltage regulation to the consumers in the Jodhpur DISCOM region.

The problem / constraint would be addressed through the project / scheme / activity:

- Introduction of Automatic Switched Capacitor Banks.
- Precise and real time compensation of reactive power.
- Establishment of reliable Reactive Power in System.
- Improvement in line losses.
- Existing infrastructure can accommodate more consumers.
- Less loading of transformers.
- Better utilization of Capacitors.

Training System: The Training System is an offline environment used for training users in the operation of the system. On-site training of equipment to users for operation of equipment's.

Execution and implementation

While finalizing technical specifications of the system, care has been taken to realize 100% success and sustainability. Considering 24 x 7, 365 days working of system, system will be procured with 5 Years support scheme is withonfine monitoring facility, in case of failure of field equipment control station raise alarm. It will be helpful to take corrective action in time. Only authorized users will be permitted to change operating limits and other features of software. Also, one-year warranty

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for all hardware is ensured and there is a comprehensive AMC with executing agency for 5 years after 1-year warranty excluding communication link for reliable operation of scheme.

2.5 Executing Agency

JDVVNL shall be the executing authority. Presently, JdVVNL owns and operate more than 2335 Power Stations of voltage level 33kv. It may be noted that JdVVNL has introduced SAS/SCADAand substation projects in past. Being the statedistribution utility, JdVVNL has had vast experiences in executing dozens of such projects in energy sector under the fund made available by REC/PFCor through other government grants. Further, it is worth mentioning that JdVVNL has a track- record of maintaining the time-schedule for completion of its various projects with its strong engineering and commissioning staff.

2.6 Time line for Implementation of Project /Scheme/Activity

Time line of the Project / Scheme / Activity	
Likely Duration of Project (in months)	24(Twenty-Four) months
Likely Start Date	On accord of Administrative & Financial Approval
Likely Completion Date	July 2025

Date: 03/08/2022

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Timeline of Activities

Sl. No.	Description	Year	2022-23		2023-2024				2024-2025	
		Month	QTR3	QTR4	QTR1	QTR2	QTR3	QTR4	QTR1	QTR2
1	Project Approval									
2	Bid Preparation									
3	Bidding Period									
4	Evaluation, Contract Award and Mobilization									
5	1st Disbursement									
6	Project Status Report									
7	2nd Disbursement									
8	Project Status Report									

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9	3rd Disbursement									
10	Project Status Report									
11	4th Disbursement									
12	Project Status Report									

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Summary of Detailed Project Report (DPR)

The revised DPR is prepared for installation of reactive power solution on 33/11 kV substations in Jodhpur DISCOMwith the ratings as per CEA's Regulations.

Summary of DPR given – Yes Copy of DPR attached – Yes

Implementation Schedule / Milestones

Target for Physical Milestones

Particulars (No. of)	Total	Quarter 1 of 2023-24& Quarter 4 of 2023-24	Quarter 2&4 of 2023-24	Quarter 2 of 2024-25
MV APFC Panels		Completion of Supply	Erection	Testing & Commissioning

Target for Financial Milestones

(in Crores)

Description of Amount Required	Total	Quarter 1 of 2023-24	Quarter 2 of 2023-24	Quarter 4 of 2023-24& Quarter 1 2024-25 out of which 10% through internal sources.	Quarter 1 of 2024-25
Supply and erection of materials and equipment covered under the scheme	296.85	10% of total project cost i.e. 29.69	20% of total project cost i.e.59.37	60 % of total project cost i.e. 178.11.21 (148.42 from PSDF & 29.69 from internal sources)	10% of total project cost i.e. 29.69

(M.L. BENDA)
Superintending Engineer
Ju. V.V.N. Ltd.

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Financial Implication of the Scheme

1. **Summary**

Sl. No.	Item	Amount (Rs. 296.85in Crore)
1.	Total Cost Estimate	**296.85Cr.**
2.	Funding Proposed from PSDF	90%
3.15.	External Borrowing	Nil, being 90% funded under PSDF& 10% through internal funding.

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Ju. V.V.N... ...R

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2. Details:

2.1 Cost Estimate: The detailed cost estimate prepared for implementation of the project is given below:

COST ESTIMATE FOR 1.98 & 3.96 MVAR								
Sl. No.	Item Description	Quantity	Units	Quoted Currency in INR / Other Currency	BASIC RATE include of F&I and erection charges In Figures Rs. P	Any Other Taxes/Duties/Levies	TOTAL AMOUNT Without Taxes include of F&I and erection charges in Rs. P	TOTAL AMOUNT With Taxes include of F&I and erection charges
1	2	4	5	6	7	8	9	10
1	**A 3.96MVAr**							
2	12.65 kV, 3960 kVAr, 3-Phase, 50 C/s housed in Outdoor Type CRCA Panel, Capacitor bank having two variable step of 792 Kvar& two Variable steps of 1188 kVAr. Bank shall be complete with Capacitor units of 396/264 kVAr, Aluminium busbars, Epoxy insulators, HT HRC fuse, Surge Suppressor etc.with details as follows-(1) 11 kV, Aluminium Wound, Dry type Series reactors a) 0.528 kVAr for 792 kVAr step - 6 Nos. , b) 0.792 kVAr for 1188 kVAr step - 6 Nos. (2) 11 kV, 3-Phase OIL COOLED Type RVT - 1 No. (3) 12 kV 3 Phase Indoor type metal enclosed Vacuum Contactor - 4 Nos. (4) Indoor Type Automatic Control Unit - 1 No.(5) IP 55 , Outdoor CRCA cubicle Panel for accommodating capacitors, Series Reactor, Vacuum contactor, Surge Suppressor etc., along with FRP Canopy- 1 set	13.000	Set	INR	3375355.78	0.00	3375355.78	43879625.10
3	**1.98 MVAr**							
4	12.65 kV, 1980 kVAr, 3-Phase, 50 C/s housed in Outdoor Type CRCA Panel,	898.000	Set	INR	2956766.12		2956766.12	2655175975.76

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	Capacitor bank having two variable step of 792 Kvar& one Variable steps of 396 kVAr. Bank shall be complete with Capacitor units of 264/132 kVAr, Aluminium busbars, Epoxy insulators, HT HRC fuse,Surge Suppressor etc. With details as follows-(1) 11 KV, Aluminium Wound, Dry type Series reactors (a) 0.528 kVAr for 792 kVAr step-6 nos. (b) 0.264 kVAr for 396 kVAr step-3 nos. (2) 11 kV, 3-Phase Indoor OIL COOLED Type RVT-1 nos. (3) 12 kV 3 Phase Indoor type metal enclosed Vacuum Contactor-3 nos. (4) Indoor Type Automatic Control Unit-1 No. (5) IP 55, outdoor CRCA cubicle panel for accommodating capacitors, series reactors, vacuum contactor, surge supressor etc., alongwith FRP canopy-1 No.							
5	**Annual Maintenance of 3.96 MVAR Capacitor Bank in all respect including material, installation, erection & FMS :– For 5 years**	13.000	Set	INR	354000.00		354000.00	4602000.00
6	**Annual Maintenance of 1.98 MVAR Capacitor Bank in all respect including material, installation, erection & FMS :– For 5 years**	898.000	Set	INR	295000.00		295000.00	264910000.00
7	**Total for Supply**							2655239953.59
8	**Total for AMC**							269512000.00
9	**Total in Figures**							2,96,85,67,600.86

Date: 03/08/2022

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COST ESTIMATE FOR 1.98 MVAR ONE SET

Sl. No.	Item Description	Item Code / Make	Quantity	Units	Currency in INR / Other Currency	BASIC RATE include of F&I and erection charges In Figures Rs. P	Any Other Taxes/Duties/Levies	TOTAL AMOUNT Without Taxes include of F&I and erection charges in Rs. P	TOTAL AMOUNT With Taxes include of F&I and erection charges
1	2	3	4	5	6	7	8	9	10
1	**A 1.98 MVAr**	0							
2	12.65 kV, 1980 kVAr, 3-Phase, 50 C/s housed in Outdoor Type CRCA Panel, Capacitor bank having two variable step of 792 Kvar& one Variable steps of 396 kVAr. Bank shall be complete with Capacitor units of 264/132 kVAr, Aluminium busbars, Epoxy insulators, HT HRC fuse,Surge Suppressor etc. With details as follows-(1) 11 KV, Aluminium Wound, Dry type Series reactors (a) 0.528 kVAr for 792 kVAr step-6 nos. (b) 0.264 kVAr for 396 kVAr step-3 nos. (2) 11 kV, 3-Phase Indoor OIL COOLED Type RVT-1	1	1.000	Set	INR	1317055.00	237069.9000	1317055.00	1554124.9

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	nos. (3) 12 kV 3 Phase Indoor type metal enclosed Vacuum Contactor-3 nos. (4) Indoor Type Automatic Control Unit-1 No. (5) IP 55, outdoor CRCA cubicle panel for accommodating capacitors, series reactors, vacuum contactor, surge supressor etc., alongwith FRP canopy-1 No.								
3	11 kV, 400 Amp, Off Load Isolator with earth switch and mounting structure.	2	1.000	No.	INR	56800.00	10224.0000	56800.00	67024.00
4	9 kV, 10 kA, Class III Lightning Arrestor	3	3.000	No.	INR	4970.00	2683.8000	14910.00	17593.80
5	Control cables, lugs/thimble, Junction Box etc.	4	1.000	set	INR	92300.00	16614.0000	92300.00	108914.00
6	11 KV 3 Core Al. XLPE Insulated 3x120 mm sq. Cable	5	90.000	Mtr	INR	1562.00	25304.4000	140580.00	165884.40
7	11KV XLPE Cable (3x120 sq.mm.) Heat Shrinkable Jointing kit Indoor	6	1.000	No.	INR	3550.00	639.0000	3550.00	4189.00
8	11KV XLPE Cable (3x120 sq.mm.) Heat Shrinkable	7	5.000	No.	INR	3550.00	3195.0000	17750.00	20945.00

Date: 03/08/2022

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	Jointing kit Outdoor								
9	11 KV VCB/Kiosk Switchgear for Capacitor Bank with complete arangement of connection.	8	1.000	No.	INR	651780.00	117320.4000	651780.00	769100.40
10	Casting of Civil foundations	9	1.000	Job	INR	109340.00	19681.2000	109340.00	129021.20
11	Cable trench for laying of power/control cables.	10	50.000	Rmt.	INR	403.00	3627.0000	20150.00	23777.00
12	Earthing for Panel 3 Nos., Isotator 1 No., VCB/Kiosk 1 No. and LA's 1 No. by Chemical pipe earthing	11	12.00	No.	INR	4970.00	10735.20	59640.00	70375.20
13	GI Strip of size-50 x 6 mm for Connection of Earthing with euipment	12	300.000	Rmt.	INR	72.93	3938.22	21879.00	25817.22
14	**Total for Supply**								2956766.12
15	**Annual Maintenance of 1.98 MVAR Capacitor Bank in all respect including material, installation, erection & FMS :–**	13					0.0000	0.00	
15.01	1st Year (Rs. per unit)	14	1	set	INR	40000.00	7200.0000	40000.00	47200.00
15.02	2nd Year (Rs. per unit)	15	1	set	INR	45000.00	8100.0000	45000.00	53100.00
15.03	3rd Year (Rs. per unit)	16	1	set	INR	50000.00	9000.0000	50000.00	59000.00
15.04	4th Year (Rs. per unit)	17	1	set	INR	55000.00	9900.0000	55000.00	64900.00
15.05	5th Year (Rs. per unit)	18	1	set	INR	60000.00	10800.0000	60000.00	70800.00
	Total for AMC								295000.00
Total in Figures									3251766.12

Date: 07/06/2022

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(Authorized Representative)

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Ju. V.V.N.L., JODHPUR

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COST ESTIMATE FOR 3.96 MVAR ONE SET

Sl. No.	Item Description	Item Code / Make	Quantity	Units	Quoted Currency in INR / Other Currency	BASIC RATE include of F&I and erection charges In Figures Rs. P	Any Other Taxes/Duties/Levies	TOTAL AMOUNT Without Taxes include of F&I and erection charges in Rs. P	TOTAL AMOUNT With Taxes include of F&I and erection charges
1	2	3	4	5	6	7	8	9	10
1	**A 3.96MVAr**								
2	12.65 kV, 3960 kVAr, 3-Phase, 50 C/s housed in Outdoor Type CRCA Panel, Capacitor bank having two variable step of 792 Kvar& two Variable steps of 1188 kVAr. Bank shall be complete with Capacitor units of 396/264 kVAr, Aluminium busbars, Epoxy insulators, HT HRC fuse, Surge Suppressor etc.with details as follows- (1) 11 kV, Aluminium Wound, Dry type Series reactors a) 0.528 kVAr for 792 kVAr step - 6 Nos. , b) 0.792 kVAr for 1188 kVAr step - 6 Nos. (2) 11 kV, 3-Phase OIL COOLED Type RVT - 1 No. (3) 12 kV 3 Phase Indoor type metal enclosed Vacuum	1	1.000	Set	INR	1671792.00	300922.56	1671792.00	1972714.56

Date: 03/08/2022

Signature:
Name:
(Authorized Representative)

(M.L. BENDA)
Superintending Engineer (PPM)
Ju. V.V.N.L., JODHPUR

	Contactor - 4 Nos. (4) Indoor Type Automatic Control Unit - 1 No.(5) IP 55 , Outdoor CRCA cubicle Panel for accommodating capacitors, Series Reactor, Vacuum contactor, Surge Suppressor etc., along with FRP Canopy- 1 set								
3	11 kV, 400 Amp, Off Load Isolator with earth switch and mounting structure.	2	1.000	No.	INR	56800.00	10224.00	56800.00	67024.00
4	9 kV, 10 kA, Class III Lightning Arrestor	3	3.000	No.	INR	4970.00	2683.80	14910.00	17593.80
5	Control cables, lugs/thimble, Junction Box etc.	4	1.000	set	INR	92300.00	16614.00	92300.00	108914.00
6	11 KV 3 Core Al. XLPE Insulated 3x120 mm sq. Cable	5	90.000	Mtr	INR	1562.00	25304.40	140580.00	165884.40
7	11KV XLPE Cable (3x120 sq.mm.) Heat Shrinkable Jointing kit Indoor	6	1.000	No.	INR	3550.00	639.00	3550.00	4189.00

Date: 03/08/2022

Signature:_____
Name:_____
(Authorized Representative)

(M.L. BENDA)
Superintending Engineer (T&C)
Ju. V.V.N.L., JODHPUR

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8	11KV XLPE Cable (3x120 sq.mm.) Heat Shrinkable Jointing kit Outdoor	7	5.000	No.	INR	3550.00	3195.00	17750.00	20945.00
9	11 KV VCB/Kiosk Switchgear for Capacitor Bank with complete arangement of connection.	8	1.000	No.	INR	651780.00	117320.40	651780.00	769100.40
10	Casting of Civil foundations	9	1.000	Job	INR	109340.00	19681.20	109340.00	129021.20
11	Cable trench for laying of power/control cables.	10	50.000	Rmt.	INR	403.00	3627.00	20150.00	23777.00
12	Earthing for Panel 3 Nos., Isotator 1 No., VCB/Kiosk 1 No. and LA's 1 No. by Chemical pipe earthing	11	12.00	No.	INR	4970.00	10735.20	59640.00	70375.20
13	GI Strip of size-50 x 6 mm for Connection of Earthing with euipment	12	300.000	Rmt.	INR	72.93	3938.22	21879.00	25817.22
14	**Total for Supply**								3375355.78
15	**Annual Maintenance of 1.98 MVAR Capacitor Bank in all respect including material, repair, erection & FMS :–**	13							
15.01	1st Year (Rs. per unit)	14	1	set	INR	50000.00	9000.00	50000.00	59000.00
15.02	2nd Year (Rs. per unit)	15	1	set	INR	55000.00	9900.00	55000.00	64900.00
15.03	3rd Year (Rs. per unit)	16	1	set	INR	60000.00	10800.00	60000.00	70800.00
15.04	4th Year (Rs. per unit)	17	1	set	INR	65000.00	11700.00	65000.00	76700.00
15.05	5th Year (Rs. per unit)	18	1	set	INR	70000.00	12600.00	70000.00	82600.00
	Total for AMC								354000.00
	Total in Figures								3729355.78

Date: 03/06/2022

Signature:_____
Name:_____
(Authorized Representative)

(M.L. BENDA)
Superintending Engineer (P&M)
O. V.V.N.L., JODHPUR

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(129)

2.2Cost Estimate

The detailed cost estimate prepared for implementation of the Project is given below.

(Amount is in Crore)

Rs. 296.85crore
(Say Rupees Two Hundred Ninety SevenCrores) only

The BOQ of capacitor bank are attached as Annexure I.Also enclosed the list of Present & Proposed Status for capacitor bank of Sub Stations having more than 2.5 MVA Transformer in JdVVNL as per Annexure-II andthepresent voltage profile and anticipated voltage profile after installing the capacitor bank are attached as Annexure – III.

The costs for installation of 1980 kVAr and 3960 kVAr and their associated equipment are based on the rate of recentLOAs awarded by PVVVNL and approved by PSDF in year 2021.

3.1 FUNDING

3.1.1 Funding Proposed from PSDF as grant

90% funding is being proposed through PSDF for implementation of 911 solution on 33/11 kVsubstationJodhpurin the general interest for strengthening the medium voltage network of the state and to automate reactive power and to optimize the performance of the distribution grid of JdVVNL sub stations.

3.1.2Contribution from Internal Sources

10% funding through internal funding.

3.1.3External Borrowings

No external borrowing is envisaged as the project is planned for 90% funding through PSDF and 10% through internal funding.

(M.L. BENDA)
Superintending Engineer (PPM)
Ju. V.V.N.L., JODHPUR

Date: 03/08/2022

Signature:_____
Name:_____
(Authorized Representative)

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Brief Details of the Project Appraisal by CTU / STU / RPC

Item	Details to be filled by Applicant Utility
Appraisal By:	CTU ☐ STU ☑ RPC ☐
Date of Submission to CTU/STU/RPC for approval	Submitted on ……..
Name of the Scheme	IMPLEMENTATION OF AUTOMATIC REACTIVE POWER SOLUTIONS AT 33/11kV SUBSTATIONS INJODHPUR
Details of the Appraisal Report by CTU/STU/RPC	Reference no.- Date:
Summary of observation from CTU / STU / RPC Appraisal Report	**Summary of Proposal Appraised** The DPR has been prepared so as to improve & strengthen the operational reliability, enhancement of system,real-time data capturing and better management of volt-var. **Technical Observations** The system will enable to maintain proper voltage profile automatically at the respective 33/11 kV substation thereby reducing reactive power losses to the minimum and to strengthen the medium voltage network of the state which will in turn benefit the distribution licensee i.e. JdVVNL. **Financial Observations** The costs for installation of 1980kVAr and 3960 kVAr and their associated equipment are based on the rate of recent LOAs awarded by PVVNL and approved by PSDF in year 2021 The prices have been escalated @42% (Price Variation clause applicable only on capacitor cell but in PVVNL considered same PV escalation factor on complete panels) onin allied equipment andin automatic capacitor panels due to inflation in raw material cost since the last order placed to the vendor in FY 20-21. The price inflation in raw material that is Aluminum and Copper since 2020 has been considered. Also, the drastically increased terrain factor has been inculcated for supply and commissioning of equipment's in the state. **Compliance of Grid Standards / Codes by the Applicant** All the grid standards as per IEGC, 2010 shall be complied. **Limitations / Shortcomings pointed out by CTU/STU/RPC if any** Installation process may take considerably time **Recommendations of CTU/STU/RPC**

Date: 03/08/2022

(M.L. BENDA)
Superintending Engineer (PTM)
Ju. V.V.N.L., JODHPUR

Signature:_____
Name:_____
(Authorized Representative)

(129)

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Page 1 of 1

UNDERTAKING

I, Mr. PramodTak son of ..... resident of Jodhpur and presently working as Managing Director in Jodhpur VidyutVitran Nigam Ltd., Jodhpur hereby undertake to comply with the following terms and conditions with regard to funding of the "**Installation of Reactive Power Solution on 33/11 kV substation in Jodhpur**" with disbursement from PSDF:

- **No tariff shall be claimed for the portion of the scheme funded from PSDF.**
- **Amount of grant shall be refunded in case of transfer/disposal of the facility being created under this proposal to any other scheme for funding.**
- **Shall specifically mention if for the scheme under the proposal, the grant from any other agency is being taken/proposed to be taken.**

  The scheme under the proposal has neither been applied for grant from any other agency nor being proposed to any agency.
- **The grant shall be refunded back to PSDF in case of non-utilization of the grant within one year of release of installment.**

(M.L. BENDA)
Superintending Engineer (PPM)
Ju. V.V.N.L., JODHPUR

Date: 03/08/2022

Signature:_____
Name:_____
(Authorized Representative)

RAJASTHAN RAJYA VIDYUT PRASARAN NIGAM LIMITED.
[Corporate Identity Number (CIN):U40109RJ2000SGC016485]
(Regd. Office: Vidyut Bhawan, Jan Path, Jyoti Nagar, Jaipur - 302 005)
OFFICE OF THE SUPERINTENDING ENGINEER (PROJECT & PLANNING)
✆ +91-141-2740623,Fax:+91-141-2740794;
e-mail: se.pp@rvpn.co.in; website:www.rvpn.co.in

RVPN
An ISO 9001:2015 Certified Company

150 YEARS OF CELEBRATING THE MAHATMA

No. RVPN/SE(P&P)/XEN-2/AE-III/ F. /D 1714 Jaipur, Dt. 13/12/2022

Member Secretary
Northern Regional Power Committee,
18-A, Shaheed Jeet Singh Marg, Katwaria Sarai,
New Delhi-110016

Sub: Submission of agenda note for consideration and approval of Installation of Capacitor Banks on 11 KV Side 33/11 KV Substations of Jaipur DISCOM (Rajasthan) for Reactive Power Compensation under Power system Development Fund (PSDF)-Phase 'I'.

Dear Sir,

On the above captioned subject, kindly find enclosed herewith the agenda note for Installation of Capacitor Banks on 11 KV Side 33/11 KV Substations of Jaipur DISCOM (Rajasthan) for Reactive Power Compensation under Power system Development Fund. Summary of the scheme is mentioned below:-

S. No.	Scheme details	Estimated Amount (Rs. In Cr.)
1	Installation of Capacitor Banks on 11 KV Side 33/11 KV Substations of Jaipur Vidyut Vitran Nigam Limited (JVVNL)	180.47

Enclosure:

1. Agenda Note of JVVNL
2. Annexure A- DPR provided by JVVNL
3. Annexure B- RERC Order dated 24.03.2001
4. Annexure-C- Rajasthan Electricity Grid Code, 2008
5. Annexure-D- Format A5: Appraisal by STU

(S.C.Meena)
Chief Engineer (PP&D)

Brief Details of the Project Appraisal by CTU / STU / RPC

The applicant utility shall submit project appraisal by CTU / STU / RPC in the given format and a copy of the Appraisal Report should be attached at Annexure.

Item	Details to be filled by Applicant Utility	
Appraisal By:	STU ■ CTU ☐ RPC ☐	
Date of Submission to CTU / STU / RPC for approval	Scheme was submitted to Rajasthan Rajya Vidyut Prasaran Nigam Ltd. (STU) by JVVNL on dated 13.10.2022.	
Name of the Scheme	Installation of Dynamic/Automatic capacitor banks on 11 kV side of 33/11 kV substations of Jaipur Vidyut Vitran Nigam Limited (JVVNL) under PSDF-Phase-I	
Copy of the Appraisal Report by CTU / STU / RPC is Attached at Annexure	Yes ■ No ☐ [DPR enclosed at Enclosure-1)]	
Summary of observations from CTU/ STU/RPC Appraisal Report	Summary of Proposal Appraised	The DPR has been prepared so as to improve & strengthen the operational reliability, enhancement of system, real-time data capturing and better management of reactive power.
	Technical Observations	As per the order of Rajasthan Electricity Regulatory Commission (RERC) dated 24.03.2001, 50% of the total MVAR requirement (presently approx. 10000 MVAR) shall be compensated by RVPN, while remaining 50% shall be compensated by remaining DISCOMs (16.6% by each DISCOM). This project report proposes installation of 1160 MVAR which is justified given their target of 1660 MVAR for operational reliability and effective voltage control.
	Financial Observations	As per guideline/procedure for disbursement of funds from PSDF in category 5.1(b), this scheme may be posed for funding/ grant from PSDF fund on 90% basis.
	Compliance of Grid Standards / Codes by the Applicant	All the grid standards, IS, IEC required, shall be followed for implementation of the scheme
	Limitations / Shortcomings pointed out by CTU/STU/RPC if any	NIL
	Recommendations of CTU/STU/RPC	The scheme may be posed for funding/ grant from PSDF fund.

Date:-

Chief Engineer (PP&D)
RVPN, Jaipur

Item No.
Agenda note for decision.

Agenda note for consideration and approval of Installation of Capacitor Banks on 11 KV Side 33/11 KV Substations of Jaipur DISCOM (Rajasthan) for Reactive Power Compensation under Power system Development Fund (PSDF)-Phase 'I'.

I

The proposal herein is to accord approval of Installation of Capacitor Banks on 11 KV Side 33/11 KV Substations of Jaipur DISCOM (Rajasthan) for Reactive Power Compensation under Power system Development Fund (PSDF)-Phase 'I'.

II

Power System Development Fund (PSDF) provides grant for improvement of Transmission System. PSDF provides fund for the following categories-

a) Creating necessary transmission system of strategic importance based on operational feedback by load dispatch centers for relieving congestion in interstate transmission system and intrastate system which are incidental to ISTS.
b) Installation of shunt capacitor, series compensators and other reactive energy generators including reactive energy absorption, dynamic reactive support etc. for improvement of voltage profile in the Grid.
c) Installation of standard and special protection schemes, pilot and demonstrative projects, projects for setting right the discrepancies identified in the protection audit on regional basis, any communication/ measurement / monitoring schemes including installation of Phasor Measurement Units (PMUs) etc.
d) Renovation & Modernization of transmission and distribution system for relieving congestion.
e) Any other scheme/project in furtherance of the above objectives, such as conducting technical studies and capacity building etc.
f) Other schemes benefitting large number of utilities collectively and having a significant impact towards the power system development and Grid operation, on case to case basis.

Presently, scheme detailed as under are posed for approval of funding from PSDF.

S. No.	Scheme details	Approval from BoD	Estimated Amount (Rs. In Cr.)	A&FS issued on dated	Proposed Grant (%age)
1	Installation of Capacitor Banks on 11 KV Side 33/11 KV Substations of Jaipur Vidyut Vitran Nigam Limited (JVVNL)	08.08.2022	180.47	08.08.2022	90%

PSDF-NLDC in its 66th meeting of TESG held on dated 29.09.2022 has desired the appraisal from regional power committee (NRPC) for the scheme to be funded from PSDF.

Brief note on the scheme-

1. Due to the spread of population in the remote areas of Rajasthan in recent years, meeting power demand, distribution of electricity and maintaining quality power for every category of consumers has always remained a challenge. The state is primarily agricultural base; and power is supplied to the domestic, non-domestic and industrial sector too. It has been identified that these loads are highly inductive in nature which need rectification.

2. In this regard, JVVNL has proposed to install dynamic/ automatic capacitor banks under which the capacitive load helps to adjust power factor as close to 'Unity Power Factor'. The implementation of the project/ scheme will limit the heavy drawl of reactive power from grid and mitigate the risk such as (a) Overloading of transmission lines; (b) Overloading of transformers at different voltage levels; and (c) Increase in system losses.

3. It has been noticed that the power factor is ranging from 0.80 to 0.90 at urban feeder and 0.75 to 0.80 (or even less) at the rural feeders within the respective circles. In view of this, installation of capacitor banks on 11 kV side of 33/11 kV substations has been proposed at various circles having 'power factor less than 0.85.

4. JVVNL proposes installation of ***capacitor banks at 577 Nos. of 33/11 kV substations*** out of total 1893 Nos. of substations spread across 13 circles and 12 districts of Rajasthan. ***Total MVAR installation will be 1159.176 MVAR.*** Detailed list of these substations have been enclosed with DPR.

5. Methodology adopted by JVVNL consists of extracting previous year data from dedicated Feeder Monitoring System (FdrMS) to have greater insights about ***'real time'*** power supply of 11 kV feeders. The data was further analyzed and cross checked with the field on sample basis to arrive at the conclusion.

6. Approximately 20 lakh consumers at these 577 Nos. of substations along with the concerned STU (Rajasthan Rajya Vidyut Prasaran Nigam Ltd.) shall be benefitted with these measures.

7. Total cost of the scheme comes around 180.47 cr. for which detailed cost estimated have been enclosed with the DPR.

   Detailed Project Project (DPR) is placed as Annexure-A.

Appraisal by the STU (Rajasthan Rajya Vidyut Prasaran Nigam Ltd. (RVPNL))-

RVPNL understands that proposal by JVVNL to install 577 Nos. of capacitor banks at 11 kV side on their 33/11 kV substations in technically and financially justified.

As per the order of Rajasthan Electricity Regulatory Commission (RERC) dated 24.03.2001, 50% of the total MVAR requirement (presently approx. 10000 MVAR) shall be compensated by RVPN, while remaining 50% shall be compensated by remaining DISCOMs (16.6% by each DISCOM). (Copy of the order enclosed as Annexure-B).

Further**,** The clause no. 11.4 of Rajasthan Electricity Grid Code, 2008 states that *"The DISCOMs shall participate in voltage management by providing Local VAR compensation as far as possible, in low voltage system close to load points not depending on EHV Grid for reactive support."* (Copy of the clause enclosed as Annexure-C).

This project report proposes installation of approx. 1160 MVAR which is justified given their target of 1660 MVAR for operational reliability and effective voltage control. Thus, as per appraisal of RVPN (STU), this scheme is technically & commercially justified. (Appraisal by STU in Format-A5 has been enclosed as Annexure-D).

III

The agenda is hereby placed before NRPC for approval, after appraisal of RVPN (STU) in Annexure A5 of following scheme for further submission to NLDC-PSDF for availing 90% grant:

S. No.	Scheme details	Estimated Amount (Rs. In Cr.)
1	Installation of Capacitor Banks on 11 KV Side 33/11 KV Substations of Jaipur Vidyut Vitran Nigam Limited (JVVNL)	180.47

******

SUMMARY OF PROPOSAL

For Official Use - To be filled by the Nodal Agency	
Project Proposal Number : _____	Date of Receipt : _____

To be filled by the Requesting Organization / Project Entity		
1.	Name of the requesting Organization / Utility :	**Jaipur Vidyut Vitran Nigam Limited**
2.	Short Summary of Project / Scheme / Activity	
a.	Name and location of the Project / Scheme / Activity :	**Provision of 11 kV Dynamic/ Automatic Switched Capacitor Bank at various 33/11 kV Sub-stations**
b.	Objective of the Project / Scheme / Activity :	**To improve power factor and hence reduce reactive current (reduction of T&D Loss), improvement in voltage profile, reduction in demand at various 33/11 kV Power Transformers**
c.	Authorized Person For this Project / Scheme / Activity	Name : **Mr. Umesh Gupta (ACE, PPM)** E-mail ID : **sera@jvvnl.org** Land line No : **-NA-** Mobile No. : **+91-99828 00244** Fax No : **0141-2209533**
d.	Nature of the Project / Scheme / Activity: Inter – State / Intra – State (Please Specify)	**Intra State**
e.	Identified Beneficiaries	**Rajasthan State (in particular) & Nation (in general)**
f.	Merits of the scheme	**With implementation of the scheme , overall redundancy in the system will be provided.**
g.	Limitations, if any	**No limitation envisaged**
h.	Time frame for Implementation	**The scheme is scheduled to be completed within 24 months progressively from date of receipt of sanction of grant/ fund.**
i.	Estimated Cost of Project / Scheme / Activity	**Rs 180.47 Crores**
j.	Category under which the project is classified (Please refer Para 5.1 of the Guidelines/Procedure)	**5.1 (b) of Guidelines/ Procedure (PSDF)**

Signature: _____

Date: 24-11-2022

Name: **Umesh Gupta**
(Authorized Representative)

Addl. Chief Engineer (PPM)
JVVNL, Jaipur

DETAILED PROPOSAL (DP)

1. Details of the Requesting Organization / Project Entity

1.1 Details of Organization / Entity

Name of Organization / Entity	**Jaipur Vidyut Vitran Nigam Limited**
Acronym or Abbreviation (if applicable)	**JVVNL**

1.2 Details of Head of the Organization

Name (Mr / Ms / Mrs)	**Mr. Ajeet Kr. Saxena**
Designation	**Managing Director, JVVNL, Rajasthan**
E-mail Address	**md@jvvnl.org**
Landline No.	**-NA-**
Fax No.	**-NA-**
Address	**Jan Path, Jyothi Nagar, Lalkothi, Jaipur, Rajasthan**
City	**Jaipur**
Postal Code	**302005**

1.3 Details of Project Incharge/ Project Manager (Authorized Person) for this project/ scheme/ activity (Not below the rank of Dy. General Manager/ Superintending Engineer)

Name (Mr / Ms / Mrs)	-
Designation	**Superintending Engineer**
E-mail Address	-
Landline No.	-
Mobile No.	-
Fax No.	-
Address	**Respective Circles under JVVNL Discom**
City	**Jaipur**
Postal Code	-

Any Change in above mentioned details may be notified to the Nodal Agency of PSDF immediately.

2. Justification of the Proposal

2.1 Analysis of the Objective

Rajasthan is the largest state in the country, in terms of area, spreading across 3,42,239 Sq. km, which is 10.41% of the nation area. The total population of Rajasthan is nearly 8.1 Crores spread across 33 Districts, of which 75% is rural population. The density of population in Rajasthan is 200 per sq.km which is much lower than the national average of 382 per sq.km. The state is, predominantly, an agrarian society with majority (45%) of the population depending on agriculture activities as source of income, which accounts for around 29.5% of Gross State Domestic Product (GSDP).

Due to this spread of population, meeting power demand, distribution of electricity and maintaining quality power for every category of consumers has always remained a challenge. The state is primarily agricultural base; however, the intensive power is too supplied to the domestic, non-domestic and industrial sector. It has been identified that these loads are highly inductive in nature which need rectification. In this regard, JVVNL has **proposed to install dynamic/ automatic capacitor bank** under

which the capacitive load helps to adjust power factor as close to **'Unity Power Factor'.** The implementation of the project/ scheme will limit the heavy drawal of reactive power from grid and mitigate the risk such as **(a) Overloading of transmission lines; (b) Overloading of transformers at different voltage levels; and (c) Increase in system losses.**

Under JVVNL Discom, efforts have continuously been made to provide requisite reactive power compensation; however, the challenge associated with low voltage at the load end and drawl of heavy reactive power from the grid still persists due to fast growing load demand. Additionally, it has been noticed that the power factor is ranging from 0.80 to 0.90 at urban feeder and 0.75 to 0.80 (or even less) at the rural feeders within the respective circles. In view of this, the provision for the installation of shunt capacitor has been proposed at various circles having power factor less than 0.85 so that it would result in following advantages as stated below.

1. **Advantages to the Consumers**
    - A substantial reduction in the power cost, due to reduced kVA demand and elimination of penalty for low power factor *(where tariff is based on kVA demand)*.
    - Reduced over-loading means reduced losses and less heating in consumer's equipments, such as, cables, motors etc.
    - A more stable voltage, which means a better and more efficient performance of the motors.
    - Connection of more consumers' equipment to the same installation.

2. **Advantages to Power Supply Utility**
    - Reduction of losses in lines and transformers.
    - Release of power system capacity enables additional load to be connected on the same system without capital investment on additional equipment.
    - Improvement in Voltage Level.
    - Reduction of over loading means less heating of cables, conductors, transformers etc.
    - A better utilization of the capacity of the generators, transformers, switchgear, cables, lines, etc., means increase in efficiency of the system.
    - Reduced depreciation charges on capital outlay and less capital investment.
    - Reduced reactive power drawn charges to NRLDC.

3. **Reduction of Overall Technical & Commercial Losses**

2.2 Identified Beneficiaries of the Project

Adequate reactive power compensation offered salient benefits to the power system which includes voltage regulation (i.e., voltage control within acceptable limits), system power losses reduction brought about by power factor improvement and it increases the utilization of connected equipments at the consumer end, improves reliability of transmission system and more importantly efficiency of real power made available at the consumer end. Hence, the identified beneficiaries of the project shall be (a) Rajasthan State (in particular), including Rajasthan Rajya Vidyut Prasaran Nigam Limited & Jaipur Vidyut Vitran Nigam Limited *(Approx. 20 Lakhs Consumers under 12 Circles)* and Nation (in general).

2.3 *Identified Source of Funding*

90% of the total project cost estimate is to be funded through grant from PSDF, balance 10% amount will be contributed from internal/ external resources.

2.4 Details of Activities for Project/ Scheme/ Activity

After getting approval of the project towards funding, the following activity will be undertaken to achieve desired results:

1. Identification of phases (I & II) based on total number of 33/11 kV sub-stations and approved/ sanctioned amount.
2. Formulation and conduct of tendering process on turnkey basis and from reputed manufacturer.
3. Issuance of LoI/ LoA/ Work Order to L1 (lowest) bidder/ contractor/ vendor etc.
4. Placement of erection & commissioning order.
5. Regular monitoring & controlling of technical and financial aspects.

The project incharge/ project manager/ area manager in the rank of superintending engineer will supervise the overall project work in their respective jurisdiction, further progresses of work are being reviewed monthly at head quarter by the Manging Director, JVVNL with representation from all authorised person.

2.5 Executing Agency

The project will be implemented at different 33/11 kV sub-stations located at different circles under JVVNL jurisdiction, as such it will be implemented by contracting agency to whom work order is awarded.

2.6 Timeline for Implementation of Project/ Scheme/ Activity

Timeline for implementation of the proposed project/ scheme is provided below under considering date of receipt of PSDF grant approval as 'Zero Date':

1. **Finalization of Tender Documents & Issuance of Work Order:** 03 Months
2. **Procurement, Installation, Commissioning & Testing of Equipments:** 20 Months (Progressive Basis)
3. **Cost Benefit Analysis & Report Submission on Improved Power Factor:** Last Month

Timeline of the Project/ Scheme/ Activity	
Duration of Project (in Months)	24 Months (03 months tendering process + 21 months implementation)
Likely Start Date	Date of Receipt of Approval from PSDF Funding
Likely Completion Date	30 September 2024

Sr. No.	Description	TIMELINE																								
		FY 2022-23						FY 2023-24														FY 2024-25				
		Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
Finalization of Tender Documents & Issuance of Work Order																									
1	Project Approval																								
2	Conduct of Committee Meeting																								
3	Preparation & Release of Tender Document																								
4	Evaluation, Contract Award and Mobilization																								
Procurement, Installation, Commissioning & Testing of Equipments																									
5	1st Disbursement (30% of Grant)				D1																				
6	Procurement, Installation, Commissioning & Testing of Equipments											Progressive Basis													
7	Bi-monthly Review Meeting																								
8	Monthly Report Submission																								
9	2nd Disbursement (60% of Grant) i.e. After Utalization of 30% Grant + 10% Self-contribution (JVVNL)										D2														
Cost Benefit Analysis & Report Submission on Improved Power Factor																									
10	Submission of Draft Report																								
11	Final Report Submission																								
12	3rd Disbursement (10% of Grant) i.e. On Completion of Scheme																								D3

Date: 24-11-2022

Signature: _____

Name: **Umesh Gupta**

(Authorized Representative)
Addl.Chief Engineer (PPM)
JVVNL, Jaipur

Summary of Detailed Project Report (DPR)

The scheme is to provide an effective control of capacitor bank installations in sub-stations to maintain power factor under varying load conditions, for any sub-station load on transformer changes during a 24 hours daily load cycle. This variation of load depends upon type of load i.e. urban, rural, agricultural, industrial load etc. The load pattern will be different for different loads. Thus, load variation will follow certain pattern, and which could be divided into four or six periods in a 24 hours daily load cycle. Power factor would also vary and at the same time actual requirement of Capacitors in circuit will also vary. If steps are provided with capacitor banks to switch them as required, it will help the Electricity Supply Authority to maintain the power factor at desired level throughout the day. This load variation has been observed to change from 8% to 100%.

Outdoor type H.T. capacitor bank with facility of automatic switching of required number of steps with the help of capacitor switch. The bank comprising of externally Single Star Connected Capacitor Bank, 0.2% Series Reactors for switching inrush current suppression at neutral end, Vacuum Contactor for capacitor switching, HRC Fuses , RVT for unbalance protection and CRCA cubicle panel to accommodates all components stated above.

Hence, JVVNL Discom has finalized and decided to install dynamic/ automatic capacitor bank on the various MVA ratings power transformer installed at various 33/11 kV sub-stations. The detailed list on which work will be carried out is enclosed under **Annexure – 'I'** of DPR.

Sr. No.	Transformer Capacity (In MVA)	Proposed Quantity (In Nos.)
1	3.15/ 5	563
2	8	14
Total		**577**

Summary of DPR given - Yes **Copy of the DPR attached – Yes**

Cost Break-up of Sub-station Equipment

Name of the Substation : -NA-

Sr. No.	Description of the Equipment to be replaced (rating, type)	Unit (Nos./Set)	Quantity	Rate including taxes	Total	Spares	Erection/ Civil Works	Total
400 kV	-NA-							
220 kV	-NA-							

Note : One table for each substation

	Abstract Cost Estimate Sub-station (Rs. In Lacs)						
Sr. No.	Description of Equipment	Sub-station Name-1	Sub-station Name-2	Sub-station Name-3	.	.	Total
400 kV	-NA-						
220 kV	-NA-						

Details of Existing Equipment

Name of the Substation : -NA-

Sl. No.	Name of Feeder	Equipment Name	Year of Manufacturing and make	Date of Commissioning	Voltage	No. of cores available (in case of CT/PT)	Type of insulation /operation	Tagged for replacement (yes/no)	Reason for replacement
400 kV	-NA-								
220 kV	-NA-								

Note : One table for each substation

Abstract Quantity Estimate Sub-station							
Sr. No.	Description of Equipment	Sub-station Name-1	Sub-station Name-2	Sub-station Name-3	.	.	Total
400 kV	-NA-						
220 kV	-NA-						

Implementation Schedule/ *Milestones

Particular	Total	Quarter 1	Quarter 2	Quarter 3	Quarter 4
1980 kVAr	563	Tendering Process	80	80	80
3174 kVAr	14	-	-	7	7

Particular	Quarter 5	Quarter 6	Quarter 7	Quarter 8
1980 kVAr	80	100	100	43
3174 kVAr	-	-	-	-

For Financial Milestone

Particular	Total (Rs. Cr.)	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Power Factor Improvement Cost	180.47	Tendering Process	28	28	25

Particular	Quarter 5	Quarter 6	Quarter 7	Quarter 8
Power Factor Improvement Cost	25	31.5	31.5	11.47

***Note:** The above implementation schedule/ milestones are tentative and may vary during the tender period.

Date: 24-11-2022

Signature: _____

Name: **Umesh Gupta**

(Authorized Representative)

Addl. Chief Engineer (PPM)
JVVNL, Jaipur

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Financial Implication of the Scheme

*(**Guidelines:** The financial implications of the proposal may be worked out as accurately as possible and should be detailed in this section. Further, the manner in which the expenditure is proposed to be borne may also be clearly indicated. Please provide the project cost estimate for its scheduled duration along with a break-up of year-wise, component-wise expenses segregated into non-recurring and recurring expenses.)*

1. Summary

S.No.	Item	Amount (Rs. Cr.)
1.	Total Cost Estimate	**180.47**
2.	Funding Proposed from PSDF	**162.43**
3.	Contribution from Internal/ External Sources	**18.05**

2. Details

2.1 Cost Estimate

(A) Cost break-up of 11 kV Switched Capacitor Bank at 3.15 / 5 MVA Power Transformer

Sr. No.	Name of Items	Unit	Qty.	Unit Rates	Amount (In Rs.)	Reference for Unit Cost
1	2	3	4	5	6	7
1	12.65 kV, 1980 kVAr, 3-Phase, 50 Hz, Outdoor Type CRCA Panel, Capacitor Bank having variable steps of 792 kVAr + 792 kVAr + 396 kVAr. Bank shall be complete with Capacitor units of 132 kVAr for 396 kVAr & 264 kVAr for 792 kVAr step at 7.3 kV, including allied material such as suitable size of aluminum busbars epoxy insulators, HRC fuses, vacuum contactor, series reactors, RVT, etc. with details as under	Nos.	1	1,180,000.00	1,180,000.00	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL) - On Pro rata Basis - – Enclosed under Annexure 'II'*
a)	11 kV, 0.2%, Aluminium Wound, Dry type Series	Nos.	6			

	reactors suitable for 792 kVAr					
b)	11 kV, 0.2%, Aluminium Wound, Dry type Series reactors suitable for 396 kVAr	Nos.	3			
c)	11 kV, 3-Phase dry type RVT	No.	1			
d)	11 kV/400 Amp, Indoor type Vacuum contactor	Nos.	3			
e)	Surge Suppressor	No.	1			
f)	IP 55 , Outdoor CRCA cubicle panel for accommodating capacitors, series reactor, vacuum contactor, surge arrestor fuses along with canaopy	Set	1			
g)	C & R Panel with Automatic Control Unit with APFC relay and Neutral Displacement relay	Set	1			
2	11 kV, 400 Amp, Off Load Isolator with earth switch and mounting structure	No.	1	35,000.00	35,000.00	*As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL) - – Enclosed under Annexure 'III'*
3	11 kV, 400 Amp, Off Load Isolator without earth switch and mounting structure	No.	1	26,630.00	26,630.00	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
4	9 kV, 10 kA, Station Class, Lightning Arrestors	Nos.	3	3,400.00	10,200.00	*As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL)*
5	*Cable Support Structure, Clamps, Connectors, Earthing MS Flats 50 x 6, 3 Mtr long Earthing CI Pipe Dia 150 mm, Dog Conductor	LS	1	61,506.95	61,506.95	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
6	11 kV XLPE insulated 3x185 mm^2 Armoured	Mtr.	50	1,251.37	62,568.50	*Items are under regular purchase by JVVNL. Rates as*
7	Heat Shrinkable Jointing kit for 11 kV 3x185 Sq. mm. XLPE	No.	2	823.77	1,647.54	

	Cable (Indoor termination kit)					per Standard Issue Rate dated 20.05.2022 - – Enclosed under Annexure 'IV'
8	Heat Shrinkable Jointing kit for 11 kV 3x185 Sq. mm. XLPE Cable (Outdoor termination kit)	No.	2	1,017.85	2,035.70	
9	11 kV VCB (Kiosks) Switchgear with complete arrangement with adopter panel for connection with existing 11 kV bus bar	No.	1	440,000.00	440,000.00	As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL)
10	**Control cables of various sizes	LS	1	43,818.20	43,818.20	PSDF Approved Scheme under Maharashtra Discom (MSEDCL)
11	11 kV CT 400 - 200/5 A Outdoor Type	Nos.	3	10,611.00	31,833.00	
12	24 Volt / 200 AH Battery with Battery Charger (For Capacitor's VCB)	Nos.	1	69,000.00	69,000.00	As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL)
	Sub-Total (A)				**1,964,239.89**	
13	Transportation on material	LS	4%	-	78,569.60	PSDF Approved Scheme under Maharashtra Discom (MSEDCL)
14	Erection cost on material	LS	5%	-	98,211.99	
15	Insurance, Labour & Finance Cost	LS	3%	-	58,927.20	
16	Service Cost	LS	12%	-	235,708.79	
	Sub-Total (B)				**471,417.57**	
	Total (C) = (A) + (B)				**2,435,657.46**	
17	Applicable GST	-	18%	-	438,418.34	PSDF Approved Scheme under Maharashtra Discom (MSEDCL)
18	Price Escalation on cost of material	-	10%	-	196,423.99	
19	***Civil Cost	LS	1	53,857.50	53,857.50	
	Sub-Total (D)				**688,699.83**	
	Grand Total (E) = (C) + (D)				**3,124,357.30**	

Note: *As JVVNL is not under practice of regular installation of APFC, hence the cost estimation has been considered from recently approved PSDF Scheme of PVVNL & MSEDCL. Also, considered JVVNL 'Standard Issue Rate' dated 20.05.2022 for some of the items.*

Additionally, the cost towards annual maintenance charges (as shown below) shall be borne by JVVNL as internal/ external source of funding.

Annual Maintenance Charges after Guarantee Period for 05 Years (1 Year + 5 Year's)

Sr. No.	Parameters	Unit	Qty.	Unit Rates	Amount (In Rs.)
1	2	3	4	5	6
1	1st Year	Job	1	50000.00	50,000.00
2	2nd Year	Job	1	60000.00	60,000.00
3	3rd Year	Job	1	70000.00	70,000.00
4	4th Year	Job	1	80000.00	80,000.00
5	5th Year	Job	1	90000.00	90,000.00
	Total				**350,000.00**
	Total AMC Cost for 05 Years considering 563 Nos. of APFC				**197,050,000.00**

Item Wise Cost Breakup:

(A.1) *Cost Structure for 11 kV Station Capacitor Bank – For 1980 kVAr

Sr. No.	Name of Items	Unit	Qty.	Unit Rates	Amount (In Rs.)
1	2	3	4	5	6
1	Structure for 11 KV CT	Kg	155	51.80	8,029.00
2	Structure for 11 KV LA	Kg	155	51.80	8,029.00
3	G.I. Nut Bolts	Kg	20	82.90	1,658.00
4	Cable Support Structure (2 Nos.)	Kg	200	51.80	10,360.00
5	MS Flat 50 X 6	Kg	235.5	48.50	11,421.75
6	Earthing CI Pipe Dia 150 mm 3 Mtr long	Nos.	3	6300.00	18,900.00
7	Dog Conductor	Mtr.	60	51.82	3,109.20
	Total				**61,506.95**

(A.2) ** Cost Structure for Control Cables – For 1980 kVAr

Sr. No.	Name of Items	Unit	Qty.	Unit Rates	Amount (In Rs.)
1	2	3	4	5	6
1	2C X 2.5 Sq. mm Armoured, Copper	Mtr.	100	55.11	5,511.00
2	4C X 2.5 Sq. mm Armoured, Copper	Mtr.	275	87.60	24,090.00
3	7C X 2.5 Sq. mm Armoured, Copper	Mtr.	40	139.19	5,567.60
4	10C X 2.5 Sq. mm Armoured, Copper	Mtr.	40	216.24	8,649.60
	Total				**43,818.20**

(A.3) * Cost Structure for Civil Work – For 1980 kVAr**

Sr. No.	Parameters	Unit	Qty.	Unit Rates	Amount (In Rs.)
1	2	3	4	5	6

1	Excavation	CuM	6	150.00	1,200.00
2	PCC	CuM	2.5	4257.00	10,642.50
3	RCC	CuM	5	5255.00	26,275.00
4	Steel	Kg	300	51.80	15,540.00
5	Back Filing	CuM	2	100.00	200.00
	Total				**53,857.50**

(B) Cost break-up of 11 kV Switched Capacitor Bank at 8 MVA Power Transformers

Sr. No.	Name of Items	Unit	Qty.	Unit Rates	Amount (In Rs.)	Reference for Unit Cost
1	2	3	4	5	6	7
1	12.65 kV, 3174 kVAr, 3-Phase, 50 Hz, Outdoor Type, CRCA panel having 4 step as 396.75 kVAr + 396.75 kVAr +1190.25 kVAr +1190.25 kVAr at 12.65 KV. Bank shall be complete with Capacitor units of 132.25 kVAr for 396.75 kVAr & 396.75 kVAr for 1190.25 kVAr at 7.3 kV including allied material such as suitable size of Aluminum busbars epoxy insulators, HRC fuses, Vacuum contactor, series reactors, RVT, etc. with details as under	Nos.	1	1,271,186.00	1,271,186.00	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL) – Enclosed under Annexure 'II'*
a)	11 kV, 0.2%, Aluminium Wound, Dry type Series reactors suitable for 396.75 kVAr	Nos.	6			
b)	11 kV, 0.2%, Aluminium Wound, Dry type Series reactors suitable for 1190.25 kVAr	Nos.	6			
c)	11 kV, 3-Phase dry type RVT	No.	1			
d)	11 kV/400 Amp, Indoor type Vacuum contactor	Nos.	4			
e)	Surge Suppressor	No.	1			
f)	IP 55 , Outdoor CRCA cubicle panel for accommodating capacitors, series reactor, vacuum contactor, surge arrestor fuses along with canaopy	Set	1			
g)	C & R Panel with Automatic Control Unit with APFC relay and Neutral Displacement relay	Set	1			

2	11 kV, 400 Amp, Off Load Isolator with earth switch and mounting structure	No.	1	35,000.00	35,000.00	*As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL) - – Enclosed under Annexure 'III'*
3	11 kV, 400 Amp, Off Load Isolator without earth switch and mounting structure	No.	1	26,630.00	26,630.00	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
4	9 kV, 10 kA, Station Class, Lightning Arrestors	Nos.	3	3,400.00	10,200.00	*As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL)*
5	*Cable Support Structure, Clamps, Connectors, Earthing MS Flats 50 x 6, 3 Mtr long Earthing CI Pipe Dia 150 mm, Dog Conductor	LS	1	61,506.95	61,506.95	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
6	11 kV XLPE insulated 3x185 mm^2 Armoured	Mtr.	50	1,251.37	62,568.50	*Items are under regular purchase by JVVNL. Rates as per Standard Issue Rate dated 20.05.2022 - – Enclosed under Annexure 'IV'*
7	Heat Shrinkable Jointing kit for 11 kV 3x185 Sq. mm. XLPE Cable (Indoor termination kit)	No.	2	823.77	1,647.54	
8	Heat Shrinkable Jointing kit for 11 kV 3x185 Sq. mm. XLPE Cable (Outdoor termination kit)	No.	2	1,017.85	2,035.70	
9	11 kV VCB (Kiosks) Switchgear with complete arrangement with adopter panel for connection with existing 11 kV bus bar	No.	1	440,000.00	440,000.00	*As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL)*
10	**Control cables of various sizes	LS	1	43,818.20	43,818.20	*PSDF Approved Scheme under Maharashtra Discom*
11	11 kV CT 400 - 200/5 A Outdoor Type	Nos.	3	10,611.00	31,833.00	

						(MSEDCL)
12	24 Volt / 200 AH Battery with Battery Charger (For Capacitor's VCB)	Nos.	1	69,000.00	69,000.00	As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL)
	Sub-Total (A)				**2,055,425.89**	
13	Transportation on material	LS	4%	-	82,217.04	PSDF Approved Scheme under Maharashtra Discom (MSEDCL)
14	Erection cost on material	LS	5%	-	102,771.29	
15	Insurance, Labour & Finance Cost	LS	3%	-	61,662.78	
16	Service Cost	LS	12%	-	246,651.11	
	Sub-Total (B)				**493,302.21**	
	Total (C) = (A) + (B)				**2,548,728.10**	
17	Applicable GST	-	18%	-	458,771.06	PSDF Approved Scheme under Maharashtra Discom (MSEDCL)
18	Price Escalation on cost of material	-	10%	-	205,542.59	
19	***Civil Cost	LS	1	53,857.50	53,857.50	
	Sub-Total (D)				**718,171.15**	
	Grand Total (E) = (C) + (D)				**3,266,899.25**	

Note: *As JVVNL is not under practice of regular installation of APFC, hence the cost estimation has been considered from recently approved PSDF Scheme of PVVNL & MSEDCL. Also, considered JVVNL 'Standard Issue Rate' dated 20.05.2022 for some of the items.*

Additionally, the cost towards annual maintenance charges (as shown below) shall be borne by JVVNL as internal/ external source of funding.

Annual Maintenance Charges after Guarantee Period for 05 Years (1 Year + 5 Year's)

Sr. No.	Parameters	Unit	Qty.	Unit Rates	Amount (In Rs.)
1	2	3	4	5	6
1	1st Year	Job	1	50000.00	50,000.00
2	2nd Year	Job	1	60000.00	60,000.00
3	3rd Year	Job	1	70000.00	70,000.00
4	4th Year	Job	1	80000.00	80,000.00
5	5th Year	Job	1	90000.00	90,000.00
	Total				**350,000.00**
	Total AMC Cost for 05 Years considering 14 Nos. of APFC				**4,900,000.00**

Item Wise Cost Breakup:

(B.1) *Cost Structure for 11 kV Station Capacitor Bank – For 3174 kVAr

Sr. No.	Name of Items	Unit	Qty.	Unit Rates	Amount (In Rs.)
1	2	3	4	5	6
1	Structure for 11 KV CT	Kg	155	51.80	8,029.00
2	Structure for 11 KV LA	Kg	155	51.80	8,029.00
3	G.I. Nut Bolts	Kg	20	82.90	1,658.00
4	Cable Support Structure (2 Nos.)	Kg	200	51.80	10,360.00
5	MS Flat 50 X 6	Kg	235.5	48.50	11,421.75
6	Earthing CI Pipe Dia 150 mm 3 Mtr long	Nos.	3	6300.00	18,900.00
7	Dog Conductor	Mtr.	60	51.82	3,109.20
	Total				**61,506.95**

(B.2) **Cost Structure for Control Cables – For 3174 kVAr

Sr. No.	Name of Items	Unit	Qty.	Unit Rates	Amount (In Rs.)
1	2	3	4	5	6
1	2C X 2.5 Sq. mm Armoured, Copper	Mtr.	100	55.11	5,511.00
2	4C X 2.5 Sq. mm Armoured, Copper	Mtr.	275	87.60	24,090.00
3	7C X 2.5 Sq. mm Armoured, Copper	Mtr.	40	139.19	5,567.60
4	10C X 2.5 Sq. mm Armoured, Copper	Mtr.	40	216.24	8,649.60
	Total				**43,818.20**

(B.3) ***Cost Structure for Civil Work – For 3174 kVAr

Sr. No.	Parameters	Unit	Qty.	Unit Rates	Amount (In Rs.)
1	2	3	4	5	6
1	Excavation	CuM	8	150.00	1,200.00
2	PCC	CuM	2.5	4257.00	10,642.50
3	RCC	CuM	5	5255.00	26,275.00
4	Steel	Kg	300	51.80	15,540.00
5	Back Filing	CuM	2	100.00	200.00
	Total				**53,857.50**

3. Funding

3.1 Funding Proposed from PSDF as grant: Rs. 162.43 Cr.

3.2 Contribution from Internal/ External Sources: Rs. 18.05 Cr.

Signature: _____

Date: 24-11-2022

Name: **Umesh Gupta**

(Authorized Representative)

Addl.Chief Engineer (PPM)

JVVNL, Jaipur

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Brief Details of the Project Appraisal by CTU / STU / RPC

The applicant utility shall submit project appraisal by CTU / STU / RPC in the given format and a copy of the Appraisal Report should be attached at Annexure.

Item	Details to be filled by Applicant Utility	
Appraisal By:	STU ■ CTU ☐ RPC ☐	
Date of Submission to CTU / STU / RPC for approval	Scheme was submitted to Rajasthan Rajya Vidyut Prasaran Nigam Ltd. (STU) by JVVNL on dated 13.10.2022.	
Name of the Scheme	Installation of Dynamic/Automatic capacitor banks on 11 kV side of 33/11 kV substations of Jaipur Vidyut Vitran Nigam Limited (JVVNL) under PSDF-Phase-I	
Copy of the Appraisal Report by CTU / STU / RPC is Attached at Annexure	Yes ■ No ☐ [DPR enclosed at Enclosure-1)]	
Summary of observations from CTU/ STU/RPC Appraisal Report	Summary of Proposal Appraised	The DPR has been prepared so as to improve & strengthen the operational reliability, enhancement of system, real-time data capturing and better management of reactive power.
	Technical Observations	As per the order of Rajasthan Regulatory Electricity Commission (RREC) dated 24.03.2001, 50% of the total MVAR requirement (presently approx. 10000 MVAR) shall be compensated by RVPN, while remaining 50% shall be compensated by remaining DISCOMs (16.6% by each DISCOM). This project report proposes installation of 1160 MVAR which is justified given their target of 1660 MVAR for operational reliability and effective voltage control.
	Financial Observations	As per guideline/procedure for disbursement of funds from PSDF in category 5.1(b), this scheme may be posed for funding/ grant from PSDF fund on 90% basis.
	Compliance of Grid Standards / Codes by the Applicant	All the grid standards, IS, IEC required, shall be followed for implementation of the scheme
	Limitations / Shortcomings pointed out by CTU/STU/RPC if any	NIL
	Recommendations of CTU/STU/RPC	The scheme may be posed for funding/ grant from PSDF fund.

Date:-

Chief Engineer (PP&D)
RVPN, Jaipur

Chief Engineer (PP&D)
R.V.P.N.L. JAIPUR

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UNDERTAKING

(On a Non-judicial Stamp paper of Rs. 50 only duly notarized and attested)

<Not Required – Already Submitted>

I, **Mr. Umesh Gupta** son of **Shri B.L. Gupta** resident of **Chitrakoot, Vaishali Nagar, Jaipur, Rajasthan** and presently working as **Superintending Engineer (Regulation)** in the **Jaipur Vidyut Vitran Nigam Limited, Jaipur (Rajasthan)** hereby undertake to comply with the following terms and conditions with regard to funding of the "**Installation of Capacitor Banks on 11 kV Side of 33/11 kV Substations for Reactive Power Compensation under Power System Development Fund (PSDF)** (name of the scheme) with disbursement from PSDF:

- **No tariff shall be claimed for the portion of the scheme funded from PSDF.**
- **Amount of grant shall be refunded in case of transfer/ disposal of the facility being created under this proposal to any other scheme for funding.**
- **Shall specifically mention if for the scheme under the proposal, the grant from any other agency is being taken/ proposed to be taken.**
- **The grant shall be refunded back to PSDF in case of non-utilisation of the grant within one year of release of instalment.**

Signature: _____

Date: _____

Name: **Umesh Gupta**

(Authorized Representative)

ANNEXURE 'B'

REVISED

DETAILED PROJECT REPORT (DPR)

FOR

System Improvement Scheme

Installation of Capacitor Banks on 11 kV Side of 33/11 kV Substations for Reactive Power Compensation under Power System Development Fund (PSDF) – Phase 'I'

Estimated Cost: Rs. 180.47 Cr.

प्रभास्मि शशि सूर्यायः

JAIPUR VIDYUT VITRAN NIGAM LIMITED

Corporate Identification Number (CIN): U40109RJ2000SGC016486
Office of the Superintending Engineer (Regulation)
Room No. 149, Old Power House Premises, Banipark, Jaipur-302016

TELEFAX: 0141-2209533, **Email –** sermdf@ivvnl.org

Website: www.jaipurdiscom.com

DETAILED PROJECT REPORT

INTRODUCTION

Rajasthan is the largest state in the country, in terms of area, spreading across 3,42,239 Sq. km, which is 10.41% of the nation area. The total population of Rajasthan is nearly 8.1 Crores spread across 33 Districts, of which 75% is rural population. The density of population in Rajasthan is 200 per sq.km which is much lower than the national average of 382 per sq.km. The state is, predominantly, an agrarian society with majority (45%) of the population depending on agriculture activities as source of income, which accounts for around 29.5% of Gross State Domestic Product (GSDP).

Due to this spread of population, meeting power demand, distribution of electricity and maintaining quality power for every category of consumers has always remained a challenge. The state is primarily agricultural base; however, the intensive power is too supplied to the domestic, non-domestic and industrial sector. It has been identified that these loads are highly inductive in nature which need rectification. In this regard, JVVNL has proposed to install dynamic/ automatic capacitor bank under which the capacitive load helps to adjust power factor as close to **'Unity Power Factor'**. The implementation of the project/ scheme will limit the heavy drawal of reactive power from grid and mitigate the risk such as **(a) Overloading of transmission lines; (b) Overloading of transformers at different voltage levels; and (c) Increase in system losses.**

Under JVVNL Discom, efforts have continuously been made to provide requisite reactive power compensation; however, the challenge associated with low voltage at the load end and drawl of heavy reactive power from the grid still persists due to fast growing load demand. Additionally, it has been noticed that the power factor is ranging from 0.80 to 0.90 at urban feeder and 0.75 to 0.80 (or even less) at the rural feeders within the respective circles. In view of this, the **provision through submission of detailed project report has been proposed at various circles having 'power factor less than 0.85'**. The report shall consist of brief background of JVVNL Discom, geographical maps, operational profile, objective, beneficiaries, recent initiatives, technology, cost estimates, timeframe, success criteria etc.

OUR PROPOSAL

1. BACKGROUND

1.1. Introduction

Jaipur Vidyut Vitran Nigam Limited (JVVNL) is a public utility company under the Department of Energy, Government of Rajasthan and is holder of the distribution and retail supply business licenses in the State of Rajasthan *(hereafter referred as "DISCOM")*. The Distribution Company came in to existence on 19 July 2000 pursuant to the "Rajasthan Power Sector Reforms Transfer Scheme, 2000" and restructuring undertaken in the State under which the vertically integrated Electricity Board *(Rajasthan State Electricity Board)* was unbundled and the power generation, transmission and distribution business was segregated to form 05 successor companies viz.

a) **Rajasthan Rajya Vidyut Utpadan Nigam Limited (RVUN)** to manage the electricity generation business of erstwhile RSEB.

b) **Rajasthan Rajya Vidyut Prasaran Nigam Limited (RVPN)** to manage the electricity transmission and bulk supply business of erstwhile RSEB.

c) **Ajmer Vidyut Vitran Nigam Limited (AVVNL)** to manage the electricity distribution and retail supply business of erstwhile RSEB in Ajmer City Circle, Ajmer District Circle, Bhilwara, Nagaur, Jhunjhunu, Sikar, Udaipur, Chittorgarh, Rajsamand, Banswara, Pratapgarh and Dungarpur Circles.

d) **Jaipur Vidyut Vitran Nigam Limited (JVVNL)** to manage the electricity distribution and retail supply business of erstwhile RSEB in Alwar, Bharatpur, Jaipur City, Jaipur District, Dausa, Kota, Jhalawar, Sawai Madhopur, Bundi, Baran, Tonk, Karauli and Dholpur Circles.

e) **Jodhpur Vidyut Vitran Nigam Limited (JdVVNL)** to manage the electricity distribution and retail supply business of erstwhile RSEB in Sriganganagar, Hanumangarh, Churu, Bikaner District, Bikaner City, Jaisalmer, Jalore, Barmer, Jodhpur City, Jodhpur District, Sirohi, Jalore, and Pali Circles.

1.2. Geographical Map of Rajasthan Discom

Figure 1: [1]Distribution Company Operating in State of Rajasthan

All the 03 Discoms have been established with the principal object of engaging in the business of distribution and supply of uninterrupted and reliable quality electricity in different districts (JVVNL – 12 Nos., AVVNL – 11 Nos. & JdVVNL – 10 Nos.) of Rajasthan. In view of above geographic locations, the proposal will mainly focus on 'Installation of Capacitor Bank at the 11 kV Side of various 33/11 kV sub-stations' under various Circles of Jaipur Discom.

1.3. Operational Profile

The JVVNL Discom is responsible for operating the distribution assets within the area of Alwar, Baran, Bundi, Bharatpur, Dholpur, Dausa, Jhalawar, Jaipur, Kota, Karauli, Sawai Madhopur and Tonk. Its scope of work and the electricity network *(as on Dec 2021)* are as presented below.

[1] **Source:** https://energy.rajasthan.gov.in/content/raj/energy-department/en/departments/avvnl/knowledge-base/discom-map.html

Table 1: Operational Profile of JVVNL Discom

Sr. No.	Parameters	JVVNL
1	Area of Operation	72,475 Sq. KM
2	Total Population (As per 2011 Census)	256 Lakhs
3	Total Number of Consumers	59.59 Lakhs
4	Total Number of Villages	15,145 Nos.
5	Electrified Villages	14,776 Nos.
6	Circles	13 Nos.
7	33/11 kV Sub-stations	1893 Nos.
8	MVA Capacity of 33/11 kV Power Transformer	13,349 MVA
9	33 kV Line	16,529 KM
10	11 kV Line	1,85,106 KM
11	11 kV Feeders	9,466 Nos.
12	LT Line	1,60,476 KM
13	11/0.4, 6.35/0.24 kV Sub-station	8,23,939 Nos.
14	MVA Capacity of Distribution Transformer	18,636 MVA
15	Load Profile (LV) based on MU	Agriculture & Domestic loads are predominating
16	Load profile (HV) based on MU	Industrial & Non Industrial, Agriculture, Residential and Commercial

Further, in terms of electrical connectivity, the JVVNL Discom is connected to Rajasthan Rajya Vidyut Prasaran Nigam Limited network at 33 kV & 11 kV levels. Also, there are few interconnection points with other Discoms.

1.4. Customers Profile

Discom currently serves about 5,038,760 consumers with a total connected load of around 18,446,237 kW under the LT & HT categories of consumers. Hence, category wise break-up of total number of consumers with connected Load as on March 2022 is stated below:

Table 2: Customer Profile for LT & HT Consumers of JVVNL Discom

Category (LT)	Consumers (Nos)	Connected Load (kW)
Domestic	3,908,907	6,218,679
Non Domestic	452,080	2,506,429
PSL	7,201	88,901
Agri (M)	565,812	4,536,199
Agri (F)	12,264	112,833
SIP	50,115	393,001
MIP	14,050	761,591
LIP	5,026	3,463,076
PWW (S)	17,737	108,974
PWW (M)	418	20,269
PWW (L)	211	108,406
Mixed Load	4,900	127,185
EV	39	694
Total	**50,38,760**	**1,84,46,237**

2. PROJECT OBJECTIVE

JVVNL believes that there is a need for a consistent and long lasting solution in order to improve & strength the Power Distribution Network with minimum losses in the long run. Also, the distribution system has suffered various challenges such as **(a) Unbalanced Load Flow; (b) High Level of Technical Losses; (c) Less System Stability; (d) Poor Voltage Regulation; (e) Low Power Factor; (f) Low Consumer Satisfaction Level etc.** which need to be gradually resolve. In this regard, JVVNL Discom is taking up Integrated Planning for Distribution System covering the Renovation & Modernization of the overall network. This will enable relieving congestion and improving the voltage profile at the load end.

"Government of India has finalized the scheme/ guidelines for operationalization of PSDF dated 10.01.2014. The provision consists of 'Installation of Shunt Capacitors, Series Compensators and other Reactive Energy Generators including Reactive Energy Absorption, Dynamic Reactive' support etc. for improvement of voltage profile in the Grid**"**.

Hence, this report aims to provide detailed information relating to the project for which Power System Development Fund for current year sought by the JVVNL. The key activity have been identified is to improve power distribution system with the installation of **1980 kVAr & 3174 kVAr Dynamic/ Automatic Capacitor Bank** at the selected 11 kV Side of 33/11 kV Sub-stations within the respective Circle/ Division/ Sub-division which could be possible with the **Power System Development Fund (PSDF).**

Table 3: Project Estimation for Installation of Capacitor Bank under JVVNL Discom

Installation of Dynamic/ Automatic Capacitor Bank under 12 Circles of JVVNL Discom							
Power Factor	**Circle**	**Division**	**Sub Division**	**Total 33/11 kV Substation**	**Feeder Count**	**Proposed Transformer Capacity (MVA)**	**Power Transformer Count (Nos.)**
Less than 0.85	12	46	151	572	2,587	3.15/ 5	563
						8	14
						Total (In Nos.)	**577**

3. SINGLE LINE DIAGRAM FOR INSTALLATION OF APFC AT VARIOUS 33/11 KV SUB-STATIONS

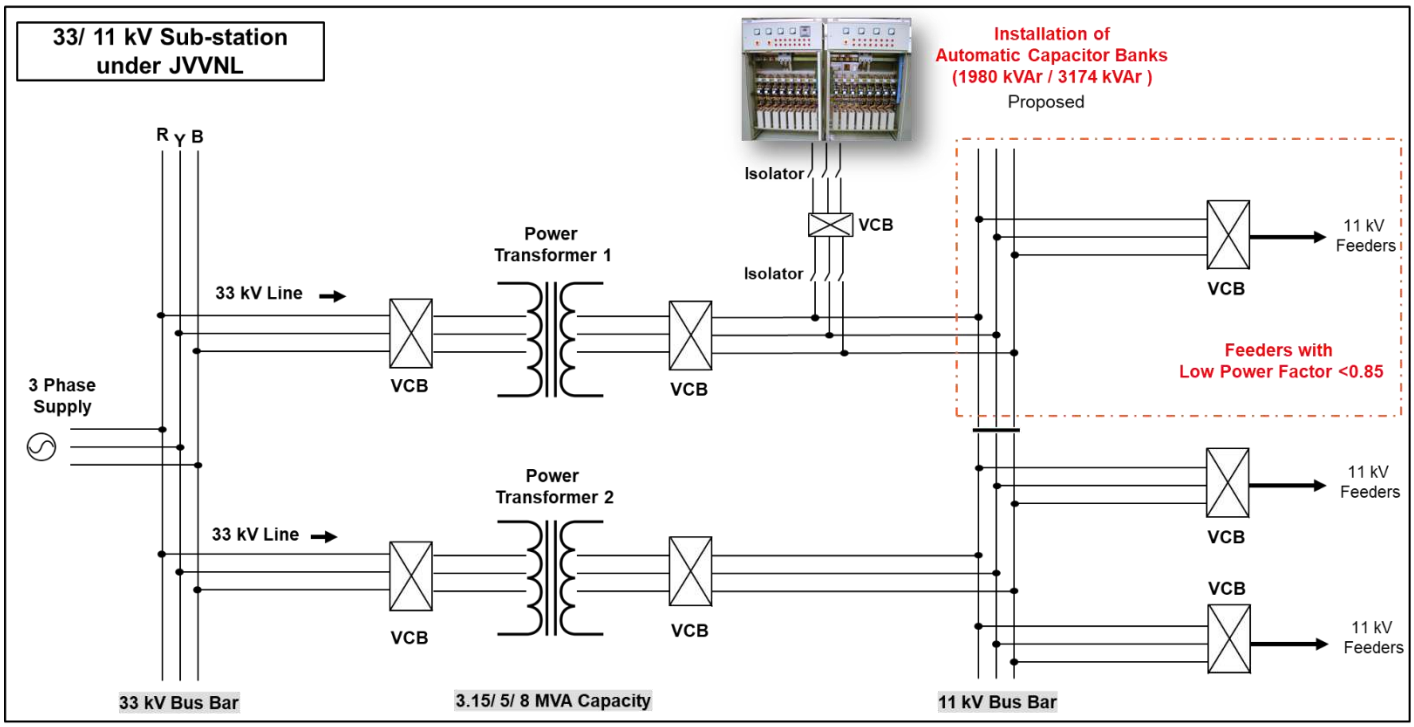


Figure 2: Single Line Diagram – Installation of Dynamic/ Automatic Capacitor Bank

4. PROPOSED SCHEMATIC DIAGRAM FOR APFC PANEL ON 3.15, 5 AND 8 MVA TRANSFORMER AT 33/11 KV SUBSTATIONS

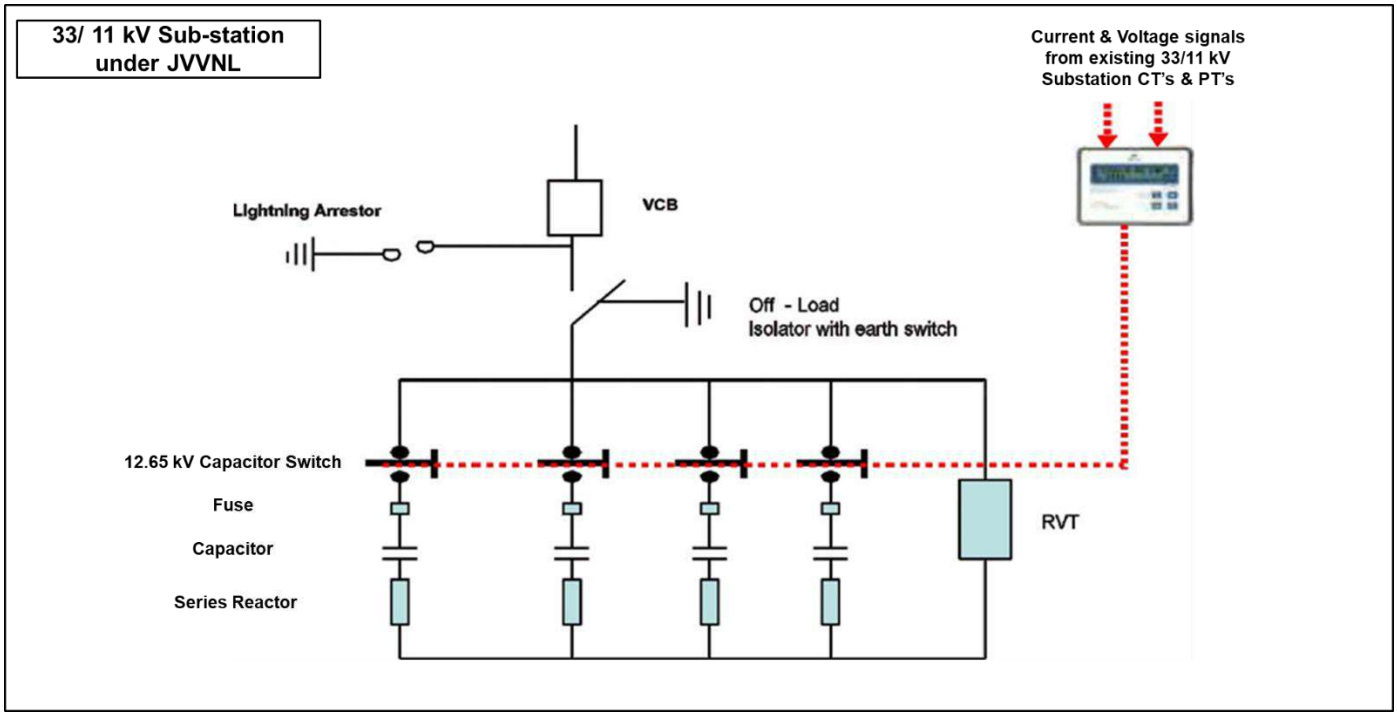


Figure 3: Proposed Schematic Diagram – APFC Panel

5. METHODOLOGY ADOPTED

The methodology as followed by JVVNL, for identification of low power factor *(i.e. below 0.85)* are as stated below.

a) JVVNL Discom has developed a **Feeder Monitoring System (FdrMS)** in order to have a **'Real Time'** power supply status of 11 kV feeders including installation status, power quality, system reliability, issue tracker, block hours supply, power factors, loan analysis, energy audit, tamper details etc.

b) With the support of FdrMS, the review reports consisting of 'Power Factors Less than 0.90' has been downloaded for the last 01 year *(i.e. from May 2021 till April 2022)*.

c) Analysis were carried-out on the Power Factor, Maximum Current (In Amp.) & Peak Load (In kW) at the various zone, circle, division, sub-division, 33/11 kV sub-stations, 11 kV feeders including its transformational capacity (In MVA).

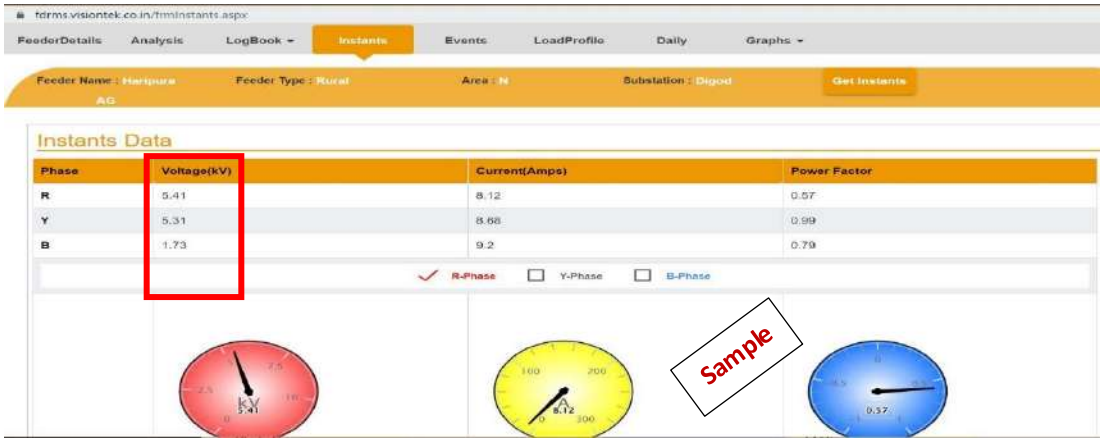
d) The average power factor for the 12 months were calculated and finalized for 12 circles *(except Jaipur, as maximum number of 11 kV feeders are having power factor >0.85)* which is enclosed under **Annexure 'I'.**

e) Further, the automatically generated data are reliable enough for consideration however, JVVNL has taken initiative and finalized data were cross-checked on a sample basis at the various division/ sub-divisions levels.

6. VOLTAGE PROFILE

In addition to the above study, as most of the identified feeders are under rural category having block hours power supply, JVVNL analyzed phase voltage under average load and peak load conditions. In Rajasthan, 11 kV feeders are not segregated from agricultural loads, hence 3-phase supply are provided during peak/ block hours where the phase voltage lies less than 0.9 pu. However, during the non-block hours, the entire loads are shifted to 1-phase supply leading to further voltage drop below 0.9 pu at various 11 kV feeders. In this regard, analysis were carried-out between 10:00 AM – 03:00 PM (peak/ block hour) under three phase (R-Y-B) supply where the voltage at the substations were found to be below 0.9 pu (i.e. below 5.7 kV phase or 9.9 kV line voltage). Hence, the phase voltage profile for some of the feeders on sample basis are as presented below. Also, detailed voltage analysis are included in attached annexure of revised detailed project report.

(a) Feeder – Haripura (Rural) under 33/11 kV Digod Sub-station

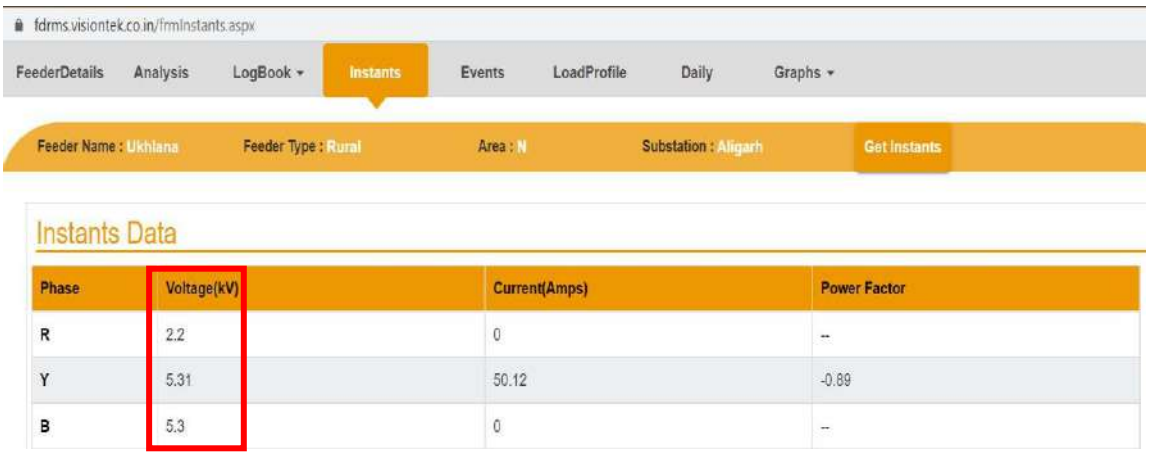


(b) Feeder – Dindhor (Rural) under 33/11 kV Tasing Sub-station

(c) Feeder – Petrol (Rural) under 33/11 kV Railganv Sub-station

(d) Feeder – Manoharpura (Rural) under 33/11 kV Kashipur Sub-station

(e) Feeder – Ukhlana (Rural) under 33/11 kV Aligarh Sub-station



Instants Data

Phase	Voltage(kV)	Current(Amps)	Power Factor
R	2.2	0	--
Y	5.31	50.12	-0.89
B	5.3	0	--

(f) Feeder – Chogai (Rural) under 33/11 kV Ranoli (Tonk) Sub-station

Instants Data

Phase	Voltage(kV)	Current(Amps)	Power Factor
R	5.41	8.12	0.57
Y	5.31	8.68	0.99
B	1.73	9.2	0.79

7. BENEFICIARIES

Adequate reactive power compensation offered salient benefits to the power system which includes voltage regulation *(i.e. voltage control within acceptable limits)*, system power losses reduction brought about by power factor improvement and it increases the utilization of connected equipments at the consumer end, improves reliability of transmission system and more importantly efficiency of real power made available at the consumer end. Hence, the major beneficiaries are as stated below.

a) Rajasthan Rajya Vidyut Prasaran Nigam Limited

b) Jaipur Vidyut Vitran Nigam Limited *(Approx. 20 Lakhs Consumers under 572 Nos. 33/11 kV Sub-stations of 12 Circles)*

8. ON-GOING INITIATIVES

JVVNL is taking active participation for the supply of quality power without compromising the technical and commercial losses in the urban and rural areas. Some of the initiatives includes village electrification, augmentation of transformational capacity, infrastructure development, privatizations through distribution franchisee, meterization, theft control, adopting schemes like Revamped Distribution Sector Scheme (RDSS), PM-KUSUM Scheme etc. Further, for the improvement of power factors at load end, JVVNL has installed approx. 5,62,323 Nos. of LT Shunt Capacitors (3 kVAr - 6 kVAr - 9 kVAr) from 2016-17 onwards. However due to smaller impact of power factor improvement, burning/ failure issue and theft of LT Shunt Capacitors have forced Discom to rethink and initiate the implementation of dynamic/ automatic capacitor bank at the various 11 kV side of the 33/11 kV sub-stations.

Apart from above, majority of the 11kV feeders in JVVNL are having high agriculture load which are being catered using 3.15/ 5 MVA power transformers at substations. **Over the decade, Discom has witnessed a growth of around ~9% in connected load thus leading to increase in power demand. Also, Government of Rajasthan has mandated supply of day-time power (two blocks supply) to agricultural farmers**. To meet this increase in demand and ensure day time supply to agriculture consumers, JVVNL need to augment its existing transformation capacities at Substation level (specifically from 3.15 MVA to 5 MVA) within next 2 years. Hence, under this detailed project report, JVVNL has considered the upcoming requirement and proposed a capacitor bank with common rated capacity for 3.15/ 5 MVA.

9. TECHNOLOGY

a) For 11 kV, 1980 kVAr & 3174 kVAr Dynamic/ Automatic Capacitor Bank shall include 11 kV Vacuum Circuit Breaker (VCB) Switchgear with complete arrangement with Adopter Panel for connection with existing 11 kV Bus Bar, Capacitor Switch, Reactor, APFC, Indoor Type Automatic Control Unit, Lightning Arrestor, Surge Arrestor, Pin & Post Insulators, PT's-CT's, Power & Control Cables, Junction Box, Supports of various types channels, Nut Bolts, Bus Bar Structure, Laying of Cables, Installation of Energy Meters, Interconnection of VCB and C&R Panel, Battery with Batter Charger etc.

b) The capacitor bank shall consist of variable steps of different kVAr *(details shared under BoQ)*. All the capacitor unit shall be controlled through separate capacitor

switch and complete capacitor bank shall be protected through a VCB suitable for capacitor duty.

c) The rated voltage of the system will be not less than 12 kV and shall be carried-out under 3-Phase Power Supply; 50 Hz frequency level.

d) The automatic power factor control unit shall continuously monitor power factor at 11 kV side of power transformer and automatically switched ON/OFF capacitors units in steps according to the requirement of KVAr to maintain the Target Power Factor *(atleast 0.98)*.

e) The automatic power factor control unit shall be programmable and have data downloading facility. Data Storage capacity of the control unit shall be at least for 45 days with every 15 minutes data. The bidder shall have to provide two data downloading instrument for data download from control unit with necessary BCS in each Circles.

f) The all display meters provided in the control panel shall be digital meters and shall be compatible for Automatic Meter Reading (AMR).

g) There are no low voltage limit for tripping of capacitor bank main VCB or capacitor switch. Also, the power factor control unit and relays provided for the protection of control unit shall be capable to store at least last 05 faults.

h) All equipment and material shall be designed, manufactured and tested in accordance with the latest applicable IS/ IEC standards.

i) The electrical installation shall meet the requirement of Indian Electricity Rules-1956/CEA safety Regulation 2010 as amended up to date; relevant IS code of practice and Indian Electricity Act-2003 in addition other rules and regulations as applicable to the work shall be followed.

10. TECHNICAL SPECIFICATION OF AUTOMATIC POWER FACTOR CAPACITOR

The technical specifications for the proposed capacitor bank are as presented below:

a) Switching Arrangement: The automatic control unit shall be mounted in the control & relay panel itself to continuously monitor total load kVAr on 11 kV side of power transformer and shall automatically switch ON or switch OFF (variable steps) through VCB operation.

b) Time Delay: The switching ON operation will take place after period of 10 minutes while switching OFF operation of relevant steps will be instantaneous.

c) Controls: The unit shall instantly switch OFF the capacitor bank when the voltage increase by 10% above the rated voltage of 11 kV etc.

d) Monitoring Facility: A suitable display should be provided to indicate the capacitor current in each phases of the complete capacitor bank. Indications shall also be provided to indicate ON & OFF status of each capacitor bank. Along with audio alarm indicating tripping of capacitor bank and ON /OFF, visual display window be provided on control panel.

e) Temperature Variation: The control equipment and associate circuitry shall be suitable for operation at an ambient temperature in the range of + 5 deg C to (+) 50 deg C.

Note: *The above proposed technology including technical specifications are indicative only, detailed version will be a part of tender documents.*

11. MANAGEMENT ARRANGEMENTS

The implementation plan for the project will be **24 months (i.e., 03 months tendering process + 21 months implementation)** from the date of approval from funding agency and shall be executed as per proposed plan. Further, the works under different activities shall be carried out on **turnkey basis** through international or national competitive bidding as per the guidelines of funding agency.

The project shall cover the overall procurement, installation, commissioning, testing and 05 years maintenance of dynamic/ automatic capacitor bank and will be divided into two phases (I & II) depending upon the total number of sub-station considered, area covered, time frame and available fund. Here, providing the estimate for **'Phase – I'**.

12. COST ESTIMATES

The cost estimation of installation of **577 Nos. of Dynamic/ Automatic 11 kV Capacitor Bank** under Power System Development Fund is stated below.

Sr. No.	Name of Work	Unit	Qty.	Unit Rate (Rs. Lakhs)	*Amount (In Rs. Cr.)
1	Installation of 1980 kVAr Automatic 11 kV Capacitor Bank including procurement, installation, commissioning and testing. (For 3.15/5 MVA)	Nos.	563	31.24	175.90
2	Installation of 3174 kVAr Automatic 11 kV Capacitor Bank including procurement, installation, commissioning and testing. (For 8 MVA)	Nos.	14	32.67	4.57

***Note:** The above estimated cost is inclusive of Transportation on material, Erection cost on material, Insurance, Labour & Finance Cost, Service Cost, Price Escalation on cost of material, Civil Cost, applicable GST and other taxes.*

13. BILL OF QUANTITY (BOQ)

(A) Cost break-up of 11 kV Switched Capacitor Bank at 3.15 / 5 MVA Power Transformer

Sr. No.	Name of Items	Unit	Qty.	Unit Rates	Amount (In Rs.)	Reference for Unit Cost
1	2	3	4	5	6	7
1	12.65 kV, 1980 kVAr, 3-Phase, 50 Hz, Outdoor Type CRCA Panel, Capacitor Bank having variable steps of 792 kVAr + 792 kVAr + 396 kVAr. Bank shall be complete with Capacitor units of 132 kVAr for 396 kVAr & 264 kVAr for 792 kVAr step at 7.3 kV, including allied material such as suitable size of aluminum busbars epoxy insulators, HRC fuses, vacuum contactor, series reactors, RVT, etc. with details as under	Nos.	1	1,180,000.00	1,180,000.00	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL) - On Pro rata Basis - – Enclosed under Annexure 'II'*

a)	11 kV, 0.2%, Aluminium Wound, Dry type Series reactors suitable for 792 kVAr	Nos.	6			
b)	11 kV, 0.2%, Aluminium Wound, Dry type Series reactors suitable for 396 kVAr	Nos.	3			
c)	11 kV, 3-Phase dry type RVT	No.	1			
d)	11 kV/400 Amp, Indoor type Vacuum contactor	Nos.	3			
e)	Surge Suppressor	No.	1			
f)	IP 55 , Outdoor CRCA cubicle panel for accommodating capacitors, series reactor, vacuum contactor, surge arrestor fuses along with canaopy	Set	1			
g)	C & R Panel with Automatic Control Unit with APFC relay and Neutral Displacement relay	Set	1			
2	11 kV, 400 Amp, Off Load Isolator with earth switch and mounting structure	No.	1	35,000.00	35,000.00	*As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL) - – Enclosed under Annexure 'III'*
3	11 kV, 400 Amp, Off Load Isolator without earth switch and mounting structure	No.	1	26,630.00	26,630.00	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
4	9 kV, 10 kA, Station Class, Lightning Arrestors	Nos.	3	3,400.00	10,200.00	*As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL)*

5	*Cable Support Structure, Clamps, Connectors, Earthing MS Flats 50 x 6, 3 Mtr long Earthing CI Pipe Dia 150 mm, Dog Conductor	LS	1	61,506.95	61,506.95	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
6	11 kV XLPE insulated 3x185 mm^2 Armoured	Mtr.	50	1,251.37	62,568.50	*Items are under regular purchase by JVVNL. Rates as per Standard Issue Rate dated 20.05.2022 - – Enclosed under Annexure 'IV'*
7	Heat Shrinkable Jointing kit for 11 kV 3x185 Sq. mm. XLPE Cable (Indoor termination kit)	No.	2	823.77	1,647.54	
8	Heat Shrinkable Jointing kit for 11 kV 3x185 Sq. mm. XLPE Cable (Outdoor termination kit)	No.	2	1,017.85	2,035.70	
9	11 kV VCB (Kiosks) Switchgear with complete arrangement with adopter panel for connection with existing 11 kV bus bar	No.	1	440,000.00	440,000.00	*As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL)*
10	**Control cables of various sizes	LS	1	43,818.20	43,818.20	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
11	11 kV CT 400 - 200/5 A Outdoor Type	Nos.	3	10,611.00	31,833.00	
12	24 Volt / 200 AH Battery with Battery Charger (For Capacitor's VCB)	Nos.	1	69,000.00	69,000.00	*As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL)*
Sub-Total (A)					**1,964,239.89**	
13	Transportation on material	LS	4%	-	78,569.60	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
14	Erection cost on material	LS	5%	-	98,211.99	
15	Insurance, Labour & Finance Cost	LS	3%	-	58,927.20	
16	Service Cost	LS	12%	-	235,708.79	
Sub-Total (B)					**471,417.57**	
Total (C) = (A) + (B)					**2,435,657.46**	
17	Applicable GST	-	18%	-	438,418.34	

18	Price Escalation on cost of material	-	10%	-	196,423.99	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
19	***Civil Cost	LS	1	53,857.50	53,857.50	
Sub-Total (D)					**688,699.83**	
Grand Total (E) = (C) + (D)					**3,124,357.30**	

Note: *As JVVNL is not under practice of regular installation of APFC, hence the cost estimation has been considered from recently approved PSDF Scheme of PVVNL & MSEDCL. Also, considered JVVNL 'Standard Issue Rate' dated 20.05.2022 for some of the items.*

Additionally, the cost towards annual maintenance charges (as shown below) shall be borne by JVVNL as internal/ external source of funding.

Annual Maintenance Charges after Guarantee Period for 05 Years (1 Year + 5 Year's)					
Sr. No.	**Parameters**	**Unit**	**Qty.**	**Unit Rates**	**Amount (In Rs.)**
1	**2**	**3**	**4**	**5**	**6**
1	1st Year	Job	1	50000.00	50,000.00
2	2nd Year	Job	1	60000.00	60,000.00
3	3rd Year	Job	1	70000.00	70,000.00
4	4th Year	Job	1	80000.00	80,000.00
5	5th Year	Job	1	90000.00	90,000.00
Total					**350,000.00**
Total AMC Cost for 05 Years considering 563 Nos. of APFC					**197,050,000.00**

Item Wise Cost Breakup:

(A.1) *Cost Structure for 11 kV Station Capacitor Bank – For 1980 kVAr

Sr. No.	**Name of Items**	**Unit**	**Qty.**	**Unit Rates**	**Amount (In Rs.)**
1	**2**	**3**	**4**	**5**	**6**
1	Structure for 11 KV CT	Kg	155	51.80	8,029.00
2	Structure for 11 KV LA	Kg	155	51.80	8,029.00
3	G.I. Nut Bolts	Kg	20	82.90	1,658.00
4	Cable Support Structure (2 Nos.)	Kg	200	51.80	10,360.00
5	MS Flat 50 X 6	Kg	235.5	48.50	11,421.75
6	Earthing CI Pipe Dia 150 mm 3 Mtr long	Nos.	3	6300.00	18,900.00
7	Dog Conductor	Mtr.	60	51.82	3,109.20
Total					**61,506.95**

(A.2) ** Cost Structure for Control Cables – For 1980 kVAr

Sr. No.	Name of Items	Unit	Qty.	Unit Rates	Amount (In Rs.)
1	2	3	4	5	6
1	2C X 2.5 Sq. mm Armoured, Copper	Mtr.	100	55.11	5,511.00
2	4C X 2.5 Sq. mm Armoured, Copper	Mtr.	275	87.60	24,090.00
3	7C X 2.5 Sq. mm Armoured, Copper	Mtr.	40	139.19	5,567.60
4	10C X 2.5 Sq. mm Armoured, Copper	Mtr.	40	216.24	8,649.60
Total					**43,818.20**

(A.3) *** Cost Structure for Civil Work – For 1980 kVAr

Sr. No.	Parameters	Unit	Qty.	Unit Rates	Amount (In Rs.)
1	2	3	4	5	6
1	Excavation	CuM	8	150.00	1,200.00
2	PCC	CuM	2.5	4257.00	10,642.50
3	RCC	CuM	5	5255.00	26,275.00
4	Steel	Kg	300	51.80	15,540.00
5	Back Filing	CuM	2	100.00	200.00
Total					**53,857.50**

(B) Cost break-up of 11 kV Switched Capacitor Bank at 8 MVA Power Transformers

Sr. No.	Name of Items	Unit	Qty.	Unit Rates	Amount (In Rs.)	Reference for Unit Cost
1	2	3	4	5	6	7
1	12.65 kV, 3174 kVAr, 3-Phase, 50 Hz, Outdoor Type, CRCA panel having 4 step as 396.75 kVAr + 396.75 kVAr +1190.25 kVAr +1190.25 kVAr at 12.65 KV. Bank shall be complete with Capacitor units of 132.25 kVAr for 396.75 kVAr & 396.75 kVAr for 1190.25 kVAr at 7.3 kV including allied material such as suitable size of Aluminum busbars epoxy insulators, HRC fuses, Vacuum contactor, series reactors, RVT, etc. with details as under	Nos.	1	1,271,186.00	1,271,186.00	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL) - – Enclosed under Annexure 'II'*
a)	11 kV, 0.2%, Aluminium Wound, Dry type Series reactors suitable for 396.75 kVAr	Nos.	6			
b)	11 kV, 0.2%, Aluminium Wound, Dry type Series reactors suitable for 1190.25 kVAr	Nos.	6			
c)	11 kV, 3-Phase dry type RVT	No.	1			
d)	11 kV/400 Amp, Indoor type Vacuum contactor	Nos.	4			
e)	Surge Suppressor	No.	1			
f)	IP 55 , Outdoor CRCA cubicle panel for accommodating capacitors, series reactor, vacuum contactor, surge arrestor fuses along with canaopy	Set	1			
g)	C & R Panel with Automatic Control Unit with APFC relay and Neutral Displacement relay	Set	1			

2	11 kV, 400 Amp, Off Load Isolator with earth switch and mounting structure	No.	1	35,000.00	35,000.00	*As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL) - – Enclosed under Annexure 'III'*
3	11 kV, 400 Amp, Off Load Isolator without earth switch and mounting structure	No.	1	26,630.00	26,630.00	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
4	9 kV, 10 kA, Station Class, Lightning Arrestors	Nos.	3	3,400.00	10,200.00	*As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL)*
5	*Cable Support Structure, Clamps, Connectors, Earthing MS Flats 50 x 6, 3 Mtr long Earthing CI Pipe Dia 150 mm, Dog Conductor	LS	1	61,506.95	61,506.95	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
6	11 kV XLPE insulated 3x185 mm^2 Armoured	Mtr.	50	1,251.37	62,568.50	*Items are under regular purchase by JVVNL. Rates as per Standard Issue Rate dated 20.05.2022 - – Enclosed under Annexure 'IV'*
7	Heat Shrinkable Jointing kit for 11 kV 3x185 Sq. mm. XLPE Cable (Indoor termination kit)	No.	2	823.77	1,647.54	
8	Heat Shrinkable Jointing kit for 11 kV 3x185 Sq. mm. XLPE Cable (Outdoor termination kit)	No.	2	1,017.85	2,035.70	
9	11 kV VCB (Kiosks) Switchgear with complete arrangement with adopter panel for connection with existing 11 kV bus bar	No.	1	440,000.00	440,000.00	*As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF*

						Scheme of PVVNL)
10	**Control cables of various sizes	LS	1	43,818.20	43,818.20	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
11	11 kV CT 400 - 200/5 A Outdoor Type	Nos.	3	10,611.00	31,833.00	
12	24 Volt / 200 AH Battery with Battery Charger (For Capacitor's VCB)	Nos.	1	69,000.00	69,000.00	*As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL)*
Sub-Total (A)					**2,055,425.89**	
13	Transportation on material	LS	4%	-	82,217.04	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
14	Erection cost on material	LS	5%	-	102,771.29	
15	Insurance, Labour & Finance Cost	LS	3%	-	61,662.78	
16	Service Cost	LS	12%	-	246,651.11	
Sub-Total (B)					**493,302.21**	
Total (C) = (A) + (B)					**2,548,728.10**	
17	Applicable GST	-	18%	-	458,771.06	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
18	Price Escalation on cost of material	-	10%	-	205,542.59	
19	***Civil Cost	LS	1	53,857.50	53,857.50	
Sub-Total (D)					**718,171.15**	
Grand Total (E) = (C) + (D)					**3,266,899.25**	

Note: *As JVVNL is not under practice of regular installation of APFC, hence the cost estimation has been considered from recently approved PSDF Scheme of PVVNL & MSEDCL. Also, considered JVVNL 'Standard Issue Rate' dated 20.05.2022 for some of the items.*

Additionally, the cost towards annual maintenance charges (as shown below) shall be borne by JVVNL as internal/ external source of funding.

Annual Maintenance Charges after Guarantee Period for 05 Years (1 Year + 5 Year's)					
Sr. No.	**Parameters**	**Unit**	**Qty.**	**Unit Rates**	**Amount (In Rs.)**
1	**2**	**3**	**4**	**5**	**6**

1	1st Year	Job	1	50000.00	50,000.00
2	2nd Year	Job	1	60000.00	60,000.00
3	3rd Year	Job	1	70000.00	70,000.00
4	4th Year	Job	1	80000.00	80,000.00
5	5th Year	Job	1	90000.00	90,000.00
Total					**350,000.00**
Total AMC Cost for 05 Years considering 14 Nos. of APFC					**4,900,000.00**

Item Wise Cost Breakup:

(B.1) *Cost Structure for 11 kV Station Capacitor Bank – For 3174 kVAr

Sr. No.	Name of Items	Unit	Qty.	Unit Rates	Amount (In Rs.)
1	**2**	**3**	**4**	**5**	**6**
1	Structure for 11 KV CT	Kg	155	51.80	8,029.00
2	Structure for 11 KV LA	Kg	155	51.80	8,029.00
3	G.I. Nut Bolts	Kg	20	82.90	1,658.00
4	Cable Support Structure (2 Nos.)	Kg	200	51.80	10,360.00
5	MS Flat 50 X 6	Kg	235.5	48.50	11,421.75
6	Earthing CI Pipe Dia 150 mm 3 Mtr long	Nos.	3	6300.00	18,900.00
7	Dog Conductor	Mtr.	60	51.82	3,109.20
Total					**61,506.95**

(B.2) **Cost Structure for Control Cables – For 3174 kVAr

Sr. No.	Name of Items	Unit	Qty.	Unit Rates	Amount (In Rs.)
1	**2**	**3**	**4**	**5**	**6**
1	2C X 2.5 Sq. mm Armoured, Copper	Mtr.	100	55.11	5,511.00
2	4C X 2.5 Sq. mm Armoured, Copper	Mtr.	275	87.60	24,090.00
3	7C X 2.5 Sq. mm Armoured, Copper	Mtr.	40	139.19	5,567.60
4	10C X 2.5 Sq. mm Armoured, Copper	Mtr.	40	216.24	8,649.60
Total					**43,818.20**

(B.3) ***Cost Structure for Civil Work – For 3174 kVAr

Sr. No.	Parameters	Unit	Qty.	Unit Rates	Amount (In Rs.)

1	2	3	4	5	6
1	Excavation	CuM	8	150.00	1,200.00
2	PCC	CuM	2.5	4257.00	10,642.50
3	RCC	CuM	5	5255.00	26,275.00
4	Steel	Kg	300	51.80	15,540.00
5	Back Filing	CuM	2	100.00	200.00
Total					**53,857.50**

14. TIME FRAME PERT CHART

The total duration of the project is considered as **24 months**. The tentative start date shall be considered as the date of receipt of approval from PSDF funding while the completion time is likely to by **end of September 2024.** The detailed time frame is presented below.

Sr. No.	Description	TIMELINE																								
		FY 2022-23						FY 2023-24														FY 2024-25				
		Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
Finalization of Tender Documents & Issuance of Work Order																									
1	Project Approval																								
2	Conduct of Committee Meeting																								
3	Preparation & Release of Tender Document																								
4	Evaluation, Contract Award and Mobilization																								
Procurement, Installation, Commissioning & Testing of Equipments																									
5	1st Disbursement (30% of Grant)				D1																				
6	Procurement, Installation, Commissioning & Testing of Equipments							Progressive Basis																	
7	Bi-monthly Review Meeting																								
8	Monthly Report Submission																								
9	2nd Disbursement (60% of Grant) i.e. After Utalization of 30% Grant + 10% Self-contribution (JVVNL)										D2														
Cost Benefit Analysis & Report Submission on Improved Power Factor																									
10	Submission of Draft Report																								
11	Final Report Submission																								
12	3rd Disbursement (10% of Grant) i.e. On Completion of Scheme																								D3

15. SUCCESS CRITERIA & SUSTAINABILITY

To identify the success of any project, it is always necessary to evaluate the standards by which to examine whether the proposed objective, target or outcomes will be achieve or not. Hence, the **Cost-Benefit Analysis** for the 1980 kVAr & 3174 kVAr ratings automatic capacitor bank on the 3.15, 5 & 8 MVA power transformer has been presented below.

Payback Calculation for Installation of 11 kV Automatic Capacitor Bank at 33/11 kV Sub-station															
Assumptions - Load Factor - 80%| Avg. Loading - 54%| Average PF - 0.85 | Desired PF - 0.98 | Initial Line Losses as 20%															
Sr. No.	Transformer Rating (In MVA)	Qty	Total MVA	Load Factor	Average Loading	Average Demand (In MW) with 0.85 Power Factor	Reduction in MVA after Capacitors Bank	% Line Loss Reduction	Actual Line Loss Reduction of Initial Loss as	Total MWh Drawn in a Year	Saving in MWh	Cost of energy saved per annum @ 4.85/- (2022-21) per unit	Proposed 11 KV Automatic Capacitor Bank (In kVAr)	Supply, Installation Cost (In Lakhs)	Total Cost (In Cr.)
				80%	54%		0.98		20						
1	3.15	346	1090	872	471	400.2113	408.38	24.77	4.95	3505851	173686	842,378,854	1980	31.24	108.10
2	5	217	1085	868	469	398.412	406.54	24.77	4.95	3490089	172905	838,591,666	1980	31.24	67.80
3	8	14	112	90	48	41.1264	41.97	24.77	4.95	360267	17848	86,564,301	3174	32.67	4.57
Grand Total										7356207	364440	1,767,534,820	-	-	180.47

Total Cost of the Project : Rs. 180.47 Cr.

Total Savings with Power Factor Improvement : Rs. 176.75 Cr.

Payback Period - Approx. 13 Months

"Further, regional entities are liable for weekly settlement of 'Reactive Energy Charges' in accordance with the CERC (Indian Electricity Grid Code) Regulations, 2010 and amendments thereof, which are sometimes payable or receivable. Due to poor power factor, sometimes Rajasthan accounts for a penalty at the rate of 10 paise/kVArh *(from 03.05.2010 onwards)* reactive charges with escalation factor of 0.5 paise/ kVArh. Also, recent provision of CERC's Draft Indian Electricity Grid Code 2022 recommends the reactive charge at the rate of 5 paise/kVArh w.e.f. the date of effect of final regulations with escalation at 0.5paise/kVArh per year thereafter".

Hence, the draft provision to rate reduction along with saving achieved through installation of capacitor bank will definitely lower down the overall penalty impact. These shall be the contributing factor for the Improvement of Financial Health of Discoms and will leading to a sustainable implementation structure. *(Note: The NRLDC charges is not taken into consideration in above payback calculation).*

Moreover, the capacitor units are used in these capacitor banks are manufactured with the latest design and tested to meet or exceed the requirement of applicable IEC & IS Standards, it is rated in continuous kVAr, voltage and frequency for operating within the -200 ^{o}C to +500 ^{o}C ambient temperature rage & designed to produce not less than rated kVA at rated voltage and frequency.

Capacitors will operate safely at 135% of kVAr rating under following condition as:

- kVAr caused by excess at rated frequency.

- kVAr added by the harmonic voltage superimposed on the power frequency voltage.
- kVAr attributable to manufacturing tolerances.

The maximum recommended working voltage of capacitor is 110% of rated voltage. The capacitors include a safely factor that permits them to tolerate without damage momentary over voltage caused due to switching/ load fluctuation.

Thus, it is quite successful and sustainable in the high voltage system.

ANNEXURE 'I'

List of Various 33/11 kV Sub-stations considered for Power Factor Improvement

Cost Estimation for JVVNL, Rajasthan					
Sr. No.	**Name of Items**	**Unit**	**Qty. (Nos.)**	**Unit Rates (In Lakhs)**	**Amount (In Cr.)**
1	Installation of 1980 kVAr Automatic 11 kV Capacitor Bank including procurement, installation, commissioning and testing (For 3.15/5 MVA)	Nos.	563	31.24	175.90
2	Installation of 3174 kVAr Automatic 11 kV Capacitor Bank including procurement, installation, commissioning and testing (For 8 MVA)	Nos.	14	32.67	4.57
Total			**577**		**180.47**

Contribution

Grant under PSDF Scheme	**90%**	**162.43**
JVVNL Internal / External Source	**10%**	**18.05**

BoQ for 11 kV Dynamic/ Automatic Capacitor Bank (APFC) for Rural Areas - JVVNL						
Sr. No.	**Name of Items**	**Unit**	**Qty.**	**Unit Rates**	**Amount (In Rs.)**	**Reference for Unit Cost**
1	**2**	**3**	**4**	**5**	**6**	**7**
1	12.65 kV, 1980 kVAr, 3-Phase, 50 Hz, Outdoor Type CRCA Panel, Capacitor Bank having variable steps of 792 kVAr + 792 kVAr + 396 kVAr. Bank shall be complete with Capacitor units of 132 kVAr for 396 kVAr & 264 kVAr for 792 kVAr step at 7.3 kV, including allied material such as suitable size of aluminum busbars epoxy insulators, HRC fuses, vacuum contactor, series reactors, RVT, etc with details as under	Nos.	1	1,180,000.00	1,180,000.00	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL) - On Pro rata Basis*
a)	11 kV, 0.2%, Aluminium Wound, Dry type Series reactors suitable for 792 kVAr	Nos.	6			
b)	11 kV, 0.2%, Aluminium Wound, Dry type Series reactors suitable for 396 kVAr	Nos.	3			
c)	11 kV, 3-Phase dry type RVT	No.	1			
d)	11 kV/400 Amp, Indoor type Vacuum contactor	Nos.	3			
e)	Surge Suppressor	No.	1			
f)	IP 55 , Outdoor CRCA cubicle panel for accommodating capacitors, series reactor, vacuum contactor, surge arrestor fuses along with canaopy	Set	1			
g)	C & R Panel with Automatic Control Unit with APFC relay and Neutral Displacement relay	Set	1			
2	11 kV, 400 Amp, Off Load Isolator with earth switch and mounting structure	No.	1	35,000.00	35,000.00	*As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL)*
3	11 kV, 400 Amp, Off Load Isolator without earth switch and mounting structure	No.	1	26,630.00	26,630.00	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*

4	9 kV, 10 kA, Station Class, Lightning Arrestors	Nos.	3	3,400.00	10,200.00	*As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL)*
5	*Cable Support Structure, Clamps, Connectors, Earthing MS Flats 50 x 6, 3 Mtr long Earthing CI Pipe Dia 150 mm, Dog Conductor	LS	1	61,506.95	61,506.95	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
6	11 kV XLPE insulated 3x185 mm^2 Armoured	Mtr.	50	1,251.37	62,568.50	*Items are under regular purchase by JVVNL. Rates as per Standard Issue Rate dated 20.05.2022*
7	Heat Shrinkable Jointing kit for 11 kV 3x185 Sq. mm. XLPE Cable (Indoor termination kit)	No.	2	823.77	1,647.54	
8	Heat Shrinkable Jointing kit for 11 kV 3x185 Sq. mm. XLPE Cable (Outdoor termination kit)	No.	2	1,017.85	2,035.70	
9	11 kV VCB (Kiosks) Switchgear with complete arrangement with adopter panel for connection with existing 11 kV bus bar	No.	1	440,000.00	440,000.00	*As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL)*
10	**Control cables of various sizes	LS	1	43,818.20	43,818.20	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
11	11 kV CT 400 - 200/5 A Outdoor Type	Nos.	3	10,611.00	31,833.00	
12	24 Volt / 200 AH Battery with Battery Charger (For Capacitor's VCB)	Nos.	1	69,000.00	69,000.00	*As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL)*
Sub-Total (A)					**1,964,239.89**	**-**
13	Transportation on material	LS	4%	-	78,569.60	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
14	Erection cost on material	LS	5%	-	98,211.99	
15	Insurance, Labour & Finance Cost	LS	3%	-	58,927.20	
16	Service Cost	LS	12%	-	235,708.79	
Sub-Total (B)					**471,417.57**	**-**
Total (C) = (A) + (B)					**2,435,657.46**	**-**

17	Applicable GST	-	18%	-	438,418.34	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
18	Price Escalation on cost of material	-	10%	-	196,423.99	
19	***Civil Cost	LS	1	53,857.50	53,857.50	
Sub-Total (D)					**688,699.83**	-
Grand Total (E) = (C) + (D)					**3,124,357.30**	-

***Cost Structure for 11 kV Station Capacitor Bank - JVVNL**					
Sr. No.	**Name of Items**	**Unit**	**Qty.**	**Unit Rates**	**Amount (In Rs.)**
1	**2**	**3**	**4**		**5**
1	Structure for 11 KV CT	Kg	155	51.80	8,029.00
2	Structure for 11 KV LA	Kg	155	51.80	8,029.00
3	G.I. Nut Bolts	Kg	20	82.90	1,658.00
4	Cable Support Structure (2 Nos.)	Kg	200	51.80	10,360.00
5	MS Flat 50 X 6	Kg	235.5	48.50	11,421.75
6	Earthing CI Pipe Dia 150 mm 3 Mtr long	Nos.	3	6300.00	18,900.00
7	Dog Conductor	Mtr.	60	51.82	3,109.20
Total					**61,506.95**

****Cost Structure for Control Cables**					
Sr. No.	**Name of Items**	**Unit**	**Qty.**	**Unit Rates**	**Amount (In Rs.)**
1	**2**	**3**	**4**		**5**
1	2C X 2.5 Sq. mm Armoured, Copper	Mtr.	100	55.11	5,511.00
2	4C X 2.5 Sq. mm Armoured, Copper	Mtr.	275	87.60	24,090.00
3	7C X 2.5 Sq. mm Armoured, Copper	Mtr.	40	139.19	5,567.60
4	10C X 2.5 Sq. mm Armoured, Copper	Mtr.	40	216.24	8,649.60
Total					**43,818.20**

*****Cost Structure for Civil Work**					
Sr. No.	**Parameters**	**Unit**	**Qty.**	**Unit Rates**	**Amount (In Rs.)**
1	**2**	**3**	**4**		**5**

1	Excavation	CuM	8	150.00	1,200.00
2	PCC	CuM	2.5	4257.00	10,642.50
3	RCC	CuM	5	5255.00	26,275.00
4	Steel	Kg	300	51.80	15,540.00
5	Back Filing	CuM	2	100.00	200.00
Total					**53,857.50**

Annual Maintenance Charges after Guarantee Period for 05 Years (1 Year + 5 Year's) - Shall be borne by JVVNL					
Sr. No.	**Parameters**	**Unit**	**Qty.**	**Unit Rates**	**Amount (In Rs.)**
1	**2**	**3**	**4**		**5**
1	1st Year	Job	1	50000.00	50,000.00
2	2nd Year	Job	1	60000.00	60,000.00
3	3rd Year	Job	1	70000.00	70,000.00
4	4th Year	Job	1	80000.00	80,000.00
5	5th Year	Job	1	90000.00	90,000.00
Total					**350,000.00**
Total AMC Cost after considering 563 Nos. APFC					**197,050,000.00**

BoQ for 11 kV Dynamic/ Automatic Capacitor Bank (APFC) for Rural Areas - JVVNL						
Sr. No.	**Name of Items**	**Unit**	**Qty.**	**Unit Rates**	**Amount (In Rs.)**	**Reference for Unit Cost**
1	**2**	**3**	**4**		**5**	**7**
1	12.65 kV, 3174 kVAr, 3-Phase, 50 Hz, Outdoor Type, CRCA panel having 4 step as 396.75 kVAr + 396.75 kVAr +1190.25 kVAr +1190.25 kVAr at 12.65 KV. Bank shall be complete with Capacitor units of 132.25 kVAr for 396.75 kVAr & 396.75 kVAr for 1190.25 kVAr at 7.3 kV including allied material such as suitable size of Aluminum busbars epoxy insulators, HRC fuses, Vacuum contactor, series reactors, RVT, etc. with details as under	Nos.	1	1,271,186.00	1,271,186.00	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
a)	11 kV, 0.2%, Aluminium Wound, Dry type Series reactors suitable for 396.75 kVAr	Nos.	6			
b)	11 kV, 0.2%, Aluminium Wound, Dry type Series reactors suitable for 1190.25 kVAr	Nos.	6			
c)	11 kV, 3-Phase dry type RVT	No.	1			
d)	11 kV/400 Amp, Indoor type Vacuum contactor	Nos.	4			
e)	Surge Suppressor	No.	1			
f)	IP 55 , Outdoor CRCA cubicle panel for accommodating capacitors, series reactor, vacuum contactor, surge arrestor fuses along with canaopy	Set	1			
g)	C & R Panel with Automatic Control Unit with APFC relay and Neutral Displacement relay	Set	1			
2	11 kV, 400 Amp, Off Load Isolator with earth switch and mounting structure	No.	1	35,000.00	35,000.00	*As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL)*
3	11 kV, 400 Amp, Off Load Isolator without earth switch and mounting structure	No.	1	26,630.00	26,630.00	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
4	9 kV, 10 kA, Station Class, Lightning Arrestors	Nos.	3	3,400.00	10,200.00	*As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL)*

5	*Cable Support Structure, Clamps, Connectors, Earthing MS Flats 50 x 6, 3 Mtr long Earthing CI Pipe Dia 150 mm, Dog Conductor	LS	1	61,506.95	61,506.95	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
6	11 kV XLPE insulated 3x185 mm^2 Armoured	Mtr.	50	1,251.37	62,568.50	*Items are under regular purchase by JVVNL. Rates as per Standard Issue Rate dated 20.05.2022*
7	Heat Shrinkable Jointing kit for 11 kV 3x185 Sq. mm. XLPE Cable (Indoor termination kit)	No.	2	823.77	1,647.54	
8	Heat Shrinkable Jointing kit for 11 kV 3x185 Sq. mm. XLPE Cable (Outdoor termination kit)	No.	2	1,017.85	2,035.70	
9	11 kV VCB (Kiosks) Switchgear with complete arrangement with adopter panel for connection with existing 11 kV bus bar	No.	1	440,000.00	440,000.00	*As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL)*
10	**Control cables of various sizes	LS	1	43,818.20	43,818.20	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
11	11 kV CT 400 - 200/5 A Outdoor Type	Nos.	3	10,611.00	31,833.00	
12	24 Volt / 200 AH Battery with Battery Charger (For Capacitor's VCB)	Nos.	1	69,000.00	69,000.00	*As per LOI No. 130/PVVNL-MT/MM/23/20-21/LOI Dated 07.04.2021 (Approved PSDF Scheme of PVVNL)*
Sub-Total (A)					**2,055,425.89**	**-**
13	Transportation on material	LS	4%	-	82,217.04	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
14	Erection cost on material	LS	5%	-	102,771.29	
15	Insurance, Labour & Finance Cost	LS	3%	-	61,662.78	
16	Service Cost	LS	12%	-	246,651.11	
Sub-Total (B)					**493,302.21**	**-**
Total (C) = (A) + (B)					**2,548,728.10**	**-**
17	Applicable GST	-	18%	-	458,771.06	*PSDF Approved Scheme under Maharashtra Discom (MSEDCL)*
18	Price Escalation on cost of material	-	10%	-	205,542.59	
19	***Civil Cost	LS	1	53,857.50	53,857.50	

Sub-Total (D)	**718,171.15**	-
Grand Total (E) = (C) + (D)	**3,266,899.25**	-

*Cost Structure for 11 kV Station Capacitor Bank - JVVNL					
Sr. No.	**Name of Items**	**Unit**	**Qty.**	**Unit Rates**	**Amount (In Rs.)**
1	**2**	**3**	**4**		**5**
1	Structure for 11 KV CT	Kg	155	51.80	8,029.00
2	Structure for 11 KV LA	Kg	155	51.80	8,029.00
3	G.I. Nut Bolts	Kg	20	82.90	1,658.00
4	Cable Support Structure (2 Nos)	Kg	200	51.80	10,360.00
5	MS Flat 50 X 6	Kg	235.5	48.50	11,421.75
6	Earthing CI Pipe Dia 150 mm 3 Mtr long	Nos.	3	6300.00	18,900.00
7	Dog Conductor	Mtr.	60	51.82	3,109.20
Total					**61,506.95**

**Cost Structure for Control Cables					
Sr. No.	**Name of Items**	**Unit**	**Qty.**	**Unit Rates**	**Amount (In Rs.)**
1	**2**	**3**	**4**		**5**
1	2C X 2.5 Sq. mm Armoured, Copper	Mtr.	100	55.11	5,511.00
2	4C X 2.5 Sq. mm Armoured, Copper	Mtr.	275	87.60	24,090.00
3	7C X 2.5 Sq. mm Armoured, Copper	Mtr.	40	139.19	5,567.60
4	10C X 2.5 Sq. mm Armoured, Copper	Mtr.	40	216.24	8,649.60
Total					**43,818.20**

***Cost Structure for Civil Work					
Sr. No.	**Parameters**	**Unit**	**Qty.**	**Unit Rates**	**Amount (In Rs.)**
1	**2**	**3**	**4**		**5**
1	Excavation	CuM	8	150.00	1,200.00
2	PCC	CuM	2.5	4257.00	10,642.50
3	RCC	CuM	5	5255.00	26,275.00
4	Steel	Kg	300	51.80	15,540.00
5	Back Filing	CuM	2	100.00	200.00
Total					**53,857.50**

Annual Maintenance Charges after Guarantee Period for 05 Years (1 Year + 5 Year's) - Shall be borne by JVVNL					
Sr. No.	**Parameters**	**Unit**	**Qty.**	**Unit Rates**	**Amount (In Rs.)**
1	**2**	**3**	**4**		**5**
1	1st Year	Job	1	50000.00	50,000.00
2	2nd Year	Job	1	60000.00	60,000.00
3	3rd Year	Job	1	70000.00	70,000.00
4	4th Year	Job	1	80000.00	80,000.00
5	5th Year	Job	1	90000.00	90,000.00
Total					**350,000.00**
Total AMC Cost after considering 14 Nos. APFC					**4,900,000.00**

Rajasthan Electricity Regulatory Commission Jaipur

Petition No.RERC/tariff/8/2000

filed by

Rajasthan Rajya Vidyut Prasaran Nigam Limited,

****

Mr. Arun Kumar, Chairman,

Mr. Shanti Prasad, Member,

Mr. Prabhakar K. Das, Member

Date of order: 24th March 2001

ORDER

1 The Secretary (Administration), Rajasthan Rajya Vidyut Prasaran Nigam Limited had submitted a petition before the Commission on 1st December 2000 on behalf of Rajasthan Rajya Vidyut Prasaran Nigam Limited (hereinafter referred to as 'RVPN') under section 26 of the Rajasthan Power Sector Reforms Act 1999, (Act 23 of 1999)(hereinafter referred to as the Reforms Act) for fixation of tariff for bulk supply and transmission of electricity for the years 2000-01 and 2001-02. This application was submitted in pursuance of resolution of Board of Directors dated 25.11.2000.

2 Rajasthan Electricity Regulatory Commission was established under the provisions of the Electricity Regulatory Commissions Act 1998 (Act 14 of 1998), on 10th December 1999 vide Government of Rajasthan Gazette notification of the same date. The Commission became operational with effect from 2nd January 2000,on appointment of Chairman and a Member. The Commission had notified interalia Rajasthan Electricity Regulatory Commission (Conduct of Business) Regulations 2000, Rajasthan Electricity Regulatory Commission (Tariff) Regulations 2000 (hereinafter referred to as Tariff Regulations) and had issued order No.2 dated 22.4.2000 laying down the methodology, procedure and formats for furnishing information under sub clause (1) of clause 3 and clause 4 of the Tariff Regulations. The Government of Rajasthan promulgated the Rajasthan Power Sector Reforms Act 1999 (Act 23 of 1999) on 10th January 2000 and made it effective on 1st June 2000. The Commission set up under the Electricity Regulatory Commissions Act 1998, became the first Commission under

87 The bulk supply tariff determined by the Commission is based on the projected cost of power purchase by the petitioner after allowing reasonable escalation. There shall be no separate power purchase and fuel cost adjustment charge.

88 In case there is a large variation in the power purchase and fuel cost, the petitioner may take that into account at the time of next tariff filing or propose a power purchase cost adjustment formula for the approval of the Commission.

Rebate for timely payment

89 The Commission has analysed the provisions of tariff for central sector generating/transmission companies, agreements for bulk power supply with NPC, tariff orders for NTPC, NHPC and PGCIL. Considering these & working capital requirements, the Commission directs that 1.5% rebate shall be admissible to Discoms for payment of bill by them upto 3rd day of billing, 1% rebate thereafter for payment upto 25th day of billing. After 55 days of billing a late payment surcharge of 1.5% per month shall be chargeable from Discoms.

Power factor levy/incentive

90 Power factor levy/incentive shall be effective after three months. In the meantime duly calibrated electronic meters capable of recording such readings on hourly basis shall be installed at all substations.

Directions to RVPN

The directions given by the Commission in this order are summarised below:

91 RVPN to be vigilant and ensure that tapping of exclusive supply lines of RVPN is not effected in future by other state/organization. (Para 23)

92 RVPN shall strive for rationalisation of determination of EHV loss in BBMB & Northern Region (NR) so that its impact on purchase from each power station is determinable in advance. (Para 32)

93 RVPN shall strive for EHV loss within the State to be reduced to the level of 5% in next five years. For the year 2001-02 a reduction of 0.08% be achieved. Steps taken by RVPN for this purpose and reduction in losses achieved should be reported to the Commission on quarterly basis. (Para 35)

94 The RVPN shall control EHV loss within the State as per directions in para 37. (Para 37)

95 Vitran Nigam shall maintain minimum power factor of 85%. Requirement of Shunt capacitors for the year be assessed as per NREB studies. 50% of the required capacity shall be installed by RVPN and balance 50% by three Vitran Nigam @ 16.6% capacity. (Para 40)

96 Lagging kVArh draw in excess of 62% of KWh draw, measured at each substation and integrated for Vitran Nigam as a whole, shall attract a penalty of 4 paisa per kVArh with 5% annual escalation with effect from 1.4.2001. Lagging kVArh draw below 32% of KWh drawn shall earn an incentive at the same rate. (Para 40)

97 SLDC shall monitor, on computer, the MVAr draw/injection at power grid/BBMB interconnections at system voltage below 97% and above 103% at respective point. (Para 40)

98 SLDC shall formulate scheme of switching off of excess capacity of shunt capacitors in phases at system voltage from 100% to 103% and switching on of shunt capacitors in phases at system voltage from 100% to 97%. (Para 40)

99 RVPN and Vitran Nigams shall prepare a comprehensive power cut and load shedding scheme so that no sector suffers at the cost of other and all categories of consumers share the shortage. (Para 52)

100 RVPN shall segregate account of generation, transmission & load despatch. (Para 54)

101 RVPN should report status and review of order after three months of introduction of ABT regime. (Para 56)

102 RVPN shall finalise provisional rate for billing conveyed by Director finance and company affairs, RVPN vide letter dated 29.8.2000. (Para 60)

103 RVPN shall enter into power station wise PPA based on GOI guidelines with RVUN within 3 months of this order. (Para 62)

Appendix - I

Complete list of Objectors (RVPNL)

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remain in force until any amendment to the tariff is approved by the Commission. This tariff shall become effective from 1st April 2001.

121. This order is made on March 24, 2001.

-sd- -sd- -sd-

(Prabhakar K. Das) (Shanti Prasad) (Arun Kumar)

Member Member Chairman

Certified copy

(Prabhat Dayal)

Secretary

Rajasthan Electricity Regulatory Commission

Jaipur

RAJASTHAN ELECTRICITY REGULATORY COMMISSION, JAIPUR
NOTIFICATION
JAIPUR 24.05. 2008

No. RERC / Secy / Reg - 74 In exercise of the powers conferred under Section 181 read with section 86(1)(h) of the Electricity Act, 2003 (Act 36 of 2003) the Rajasthan Electricity Regulatory Commission after previous publication makes the following regulations namely:

1.0 Short title and applicability

(i) These regulations shall be called as the "Rajasthan Electricity Regulatory Commission (Rajasthan Electricity Grid Code) Regulations 2008". In short **REGC**.

(ii) These regulations shall apply to the **Users** of 33kV and above, which includes Transmission licensee, Generating Station located in the State including Independent Power Producers, Renewable Energy Power Plants, Generating or/and Transmission Companies connected to State Transmission System, Distribution Companies having HV/EHV consumers directly connected to State Transmission System, Open access customers interconnected to State Transmission System, and Traders.

(iii) These Regulations supersede Part-1 of the Grid Code; earlier approved by Rajasthan Electricity Regulatory Commission **(RERC)** and published by Rajasthan Rajya Vidyut Prasaran Nigam Ltd **(RVPN).** The REGC shall be effective from the date of its publication in the official gazette.

(iv) These Regulations shall also be applicable to the new **Connections** and equipments procured/provided for new works/replacements from the date the **REGC** is made effective. The existing Connections and equipments shall continue to operate till such time it is considered necessary. The operational aspects of the **REGC** shall have no such relaxation and shall be applicable with immediate effect.

(v) The Regulations relating to Grid connectivity, Grid standards & safety standard as specified by the CEA under section 73 of the Act shall generally be complied with in addition to **REGC**.

(vi) These Regulations are covered in 16 Chapters:

Chapter I	SHORT TITLE AND APPLICABILITY
Chapter II	GENERAL REQUIREMENT & BACKGROUND.
Chapter III	DEFINITIONS.
Chapter IV	MANAGEMENT OF THE GRID CODE.
Chapter V	SYSTEM PLANNING.
Chapter VI	CONNECTION CONDITIONS.
Chapter VII	SYSTEM SECURITY ASPECTS.
Chapter VIII	OUTAGE PLANNING.
Chapter IX	OPERATIONAL PLANNING.
Chapter X	SCHEDULEING, DESPATCH AND ACCOUNTING.
Chapter XI	FREQUENCY, VOLTAGE AND NETWORK LOADING MANAGEMENT.
Chapter XII	CONTINGENCY PLANNING.
Chapter XIII	INTER USER BOUNDARY SAFETY.
Chapter XIV	OPERATIONAL EVENT/INCIDENT AND ACCIDENT REPORTING
Chapter XV	PROTECTION.
Chapter XVI	DATA REGISTRATION.

2.0 Chapter-II General Requirement & Background

The Central Electricity Regulatory Commission (**CERC**) under the Electricity Act 2003, Section 79(1)(h) has specified the Indian Electricity Grid Code (**IEGC**). The Electricity Act 2003, Section 86(1)(h) also mandates that the State Electricity Regulatory Commissions shall specify State Grid Code consistent with **IEGC**. Accordingly **REGC** is introduced.

REGC lays down the rules, guidelines and the standards to be followed by the **Users** to operate and maintain an efficient and coordinated State Transmission

Close co-ordination amongst the **Users, SLDC** and the **Transmission Licensee** shall exist at all times for the purposes of effective frequency and voltage management.

The **SLDC** shall monitor the actual **Drawal** against the scheduled **Drawal** and shall regulate the internal generation/demand and maintain the schedule. **SLDC** shall also monitor the reactive power drawal and availability of capacitor bank(s).

The **SGS** shall follow the **despatch instructions** issued by **SLDC.**

The **Discoms** shall primilarly be responsible for managing its load and reactive power **drawal** as per instructions of **SLDC.**

11.3 **Frequency Management:** The nominal system frequency is 50Hz. All possible efforts shall be made to ensure that system frequency shall remain in the band of 49.0Hz to 50.5Hz.

11.4 **Voltage Management: STU** and/or **SLDC** shall carry out the load flow studies based on operational data from time to time to predict where the voltage problems may be encountered and to identify appropriate measures to ensure that the voltage remain within the prescribed limits. Based an such studies the **SLDC** shall instruct the **SGS** to maintain the specified voltage level at interconnecting points. **SLDC** and **STU** shall co-ordinate with the **Discoms** to determine voltage level at the interconnection points.

SLDC shall continuously monitor 400kV, 220kV, 132kV voltage levels at strategic sub-stations and take appropriate measures to control **STS** voltages which may include but not be limited to transformer tap changing, capacitor / reactor switching including capacitor switching by **Discoms** at 33 kV substations, operation of Hydro unit as synchronous condenser and use of MVAr reserves with **SGS** within technical limits as agreed to between **STU** and **SGS.**

RVUN and **IPPs** shall make available the up-to-date capability curves for all **Generating Units** to **SLDC**, as detailed in Chapter-VI, indicating restrictions if any, to allow more accurate system studies and effective operation of the **STS.** The **CPPs** shall furnish the net reactive capability available for Export to/Import from **STS.**

The **Discoms** shall participate in voltage management by providing Local VAR compensation as far as possible, in low voltage system close to load points not depending on **EHV Grid** for reactive support.

11.5 **Network Loading Management:** The **SLDC** shall carry out the periodic studies of the intra-state network loading at least once a year to assess the transfer capability of the state as a whole as well as **Discom** wise and post such information on its website. This shall form the basis for approving Short Term OA transaction at the inter state level.

12.0 Chapter -XII CONTINGENCY PLANNING

12.1 **General:** The recovery process is to be followed by all the **Users** in the event of contingency i.e. total or partial blackouts of **STS** or Regional Transmission System to achieve the fastest recovery taking into account the essential load, Generator capabilities and system constraints.

12.2 **Contingency Planning Procedure:** The contingency planning and blackstart procedure for the **State Transmission System** shall be as per Load Despatch & System Operation Manual.

12.3 **Restoration Procedure:** The restoration procedure for **STS** shall be prepared by **SLDC** for the following contingency:

(i) Total system black out
(ii) Partial System Blackout
(iii) Synchronisation of System Islands and System Split (separation)

The procedure shall be in conformity to the Recovery Procedure of the **Northern Region** prescribed under **IEGC** to be updated with new network parameters.

The restoration process shall take into account the generator capabilities and the operational constraints of Region and **STS** in achieving normalcy in the shortest possible time. The Users should be aware of the steps to be taken during the **Grid Disturbance** and system restoration process.

12.4 During the restoration period as certified by **SLDC** the provision of ABT shall remain

Draft No. DFA/42202

Attachment:Annexure IV_SS (1).pdf

2nd System Studies Sub-Committee Meeting – PSDF Scheme

(Proposal No.: 349)

Meeting Date: 04 April 2023 | 11:00 AM Onwards

JAIPUR VIDYUT VITRAN NIGAM LIMITED

Corporate Identification Number (CIN): U40109RJ2000SGC016486

Office of the Additional Chief Engineer (PPM)

Old Powerhouse Premises, Banipark, Jaipur-302016

Background

Installation of Dynamic/ Automatic Capacitor Banks on 11 kV Side of 33/11 kV sub-stations under Power System Development Fund (PSDF)-Phase-I Scheme in Jaipur Discom

Chronology of Events

Sr. No.	Parameters	Date
1	Submission of DPR **(Estimated Cost: ₹ 175.48 Cr.)** vide letter no: JPD/SE(Regulation)/XEN(DF)/F./D. 503	**25.08.2022**
2	Observations/ Gaps under 66th TESG meeting vide letter no. NLDC-PSDF/66th TESG/2022-23	27.09.2022
3	JVVNL clarification on 66th TSEG meeting vide letter no. JPD/SE(Regulation)/XEN(DF)/F./D 676	07.10.2022
4	JVVNL request to STU on project appraisal vide letter no: JPD/SE(Regulation)/XEN(DF)/F./D.717	13.10.2022
5	Observations/ Gaps under 66th TESG meeting vide letter no. NLDC-PSDF/66th TESG/2022-23	01.11.2022
6	STU request for Reactive Power Installation vide letter no. EVPN/SE(P&P)/XEN-2/AE-III/F. 51/D. 1566	22.11.2022
7	Submission of Revised DPR **(Estimated Cost: ₹ 180.47 Cr.)** vide letter no: JPD/SE(Regulation)/XEN(DF)/F./D. 847	**24.11.2022**
8	Observations/ Gaps under 70th TESG meeting vide letter no. NLDC-PSDF/70th TESG/2022-23	16.01.2023
9	JVVNL clarification on 70th TSEG meeting **(Estimated Cost: ₹ 132.51 Cr.)** vide letter no. JPD/ACE(PPM)/XEN(DF)/F./D 999	**17.01.2023**
10	Observations/ Gaps under 73rd TESG meeting vide letter no. NLDC-PSDF/73rd TESG/2022-23	06.03.2023
11	JVVNL Clarification on 73rd TSEG meeting vide letter no. JPD/ACE(PPM)/XEN(DF)/F./D.1134	14.03.2023

Project Summary

Sr. No.	Parameters	Remarks
1	Objective	Installation of Capacitor Banks on 11 kV Side of 33/11 kV Substations for Reactive Power Compensation under Power System Development Fund (PSDF) – *Phase 'I'*
2	Financial Implications	**Total Cost Estimate*: Rs. 132.51 Cr.** (i.e., 90% funding proposed from PSDF of Rs. 119.26 Cr. + 10% contribution from internal/ external sources of Rs. 13.25 Cr.) *****The cost is inclusive of transportation, erection, insurance, labour & finance cost, service cost, price escalation on cost of material, civil cost, applicable GST and other taxes, however it doesn't include Annual Maintenance Cost (AMC) which shall be borne by JVVNL separately*
3	**Estimation for Installation of Capacitor Banks**	
4	Proposed Timeline	24 Months (from the date of receipt of PSDF grant approval) i.e. • **Finalization of Tender Documents & Issuance of Work Order:** 03 Months • **Procurement, Installation, Commissioning & Testing of Equipments:** 20 Months • **Cost Benefit Analysis & Report Submission on Improved Power Factor:** Last Month

Estimation for Installation of Capacitor Banks

Power Factor	Circle	Division	Sub-Division	33/11 kV Sub-station	Feeder Count	Transformer Capacity (MVA)	Rating (kVAr)	Quantity (Nos.)	Unit Rate (Rs. Lakhs)	Total Amount (Rs. Cr.)
Less than 0.85	12	46	151	572	2,587	3.15/ 5	1587	563	22.87	128.75
						8	3174	14	26.84	3.76
							Total (In Nos.)	**577**	**-**	**132.51**

Other factors considered

Focus Area	Key Activities
(A)Technology	▪ Methodology adopted by JVVNL to analyze poor voltage profile (below 0.9 p.u.) and power factor (below 0.85), is truly based on **"Feeder Monitoring System"** which includes real time power supply status of 11 kV feeders ▪ JVVNL has considered complete solution for installation of 1587 kVAr & 3174 kVAr APFC Bank including provisions of: ✓ Switching Arrangements with Switchgear Protective System ✓ Monitoring Mechanism and Automatically Control of Capacitors Units ✓ Compatible for Automatic Meter Reading (AMR) with programmable and have data downloading facility
(B) Implementation Plan	▪ Works shall be carried out on **turnkey basis** through international or national **competitive bidding (L1)** ▪ Shall cover the overall procurement, installation, commissioning, testing and even **05 years maintenance**
(C) Cost Benefit Analysis	▪ With the project implementation, **total savings of Rs. 176.75 Cr. annually** with an estimated **'Payback Period' of approx. 10 months** ▪ Capable of **lowering down the overall penalty impact (i.e., below 10 paise/kVArh)** due to poor power factor *– As per provision of weekly settlement in accordance with the CERC (Indian Electricity Grid Code) Regulations, 2010*

Thank you

JVVNL Response to observations dated 06.03.2023 (1/3)

- On 06.03.2023, NLDC shared approved agenda of Techno-Economic Subgroup including some observations/ requirements as below.

S. No.	Comments/ Observation of TESG Members	Our Remarks
(A) PSETD		
1	(2) Study report detailing expected voltage and power factor after installation of automatic capacitor bank may be submitted for justification of the proposal.	As already highlighted vide letter no. JPD / ACE(PPM) / XEN(DF) / F. / D 999 dated 17.01.2023, with the installation of proposed capacitor bank(s), the existing voltage profile (below 0.9 pu) and power factor (below 0.85) shall be improved at a level of atleast 0.98 PF. Also, as highlighted in Section 15 (Success criteria and sustainability) of the DPR, the project will result in savings to the tune of Rs. 176.75 Cr through Power Factor Improvement, with payback period of around 10 months. Even though no study detailing expected voltage and power factor after the installation of automatic capacitor bank is available with JVVNL, however, a study was conducted by ERDA on benefits of APFC Panel installed at 33/11 kV S/s of UPCL**.** The cost-benefit analysis done in the study report concluded the following: **When APFC Panel is in OFF Condition:** ▪ Maximum Voltage: 11.25 kV ▪ Power Factor: 0.83 **When APFC Panel is in ON Condition:** ▪ Maximum Voltage: 12.14 kV ▪ Power Factor: 0.99 ▪ Amount Saved: Rs. 160 Cr. per Year ▪ Payback Period: 1.63 Years Hence, the appraisal committee is requested to consider the above highlighted two cost-benefit studies towards the justification of the proposal.

JVVNL Response to observations dated 06.03.2023 (2/3)

S. No.	Comments/ Observation of TESG Members	Our Remarks
(B) NPC		
2	(4) Entity informed that AMC will borne by entity and agreed to exclude the AMC. However, it is included in the revised cost estimate. Therefore, entity is once again requested to separate this AMC portion from this project.	As already highlighted vide letter no. JPD / ACE(PPM) / XEN(DF) / F. / D 999 dated 17.01.2023 and the submitted revised DPRs, the Annual Maintenance Cost (AMC) cost has been presented separately under Section 13: BILL OF QUANTITY of DPR. Thus, the estimated cost of Rs. 132.51 is exclusive of such AMC cost as evident from the summary table given below: **Rating (kVAr) / Qty (Nos.) / Unit Rate (Rs. Lacs) / Amt. (Rs. Cr)** 1587 / 563 / 22.87 / 128.75 3174 / 14 / 26.84 / 3.76 **Total / 577 / - / 132.51** To ensure completeness of the DPR in every aspect, the AMC cost of Rs. 20.20 Cr. (i.e., Rs. 19.71 Cr + Rs. 0.49 Cr) is separately indicated under the submitted proposal / DPR and **shall be completely borne by JVVNL.**
3	(6) Entity is requested to provide Study conducted by RPC / third party / STU / JVVNL and the study report should be appraised / vetted by NRPC.	It is submitted that JVVNL vide letter no. JPD/SE (Regulation) / XEN(DF) / F. / D. 717 dated 13.10.2022 has already requested the state STU (RVPNL) to provide project appraisal report including technical, financial observation, suggestions on compliance of grid standards, shortcomings (if any), recommendations and format A5 duly vetted by RPC under the membership of Operational Coordination Sub-Committee (OCC). Response in this regard is still awaited from RVPNL and the same shall be submitted by JVVNL to the appraisal committee as soon as it is received.
4	(7) The rating of VCBs is same for both 3.17 MVAR and 1.98 MVAR capacitor banks Entity is requested to provide the justification of the same.	As already highlighted vide letter no. JPD / ACE(PPM) / XEN(DF) / F. / D 999 dated 17.01.2023, a common VCB with minimum current rating of 630 Amp. shall be suitable for 1587 kVAr & 3174 kVAr APFC Ratings. Also, both the proposed ratings of APFC will be installed at 11kV level and thus it becomes imperative to have VCB based on the voltage profile, fault current and other associated parameters at 11kV level only. Further, it may be noted that under the already 'Approved Cost' of MSEDCL Capacitor Bank Project, similar approach was followed i.e., single rating of VCB considered for different kVAr rating APFC. Hence, the appraisal committee may also consider the JVVNL proposal in this regard.

JVVNL Response to observations dated 06.03.2023 (3/3)

S. No.	Comments/ Observation of TESG Members	Our Remarks
(B) NPC		
5	(8) Entity may provide the details of performance of LT Shunt Capacitors (3 kVAr - 6 kVAr - 9 kVAr) installed from 2016-17 onwards.	It is to highlight that as per Section 8 of revised DPR submitted, from 2016-17 onwards, for the improvement of power factors at load end, JVVNL has installed approx. 5,62,323 Nos. of LT Shunt Capacitors (3 kVAr - 6 kVAr - 9 kVAr) on request of consumers only. However due to smaller impact of individual power factor improvement, burning / failure and theft related issues, Discom has resorted for implementation of dynamic/ automatic capacitor bank at the various 11 kV side of the 33/11 kV sub-stations. Further, Rajasthan is one of the largest state by land area in the country resulting in very poorly densed population which has ultimately resulted in widely spread consumer base for Discoms & long distribution lines. Due to this, it is not a cost-effective proposition for Discom to monitor and assess the actual performance of individual capacity bank installed at load end. Due to above mentioned challenges, JVVNL has no study available on LT Shunt Capacitors installed during 2016-17 period.
(C) CTU Plng.		
6	(10) Provision of capacitor at 11kV side of 33/11kV substation wouldn't be very effective for controlling voltage at 11 kV feeder end. Capacitor at the end of Radial 11 kV feeder and capacitor bank at 33/11 kV substation would be better proposal for control of voltage and of losses as done by Telangana.	From 2016-17 onwards, JVVNL has installed approx. 5,62,323 nos. of LT Shunt Capacitors (3 kVAr - 6 kVAr - 9 kVAr), however, due to smaller impact of power factor improvement, burning/ failure and theft related issues, JVVNL has resorted for installation of APFC at substation level so as to avoid the challenges associated with the installation at load end. Therefore, even though capacitor at the end of Radial 11 KV Feeder and Capacitor Bank at 33/11 KV substation would be better proposal for control of voltage and losses, however, based on past-experience of JVVNL, it is also imperative to address the challenges associated with wide scale of maintenance requirement, equipment safety and effective monitoring. Therefore, it is recommended that the committee may consider the proposal of JVVNL for installation of capacitor bank on the 11 kV side of 33/11 kV Sub-stations only.